

# A BANDSPREAD TWO-VALVER—

See page 191.

# Practical and Amateur Wireless

**3<sup>d</sup>**  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 12. No. 294.  
May 7th, 1938.

AND PRACTICAL TELEVISION

## More About

- ① 2 Valve S.W. Converter
- ② All-Wave Tuner
- ③ Economy Iv. S/Waver
- ④ Hurricane All-Waver



1



2



3



4

# OUTLINE of WIRELESS

**816**  
PAGES

By RALPH STRANGER

(9/- post free)

Here is a book which covers the theory and practice of Wireless Reception from A to Z, and makes everything plain even to the most "non-technical" reader.  
NEWNES FROM ALL BOOKSELLERS or from Tower House, Southampton Street, Strand, W.C.2. LONDON

**8/6**  
NET

*"Shall we  
join the Ladies?  
— they've gone off  
with the Gold Flake!"*



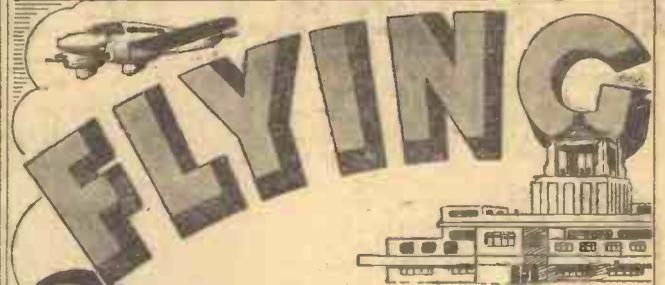
Women have got taking ways when it comes to a man's cigarettes—or rather, the man's cigarettes, Wills's Gold Flake. That's because, in these days, they want a cigarette really worth smoking. Men have always liked the flavour of really fine Virginia tobacco that is so distinctive in Wills's Gold Flake. So do women, now!

**WILLS'S  
GOLD FLAKE**

*is the man's cigarette  
that women like*

**N.B.** You can get Wills's Gold Flake Cork-tipped as well as Plain. Ten for 6d. Twenty for 1/-

G.F.B. 425



**3<sup>d</sup>** The New Popular  
**Air Weekly**  
EVERY  
FRIDAY



*If you are air-minded you will enjoy FLYING.*

Contents of this week's FLYING include:—

**FLOATING DOWN TO EARTH—BY PARACHUTE**  
By Neil P. Ewart.

**WAR ACES WHO CHEATED DEATH**  
By John C. Hook.

**PROPELLER DESIGN IN MODEL AEROPLANES**  
By L. S. Wigdor.

**EMPIRE AIR DAY**  
Where to go and what to see.

**THE WIND INDICATOR (Topical Gossip)**  
**FLYING CONTRABAND**

A short story by William Courtenay.

**MURDER BY AIR**  
By Capt. W. E. Johns.

Also

**PAGES OF AIR PICTURES IN PHOTOGRAVURE**



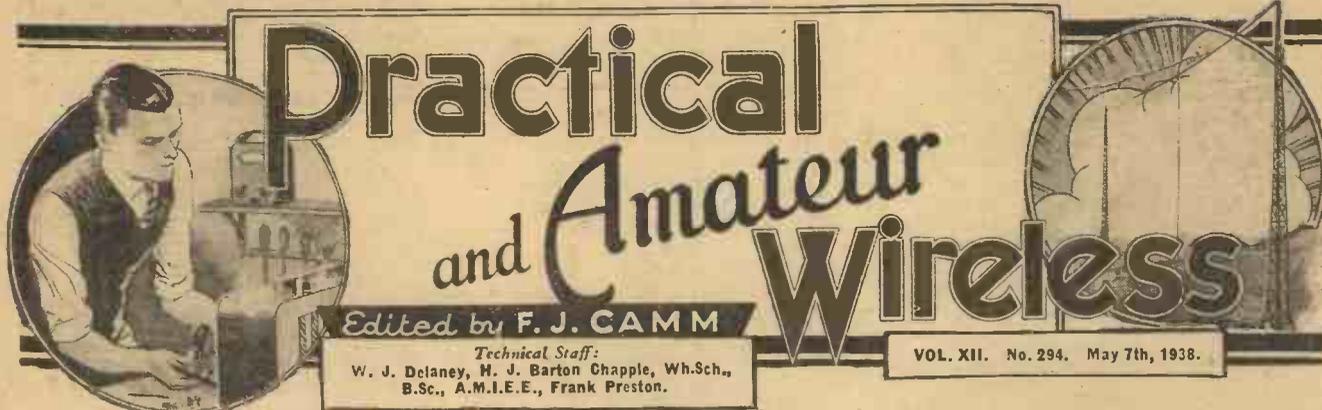
**ON SALE EVERY  
FRIDAY**

Of all Newsagents and Bookstalls,  
or by post, 4d., from the Pub-  
lisher, George Newnes, Ltd., Tower  
House, Southampton Street, Strand,  
London, W.C.2.



George Newnes, Ltd.

# INTERFERENCE ON SHORT WAVES. — SEE PAGE 200



## Practical and Amateur Wireless

Edited by **F. J. CAMM**

*Technical Staff:*  
W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,  
B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 294. May 7th, 1938.

## ROUND *the* WORLD of WIRELESS

### Short-wave Interference

ONE of the first points which impresses the newcomer to the short waves is the interference which is experienced from various sources. If you live close to a main road you will find that as every car or motorcycle passes the house a noise is heard in the loudspeaker, increasing to maximum as the vehicle approaches and dying away as it recedes. In most cases this will take the form of a continuous crackle which will completely drown any station you have received. The remedy is to remove the aerial as far as possible from the roadway, but this is not always convenient. Other forms of interference will be found to arise from faulty switches, electrical apparatus of a domestic nature, commercial equipment, and so on. It is to be hoped that the Government will not long delay the passing of the Bill which will make it illegal to use any apparatus capable of causing interference with radio apparatus, and in several other countries this has already been done. There are various things which may be done in the receiver and its associated equipment to cut out interference, and on page 200 this week we give details of the various forms of interference which may be experienced and suitable remedies or cures. If your particular trouble is not mentioned specifically, do not forget that our Queries Bureau is available to help you in solving the difficulty.

### Manchester Radio Show

THE date of the North National Radio Exhibition, to be held at the City Hall, Manchester, is from September 27th to October 8th. The exhibition has received the R.M.A. sanction and will be restricted to British goods conforming to the R.M.A. foreign content clause.

### Scottish Radio Show

IT is now stated that there will be no radio show in Scotland this year. Independent organisers may arrange to provide some kind of alternative, but it is stated that the Empire Exhibition at Bellahouston Park will provide adequate exhibition facilities and that a radio show would be unpopular.

### Radio in Belgium

AN interesting innovation is now to be introduced on the Belgian State Railways. This will consist of the installa-

tion on certain trains of elaborate radio equipment which will enable tourists to hear broadcasts from various stations and relays of gramophone records. The main receiver and gramophone amplifier is to be installed in a specially-designed brake-van, and each coach will be fitted with reproducers, either of the loudspeaking type or for more intimate use.

time ago, the driver of a train was able to communicate to the guard and also with the nearest signal box by means of a special transmitter, but the apparatus has not yet been permanently installed. In Norway, goods trains plying between Trondhjem and the Swedish frontier are now permanently equipped with this type of apparatus and greater safety is ensured.

### ON OTHER PAGES.

The "Hurricane" All-wave Three	187
The "Cyclo" Converter	188
Technical Fundamentals	189
Short-wave Section	191
On Your Wavelength	193
Readers' Wrinkles	195
All-wave Tuner	196
"Economy" S.W. One-valver	198
Interference Suppression on Short Waves	200
Practical Television	202
Impressions on the Wax	203
Readers' Letters	205
Queries and Enquiries	207

### Radio Life-savers

THE development of radio as a safety device is adequately illustrated by the latest figures of radio beacons. These are employed, as most readers know, somewhat on the lines of a normal lighthouse, providing identification of various danger points, harbours, etc. The total number of these beacons in use at the beginning of the year was approximately 421, which represents an increase of 41 during the year 1937. Out of the 53 lifeboats which are suitable for radio round our coast, 27 have already been fitted and before the end of the year it is hoped that another 23 will be similarly equipped.

### Radio Train Link

EXPERIMENTERS have been interested in the suggestion that trains should be fitted with special transmitting and receiving gear. In tests made in this country some

### Aerial Bans

CERTAIN local councils, we understand, are banning outdoor aerials on the grounds that the average aerial pole is generally of a flimsy nature and renders the landscape unsightly. To combat this ban builders are now stated to be incorporating the aerials and associated leads inside the walls of the houses, and communal aerial systems are being so designed for use in flats.

### Chaliapin Records

IN reply to many requests, H.M.V. announce that the only records made by Chaliapin and as yet unissued are two in number. These were released on Friday last and one includes "The Prisoner" and "Black Eyes," whilst the other is a historic gem giving the Prayer and Death of Boris recorded at Covent Garden on July 4th, 1928, during an actual performance of "Boris Godounov."

### Eight Bells

THE first of the new Summer shows to be broadcast serially is Eight Bells, and this will be heard on May 12th in the National programme and on May 14th in the Regional programme. Each broadcast will come from the quarter-deck of the St. George, under which pseudonym listeners will recognise the stage used by the B.B.C. variety department at St. George's Hall. Nautically speaking, eight bells on May 12th will find the B.B.C.'s world-cruising radio ship tied up within the shadow of the famous bridge at Number One Buoy, the Flagship's buoy, in Sydney Harbour.

### Holiday Time

IN the West of England programme on May 11th and the National programme, May 14th, John Betjeman will end his review of the amenities of coastal resorts in the West Country, in a fourth talk entitled "Seaview: Where are you going?" He will put forward different kinds of holidays.

# ROUND the WORLD of WIRELESS (Continued)

## New B.B.C. Appointments

WE are informed that Mr. J. Tudor Jones has been appointed Welsh Regional Programme Director and Mr. Sam Jones, Chief Producer at Cardiff. As Programme Director of the Welsh Region Mr. Tudor Jones succeeded Mr. Owen Parry, who has resigned on grounds of ill-health. Mr. Tudor Jones took up his appointment on April 19th, and after spending three weeks in Cardiff, will visit other Regional offices, spending two weeks in each. Mr. Sam Jones, who will shortly transfer from Bangor to Cardiff, is at present the B.B.C.'s North Wales representative.



A view of the amplifier in the new French station at Essart le Roi. This station is being built to supply broadcasts to the French colonies and will use a power of 2 kW, supplying 5 directional aeriols.

## INTERESTING and TOPICAL NEWS and NOTES

Webster on May 6th and repeated on the following day in the Regional programme. The play, which concerns the tracking down of a gang of jewel thieves, will be completed in eight episodes. The author has accepted a suggestion from a firm of publishers that it should next be put into the form of a novel. Thus extended it will appear in the summer.

Mondays. The programmes have been written by Verne Fitzpatrick from facts contained in Jehl's "Menlo Park Reminiscences." Station WLW operates on a wavelength of 428 metres (700 kc/s).

## For Football Followers

MAY 7th sees the end of the professional Soccer season in England and Wales. Perhaps a million spectators will ache for its reopening until the last Saturday in August. What Soccer means to its fans, its regular supporters, its players, its referees, its directors and journalists, they will tell listeners on May 6th in the Northern programme.

## Variety from Bristol

VARIETY will be broadcast from the Annual Exhibition at the Bristol Coliseum on May 11th; when the artists will be: Beryl Orde, "Impressions"; Bennett and Williams, "The Two Jovial Boys with their Phono-Fiddles"; Pat O'Brien, "The Irish Street Singer"; Jan Ralfini and his Band.

## B.B.C. Midland Orchestra

LESLIE HEWARD will conduct the B.B.C. Midland Orchestra in a programme which is entitled "Modern Miscellany" on May 14th. It includes Miaskowsky's Serenata for small orchestra, a Suite by Cras, and two short pieces for orchestra by W. L. Reed.

## "The Deputy"

SAM BARLOW is "The Deputy," in the play of that name written by Lewis Hodgkinson and A. Raymond Walton. The scene is laid down a Tyneside colliery, and the characters are all men; the Deputy himself, seven miners, and a colliery manager. This play will be broadcast in the Northern programme on May 7th.

## Development of Radio in U.S.S.R.

THE growth of radio transmission in the U.S.S.R. may be gauged from the fact that last year there were 80 central broadcasting stations in the Union and 280 provincial broadcasting stations. In the cities, factories and mills, on the State and collective farms, there are 3,649 radio relay stations with 2,766,000 receiving points, of which 573,000 are in rural districts.

## New Turkish Transmitter

IT is reported that the Turkish broadcasting authorities intend to construct a new short-wave transmitter of 20 kW, and a medium-wave transmitter of 120 kW.

## Cycle Radio

WIRELESS manufacturers in France are contemplating the production, on a large scale, of lightweight wireless sets, designed for use on bicycles.

## Vacancies for Wireless Operators

LARGE shipping companies are experiencing a shortage of wireless operators, and many vacancies are being advertised. There are no age limits imposed on applicants, whose period of training is about twelve months.

## 'Send for Paul Temple'

THE fifth episode of Francis Durbridge's serial thriller, "Send for Paul Temple," will be produced by Martyn

## Famous Bands for Empire Exhibition in Glasgow

FIFTY of the best bands in the country, including the most famous Army bands and the pick of the civilian bands of England, Scotland and Wales, have been engaged to play this summer at the Empire Exhibition in Glasgow, which was opened by the King last Tuesday (May 3rd).

There are two bandstands in the grounds at Bellahouston Park, each with seating accommodation for several thousand people, and music is to be one of the big attractions of the Exhibition. For the opening week the bands of the Royal Horse Guards and the Highland Light Infantry have been engaged. Among other Army bands to play in Glasgow are the Scots Greys, Scots Guards, Coldstream Guards, Grenadier Guards, as well as the bands of most of the Scottish regiments and the famous Kneller Hall band.

Among civilian bands which have secured engagements are the Black Dyke Mills Band, the Scottish C.W.S. Band, Fodens Band, the R.A. Lister Military Band, and the Wellesley Colliery Band.

## Edison Broadcasts from WLW

"THE Wizard of Menlo Park" is the title of a series of weekly talks on the life of the late Thomas A. Edison, which are broadcast from WLW (Cincinnati, U.S.A.) from 2 to 2.15 p.m. E.S.T., on

# SOLVE THIS!

## PROBLEM No. 294

Thackeray had an old mains transformer which, amongst others, had a 2-volt .5 amp. secondary winding on it. As he wished to use this transformer in an experimental circuit where a 4-volt 1 amp. winding was called for, he decided to obtain the necessary doubling by joining an old 2 to 1 transformer, which he had, between the winding in question and his apparatus. This failed to function, although he ascertained that the 2 to 1 transformer had suitable wire for the current called for. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 294 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 9th, 1938.

## Solution to Problem No. 293

When Atkins connected the fixed condenser in series with his variable he was overlooking the fact that the minimum capacity left in circuit was that of the fixed condenser and this was obviously higher than the minimum of the variable. The best plan was to have stripped off a few turns from the tuning coils. The following three readers successfully solved Problem No. 292 and books have accordingly been forwarded to them: A. H. Curtis, "Braemar," 121, Walsdale Road, Walsall, Staffs.; A. C. Dean, 41, West Broadway, Westbury-on-Trym, Bristol; J. Jackson, 57, Crescent Road, New Barret, Herts.

# THE "HURRICANE" ALL-WAVE 3

More About the Simple All-wave Receiver which was Described in Last Week's Issue

**B**EFORE giving further details regarding this interesting receiver, we may point out the reason for including the diagram of the combined volume control and on-off switch in the wiring diagram last week. The switch is necessary to break not only the L.T. circuit, but also the H.T. circuit, which is completed through the screen-grid potential divider, and thus a three-point switch is called for. The standard combined control has four contacts for the switch, and thus two of these have to be linked together to act as a single contact. In the theoretical diagram and in the wiring diagram these have been given identification numbers, and this will ensure that the correct connections are made so that the H.T. will be cut off when the set is switched off and no leakage will take place.

The potential divider already mentioned controls the voltage on the screen of the H.F. valve, and this controls the sensitivity of the receiver. Therefore the first thing to do in operating this set is to put the control at a point where sensitivity is at a maximum whilst stations are located. Reaction is employed in the usual way to boost signals or to bring weak signals up to a suitable volume for the loudspeaker, but the most important adjustment is that for the first valve. A separate H.T. lead is recommended for this to assist in obtaining a suitable adjustment, and a little care should be devoted to trial and error tests so that the best setting is found for subsequent use.



This is the complete receiver, with two S.W. coils plugged in ready for S.W. reception.

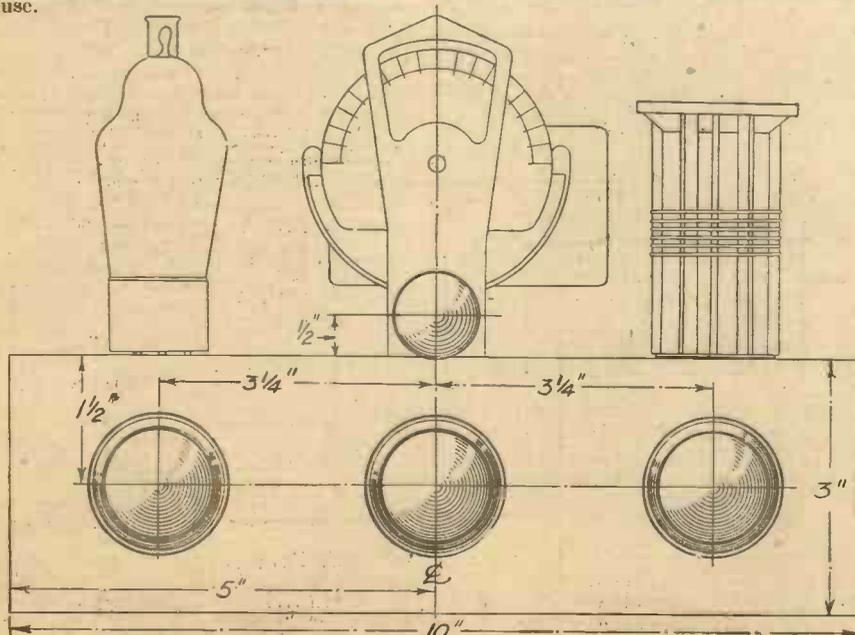
### Panel and Cabinet

As already mentioned, a metal cabinet is available from Messrs. Peto-Scott for this receiver, and by using this, in conjunction with a metal panel, not only will hand-capacity effects be removed, but direct pick-up on the wiring of the receiver will be avoided and selectivity will be at its best. In many cases of interference or poor selectivity, it is found that the inter-circuit wiring of the receiver is responsible for quite a lot of the trouble,

but by using a metal box to enclose the receiver this difficulty is removed. The accompanying illustration gives the layout of the four controls, and this may be used

### LIST OF COMPONENTS FOR THE "HURRICANE" ALL-WAVE THREE.

- One pressed-steel chassis with valve-holders and coil-holders riveted in position (Peto-Scott) (5s. 6d.).
- One "Hurricane" 2-gang condenser and distance pieces (New Times Sales) (5s.).
- One L.F. "Super" transformer (Peto-Scott) (4s. 6d.).
- One 50,000-ohm potentiometer with 3-pt. switch (Lab.) (Erie) (5s.).
- Four 1-watt resistors: 10,000 ohms, 30,000 ohms, 150,000 ohms, 5 megohms (Dubilier) (2s.).
- Six tubular condensers: two .0002 mfd., type 451; one .005 mfd., type 451; three .1 mfd., type 341 (T.C.C.) (7s.).
- One .01, type 34, fixed condenser (T.C.C.) (3s.).
- One special 1 mfd. condenser (Peto-Scott) (1s. 6d.).
- One "Hurricane" slow-motion dial (New Times Sales) (2s.).
- One .0001-mfd. reaction condenser (B.T.S.) (2s. 6d.).
- One .0003-mfd. reaction condenser (B.T.S.) (2s. 6d.).
- One set of three "Hurricane" American-type valves (N.T.S.) (5s. 6d.).
- One set of "Hurricane" 6-pin one-shot inductors (B.T.S.).
- Connecting wire, battery leads, plugs, etc. (Peto-Scott) (2s. 6d.).
- One "Hurricane" metal cabinet (12s. 6d.) and metal panel (2s. 6d.) (Peto-Scott).
- One Junior 381 loudspeaker (W.B.).
- One pair of 4,000-ohm headphones (Ericsson).
- One 2-volt accumulator.
- One 120-volt H.T. battery.



The panel layout, showing the symmetrical arrangement of components and control knobs.

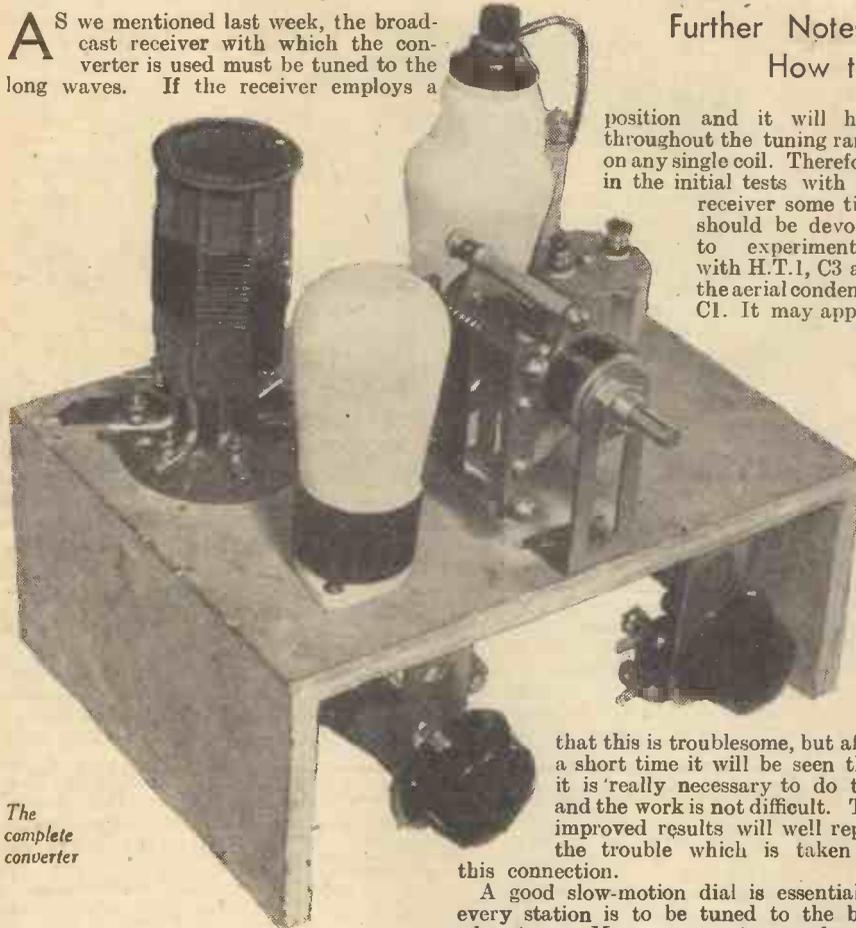
when drilling the panel. If the dial light is required it should be wired direct to the nearest valveholder filament terminals, taking ordinary twisted flex down through a hole in the chassis for the purpose. If it is felt that the additional L.T. consumption is not desirable the dial light holder may be wired in series with an ordinary on-off switch mounted immediately above the dial so that it may be switched out after a station has been located. Use the highest grid-bias on the output valve that can be applied without reducing volume, as this will reduce H.T. consumption and lead to more economical working.

### Trimming

To enable the two circuits to be kept in tune a panel trimmer is provided and will be found in the centre of the lower row of knobs. This control must, therefore, be operated in conjunction with the main tuning control, and the best way to use it is to swing it backwards and forwards as the main tuning control is adjusted. On loud stations the setting will not be found critical, but on the weaker stations it will have to be adjusted in order to bring signals up to suitable strength and it must then be used in conjunction with the reaction control.

# The "Cyclo" Converter

As we mentioned last week, the broadcast receiver with which the converter is used must be tuned to the long waves. If the receiver employs a



The complete converter

## Further Notes on This Useful Converter and How to Obtain Maximum Results

position and it will hold throughout the tuning range on any single coil. Therefore, in the initial tests with the receiver some time should be devoted to experimenting with H.T.1, C3 and the aerial condenser C1. It may appear

window frame make certain that it is well insulated. It should be remembered that the lead-in should be kept clear of walls, and where it is fed into the house a really efficient insulator should be employed to avoid leakage. The earth wire should be insulated and kept clear of everything until it enters the ground, to avoid erratic tuning effects which might be introduced due to "earth loops." As pointed out last week, the H.T. and L.T. batteries used for the broadcast receiver may also be used to operate the converter, and the only precaution is to see that the H.T.— and L.T.— leads in the receiver are both joined together and to earth. This is essential, as

that this is troublesome, but after a short time it will be seen that it is really necessary to do this and the work is not difficult. The improved results will well repay the trouble which is taken in this connection.

reaction control this should be set to minimum for the reception of telephony signals, but when it is desired to receive C.W. morse signals the reaction may be turned up until the signals are heard. It should be remembered that a superhet cannot be used to pick up this type of code signal unless some form of beat-frequency oscillator is employed, and when using a converter in conjunction with a broadcast receiver the B.F.O. may be obtained by the standard reaction control. The reaction condenser C3 in the converter has to be adjusted to provide the local oscillation by means of which the incoming signal is heterodyned and converted into the new frequency which is passed to the broadcast receiver. Therefore, this adjustment will be found fairly critical. If too fierce whistles will be experienced and severe distortion may set in, with the result that speech or music will be rendered unintelligible. On the other hand, if the control is insufficiently advanced the local heterodyne will not take place and the set will be "dead." After using the converter for a few hours the best adjustment will be found, and it will be a simple matter to set the control merely by the background noise heard from the loudspeaker.

### H.T. Adjustments

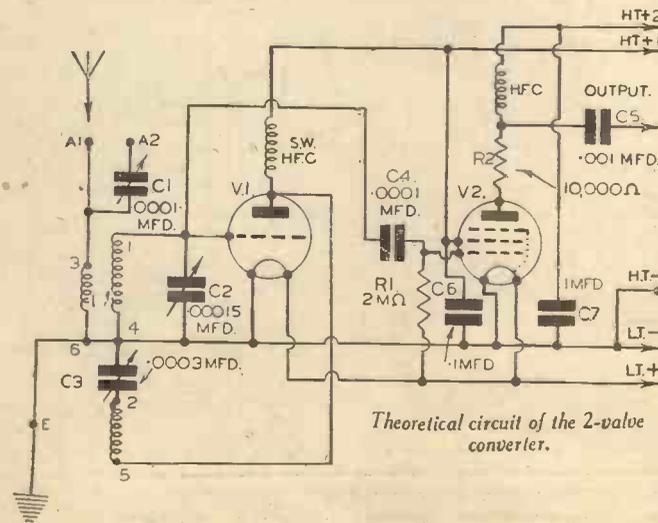
The voltage at the point H.T.1 will be found fairly critical and will have to be adjusted in conjunction with the setting of the reaction control. With a suitable aerial and earth system there should be a position easily found where C3 may be set to one

- LIST OF COMPONENTS**
- 1 Clix socket strip A, A1, and E. (7d.)
  - 2 Clix S.W. 4-pin valveholders, Type V.5. (10d. each.)
  - 1 J.B. S.W. special .00015 mfd. variable condenser. (5s. 9d.)
  - 1 J.B. Dilexon reaction condenser, .0003. mfd. (2s. 6d.)
  - 1 Dubilier 10,000 ohm resis. 1 watt. (1s.)
  - 1 Dubilier grid leak, ½ watt, 2 megohm. (6d.)
  - 3 Component-mounting Brackets, Peto-Scott. (4d. each.)
  - 1 Bulgin screened H.F. Choke type HF9. (4s.)
  - 1 Bulgin S.W. H.F. Choke type HF3. (2s.)
  - 1 Eddystone 6-pin coil holder, type 969 (and coils to match for wavelength desired). (2s. 3d.)
  - 1 Eddystone variable condenser, .0001, type 900-100. (5s.)
  - 1 T.C.C. fixed condenser, 1 mfd. type 341. (2s. 3d.)
  - 1 T.C.C. fixed condenser, .1 mfd. type 341. (1s. 4d.)
  - 1 T.C.C. fixed condenser, .001 mfd. type 451. (1s.)
  - 1 T.C.C. fixed condenser, .0001 mfd. type 451. (1s.)
  - 1 Peto-Scott chassis, 8in. x 6in. with 3in. runners. (3s. 6d.)
  - 1 Tungram valve, LD210.
  - 1 Tungram valve, HP210.

A good slow-motion dial is essential if every station is to be tuned to the best advantage. Many constructors prefer the dual type of dial as this enables a station to be located approximately with the minimum of delay, and the final adjustment may then be made by means of the slow-motion drive. In the unlikely event of the receiver proving dead on most bands, in spite of the adjustment of condenser C1, it will indicate that there is a very high resistance between the aerial and earth, or that either the aerial or earth is inefficient. If a lightning arrester is fitted, make certain that this is clean and that there is no leakage across it. If the lead-in comes into contact with the wall or

in some receivers H.T.— and L.T.+ are connected together and to earth, and the converter and receiver could not be joined together if this were the case. If you wish to alter the battery connections in a receiver to agree with the requirements outlined, the detector grid-leak should be joined to the L.T. positive filament terminal when the change is made, and in most receivers no other alteration will be needed.

The converter may be placed close to the broadcast receiver, but care should be taken to prevent the coils in the two units from interacting. This may be avoided by lining the converter cabinet with metal foil, or by placing a sheet of foil on the side of the cabinet where the two sections meet. If this point is not attended to, instability and perhaps failure to function may be experienced.



Theoretical circuit of the 2-valve converter.

# Technical Fundamentals—7

The Characteristics and Functions of Valves are Dealt with in this Article

THE emission of electrons from a heated cathode forms the basic action of all valves of normal types. In the case of a directly-heated valve the electronic emission takes place from a special coating on the filament itself, the latter forming the cathode element of the valve. In an indirectly-heated valve, however, the emission takes place from a coated metal cylinder which is indirectly heated by a filament placed inside, but insulated from it. In this case the metal cylinder referred to, and not the filament, is the cathode.

anode is held constantly at a positive potential then the movement of electrons to the anode will be a continuous movement. It is possible to make electrons move from cathode to anode as fast as they are emitted by the latter (no space charge forming at all), but this must be regarded as an exceptional condition, permitted only under special circumstances. Under more usual conditions there will still be a certain number of electrons moving from cathode to space charge and back to the cathode again, despite the high positive potential of the anode. Why should this be? The reason is due to the shielding 'action of the outer layers of the space charge which, in effect, shield the electrons, which are nearer to the cathode from the electric field of the anode. There is thus a "space charge limitation" on the number of electrons reaching the anode in any given time.

there will be no attraction of electrons to anode; instead, the anode will set up repulsion and drive the space charge closer to cathode. Under this condition the valve forms a non-conductive "barrier" in the circuit formed by the valve and the H.T. battery.

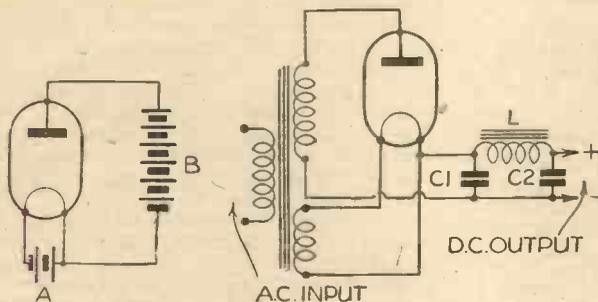
It becomes obvious that if the H.T. battery were replaced by a source of alternating voltage the current passing from the latter through the valve cannot possibly be of alternating character; actually, it will be intermittent D.C., one pulse of current passing through the valve for each voltage alternation that makes the anode positive and no current for each voltage alternation that makes the anode negative.

For H.T. supply to a radio receiver, operating from A.C. mains, it will be necessary to have not only rectification, but also "smoothing," for a continuous D.C. supply with the minimum of fluctuation is required.

Fig. 24 illustrates half-wave rectification. Note that the H.T. secondary of the transformer, the valve and whatever may be connected across the D.C. output points, form a series circuit. C1 is the "reservoir" condenser. This condenser is charged by the intermittent pulses of current that are passed by the valve and the output load circuit must be regarded as drawing current from C1. Essentially C1 charges up intermittently but discharges continuously. The charging pulses are of briefer duration than the actual voltage alternations because no current can pass through the valve, even when it is conductive, until the voltage has risen up to that across the reservoir condenser terminals.

To minimise fluctuation at the D.C. output terminal points the filter consisting of the "smoothing" choke L and the "smoothing" condenser C2 is provided.

The problem of obtaining an adequately smoothed supply is rendered much easier if full-wave rectification is used. This entails either the use of two two-electrode valves or, what amounts to the same thing, a double anode rectifier as shown in Fig. 25. With full-wave rectification both alternations of each A.C. cycle in the secondary of the mains transformer are made use of. For one alternation one anode becomes positive and current flows via one half of the H.T. secondary and this particular anode. For the next alternation the other anode becomes positive and the current flows via the other half of the H.T. secondary and this anode. It follows, of course, that while one anode is positive and one half of the secondary is carrying current the other anode is negative and the other half secondary is out of action. Whichever half of the rectifier is conductive the direction of current flow to the reservoir condenser will always be the same, and the cathode of the rectifier will always be positive with reference to the centre tap



Figs. 23 and 24.—Illustrating a rectifier and the circuit for a half-wave mains unit.

The addition of a metal anode in proximity to the cathode gives us the electrode assembly of the two-electrode valve.

Electrons are negative. Electrons repel one another, and are attracted by any electrode of positive potential. These facts are widely enough known, but they are mentioned here for the sake of emphasis. Valve action depends very much upon them.

## Two-electrode Valve

If the cathode of the valve is brought up to sufficient temperature to emit electrons, but the anode is not connected externally, the latter will acquire a negative charge due to some of the electrons which are expelled from the cathode collecting on the surface of the anode. This anode charge will not grow indefinitely because the repulsion set up by the charge will very soon prevent further electrons reaching the anode. When this state is reached the conditions inside the valve are that in the space between the cathode and the anode there is a dense (although invisible) "cloud" of electrons which can be referred to as the "space charge." A state of equilibrium is very quickly reached when the space charge keeps constant in intensity, despite the fact that the cathode is continuously shooting more electrons into it. The point is that just as fast as electrons are leaving the cathode and joining the space charge group others are returning from the space charge to the cathode. In the latter connection it must be appreciated that the loss of electrons, due to emission, leaves the cathode electrostatically positive with reference to the space charge, so that there is actually an electrostatic attraction tending to pull electrons back to the cathode.

By making the anode of the valve positive in potential with reference to the cathode we can cause the anode to attract electrons from the space charge, and if the

to be made high enough, the anode would gather up the electrons sufficiently fast to prevent the formation of any space charge. The limiting factor is now the rate of emission of the cathode. This is the exceptional condition referred to above, and when the condition exists the valve is said to be "saturated."

In Fig. 23 is a diagrammatic sketch of a directly-heated two-electrode valve. There

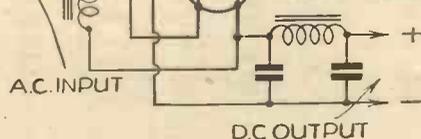


Fig. 25.—The circuit of a full-wave mains unit.

are two batteries, A, to supply the heating current to the filament, and B, to make the anode positive with reference to the filament and to maintain it so. Electrons reaching the anode will displace others in the external circuit containing B. There will, in fact, be a current in the anode circuit, the direction of electronic movement being from cathode to anode inside the valve, and anode to cathode outside the valve.

## Rectification

We have only to think of what would happen if battery B were reversed (negative to anode, positive to cathode) to arrive quickly at the secret of the valve action when acting as a rectifier of A.C. With a reversed H.T. battery making the anode potential negative with reference to cathode

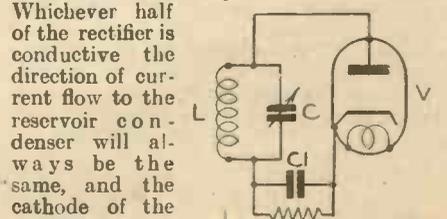


Fig. 26.—A diode circuit with load resistance and by-pass condenser.

## TECHNICAL FUNDAMENTALS

(Continued from previous page)

of the H.T. secondary, and this centre tap is the point from which the negative side of the D.C. output is taken.

### The Diode Detector

As we are dealing with two-electrode valves it is a logical step to proceed to the diode detector. Up to this point in this series we have not dealt with the matter of detection at all, but the necessity for it in radio reception is not at all difficult to appreciate.

In an earlier article it was shown that the H.F. oscillations carry the characteristics of the broadcast sounds in the form of amplitude modulation fluctuations. For the operation of a loudspeaker (or headphones, for that matter) we require either audio-frequency A.C. or D.C. having an audio-frequency fluctuation. The waveform of the A.C. (or of the D.C. fluctuation) must conform to the waveform of the H.F. modulation. High-frequency oscillations, even though they may be modulated at audio-frequency, are unsuitable for the direct operation of sound-reproducing apparatus and the necessary conversion from modulated H.F. to pure audio-frequency is carried out by the "detector" and its associated components.

A small two-electrode valve, usually called a "diode," is frequently used as a detector. Such a valve is essentially a rectifier, which suggests that there must be some close connection between the process of detection and that of rectification.

In Fig. 26, let LC represent the last tuned H.F. circuit of a radio receiver. Across this circuit are connected a diode valve V and a resistance R. R and V are in series with each other.

Suppose unmodulated H.F. oscillations are set up in LC. As the diode is a rectifier the H.F. voltage developed across LC will not be able to force an H.F. alternating current through V and R. The valve is a "one-way traffic" device, and will pass current only for the alternations that make the anode positive with reference to cathode. For the reverse alternations the valve current will cut off, and it is assumed that the H.F. voltage is not of exceptionally small amplitude.

If there were absolutely no capacity associated with R we could imagine the current in R to be of intermittent D.C. character, the pulses occurring at high frequency. There must, however, inevitably be capacity associated with R, even if it is only stray capacity, and in practice we would use a condenser C1 (Fig. 26). The presence of capacity across R has important effects. The pulses of current passing through the valve will build up a charge in C1. At the same time a discharge current will flow from the condenser through R. With an unmodulated applied H.F. voltage (having, of course, a constant amplitude), the current through R will be of steady D.C. character.

We now have an arrangement whereby H.F. of constant amplitude gives rise to D.C. of constant value, and it needs little imagination to see that if the H.F. were to change to greater amplitude the D.C. in R would rise to a higher value. Correspondingly, if there were a reduction in the H.F. amplitude there would be a drop in the value of D.C. in R. It is only a small step now to appreciate that if the H.F. were to have a fluctuating amplitude, then the D.C. in R would also fluctuate, and this is just what is desired. In broadcast reception the H.F. amplitude certainly will be fluctuating; more than that, the

amplitude fluctuations will have the waveform of the sounds that we wish to reproduce. In R, we have, in effect, eliminated the H.F. alternating fluctuation but retained the audio-frequency amplitude fluctuation. It now becomes a straightforward matter to follow up with L.F. amplification and sound reproduction.

The condenser C1 (Fig. 26) is normally of the order of .0001 mfd. Apart from its action in connection with the actual detection process, as outlined above, it can be regarded as an H.F. by-pass across R.

As, for the present, we are dealing solely with the basis of valve action we will not

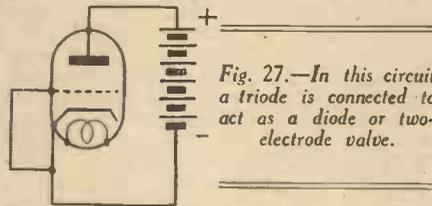


Fig. 27.—In this circuit a triode is connected to act as a diode or two-electrode valve.

at this stage go into any question regarding distortion in the detector circuit.

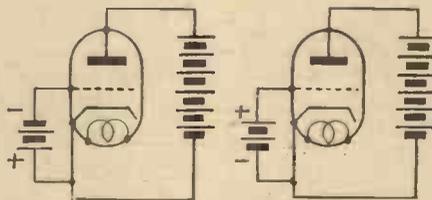
### The Triode

The triode, or three-electrode valve contains the anode and cathode features of the two-electrode valve, plus an additional electrode. This additional electrode is of grid construction, and is placed between the cathode and anode.

It is quite obvious that electrons which reach the anode of a triode valve must necessarily have found their way through the spaces of the grid. It should be apparent, too, that the grid is going to have some influence upon the number of electrons that reach the anode, and, therefore, upon the value of the anode current. That the potential of the grid exercises a very profound influence on the anode current is worthy of explanation.

Let us start with the case of the grid being at zero potential. (See Fig. 27.) Convention has it that the cathode potential, if the cathode is indirectly heated, or the negative end of the cathode, if it is directly heated, shall be taken as the zero of reference for valve potentials.

As the grid of the valve of Fig. 27 is at cathode potential it will neither attract



Figs. 28 and 29.—Showing the differences when positive or negative bias is applied to the grid.

nor repel electrons. Some electrons will, more or less accidentally, drive on to the grid wires and there will therefore be a small grid current, but it will be exceedingly small. The majority of the electrons that are pulled away from the space charge by the anode attraction will pass through the grid spaces and go to the anode.

Suppose, now, that the grid is given a potential which is negative to the cathode. Fig. 28 illustrates the circumstances, using battery bias. It will be noted that a battery has been inserted into the grid circuit with negative to grid and positive to cathode. The grid, being at negative potential, will repel electrons and this fact suggests at once that the anode current will be reduced. The negative

repulsion of the grid will force the space charge closer to cathode, and lessen the number of electrons that will experience the direct pull of the anode. Also, some of the lines of force which previously acted from anode to space charge will now act between anode and the grid wires, and the grid, remember, is a non-emitting electrode.

From the practical point of view the fact of supreme importance is that a comparatively small negative potential on the grid will affect the anode current to a considerable degree. If the grid is made sufficiently negative the anode current can be "shut off" altogether—no electrons reaching the anode. To bring about this condition it is not necessary to make the grid/cathode p.d. (grid negative) anything like the anode/cathode p.d. (anode positive). In other words, a negative grid potential that is small compared to the positive anode potential can completely annul the effect of the latter.

Arising out of this is the fact that, as far as anode circuit conditions are concerned, the valve is very sensitive to changes of grid potential.

To finish off this section we must consider the effect of making the grid positive with reference to cathode. (See Fig. 29.)

A positive grid will attract electrons and some electrons will move from space charge to grid under this attraction. The value of grid current will rise with increase of positive grid potential. It will normally, however, always be much smaller than the anode current.

The fact that the grid is now doing some electron collecting on its own account may possibly suggest that the anode current will become smaller in value. Actually, a positive grid increases the anode current, despite the diversion of electrons to the grid. One effect of the positive pull of the grid will be to draw the space charge further away from cathode, and more electrons will come under the attractive influence of the anode. There is another viewpoint. We have already mentioned the space charge limitation effect. The space charge is negative and the positive potential of the grid will act directly counter to the negative potential of the space charge, and have the effect of lessening the space charge limitation of anode current.

Under conditions of radio reception it becomes important in many cases to prevent the grid from running into positive grid potential values, but we will consider such cases when we come to them.

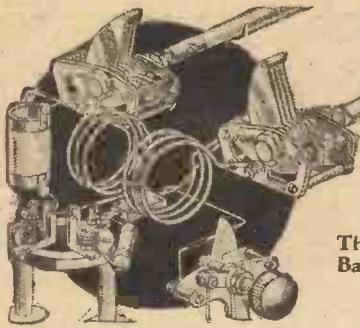
We will now deal with valve constants.

### Mutual Conductance

If the anode potential is held constant a change of grid potential will cause the anode current to change. The change of anode current caused by one volt change of grid potential is called the mutual conductance of the valve, and is usually expressed in milliamperes per volt. The mutual conductance is sometimes called the "slope." This is because the greater the mutual conductance the steeper will be the anode current/grid volts characteristic curve of the valve.

### Anode Impedance

This is sometimes referred to as the "A.C. resistance" of the valve. If the grid potential is held constant a change of anode potential will cause a change of anode current. The change of anode potential divided by the corresponding change of anode current gives the value of anode impedance. Note particularly that we do not merely divide anode voltage by anode current.



# Short Wave Section

## A SHORT-WAVE TWO-VALVER

The Construction of an Experimental Two-Valve Bandsread Receiver is Dealt with in this Article

By A. W. MANN

**WHILST** it is possible to receive a number of short-wave transmissions on the loudspeaker which, if a simple headphone set were used, would be heard weakly, it is possible with the latter to receive many distant and low-powered transmissions which, due to a higher ratio of background noise, the larger receivers miss.

The simple two-valve receiver described in this article is capable of functioning on

### Chassis Construction

The mechanical form of construction should, in conformity with modern methods, be on chassis lines. Use metal-foil-lined underside or face-plywood constructions, according to individual preference, but in all cases a metal panel supported by two suitable brackets, with at least 2½ in. feet, should be used in order to assure rigid assembly and freedom from mechanical noises.

It will be noted that a tag or postage stamp type grid condenser is shown. This is one of the best types for inclusion in short-wave sets and avoids long wiring as direct connection is made between coil base and valveholder. A ten-division dial and pointer may be fitted to the band-setting condenser, but the reaction condenser should be fitted with a small slow-motion dial.

The bandsreading condenser shown in the centre of the panel should be fitted with a first-class clock face or other type slow-motion dial calibrated in 100 or 180 degrees.

Reverting to Fig. 1, a fuse is shown in the theoretical diagram, and this safety device should certainly be included. Whilst on this subject, always make sure, especially when a new set will not function first time, that the fuse bulb and holder contacts are making contact and not open-circuited. This sometimes happens.

### Aerial Input Condensers

With reference to the two aerial input condensers. These should be of the pre-set type, the .00005 mfd. condenser being used for 10 metres to 50 metres reception, and the .0001 mfd. for wavelengths above 50 metres. When receiving on the 160 metres band, it is sometimes advisable to short-circuit the .0001 mfd. pre-set condenser.

These things are matters for experiment, depending on the type of aerial used, and the location conditions concerned with its erection, height, and freedom, or otherwise, from screening.

Pre-set condensers, however, whether mounted below or above the chassis, should be clear by at least ¼ in. off the metal chassis face or underside, and having once found the most suitable setting, they should be locked and left well alone in the interests of calibration.

Where capacity coupling is used many short-wave enthusiasts make the mistake of adjusting the series aerial condenser so that the coupling is too tight, and instability results. It is best to strike a happy medium, to ensure sensitivity, stability, and ease of handling. Maximum volume means poor selectivity, and slack coupling will increase both selectivity and sensitivity.

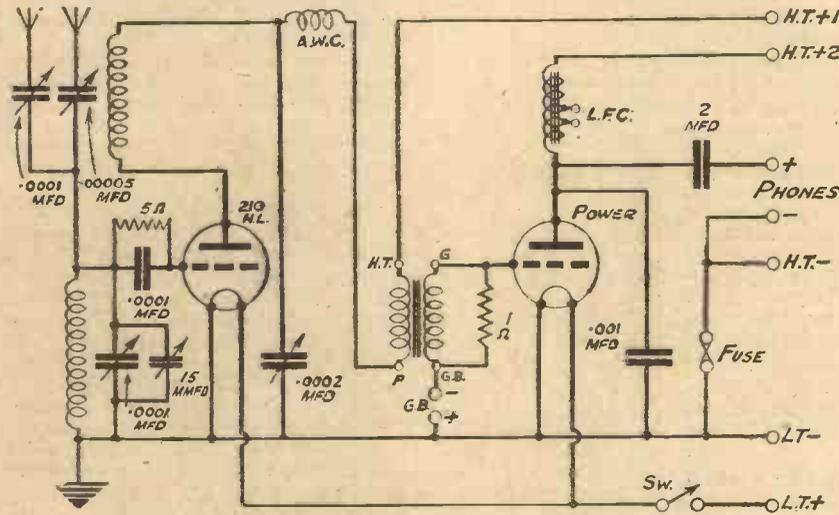


Fig. 1.—Complete circuit of the 2-valve short-wave receiver discussed in this article.

all wavelengths between 10 metres and 170 metres, which includes all short-wave broadcast bands and also the channels allocated to amateurs who work on telephony and C.W.

### The Circuit

Fig. 1 shows the theoretical circuit diagram, and a receiver built from this will, if carefully constructed, be found stable in operation and easy to handle. The circuit embodies a simple regenerative detector stage capacity-coupled to the aerial, a leaky-grid detector, four-pin coils, and bandsread tuning.

It will be noticed that an all-wave type H.F. choke is specified. Taking into consideration the fact that coils are available which enable the tuning range to be extended, it is advisable to use a screened H.F. choke of this type, and guard against peak resonance troubles in the future.

A grid stopper is also included, and the incorporation of an output L.F. choke and bypass arrangements will assure stability, and remove the possibilities of headphone or capacity effects.

In a simple arrangement of this type the L.F. stage should receive attention equal to that given to the detector stage in order to assure that the maximum amount of amplification will be obtained. A good L.F. transformer of reputable make should be used.

A 14 in. by 8 in. by 2 in. deep metal or other form of chassis is suitable, together with an 18 gauge metal panel 14 in. by 8 in. A suitable layout is shown in Fig. 2. Tuning condensers can be of the Raymart ceramic type, also the reaction condenser. Valveholders and coil base should be of low-loss ceramic types mounted clear of the chassis face.

### Coils and Valves

Just a few remarks concerning coils and valves. If possible use commercial coils, but if home-made four-pin coils are to be used, wind them to conform to standard coil-pin connections, in order to avoid having to alter connections when commercial coils are purchased at some future date.

Concerning valves, if you are a beginner, never use old valves in your first, or any S.W. receiver, and in any case, always make quite sure that serious loss of emission in detector and other valves is not the factor which is affecting performance. If an L.F. output choke is to be purchased, choose a tapped type suitable for use with power or pentode output valves.

A receiver built along the lines suggested in this article should function without difficulty from

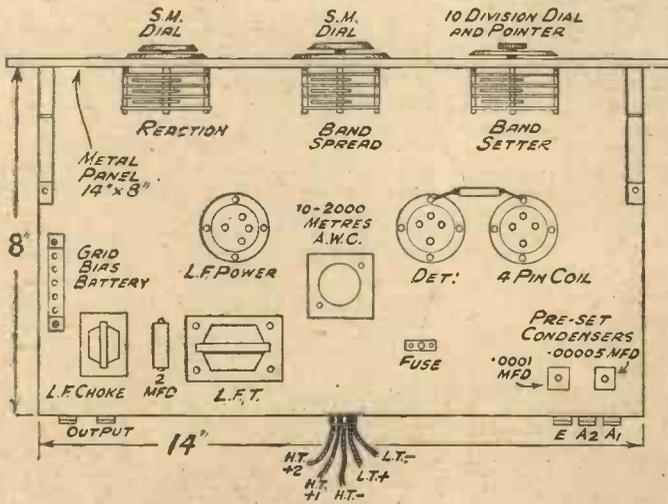


Fig. 2.—Chassis dimensions and component layout for the receiver.

(Continued overleaf)

## SHORT-WAVE SECTION

(Continued from previous page)

10 metres up to 170 or 200 metres. It should not be forgotten, however, that the voltage applied to the plate of the detector valve, when receiving on 10 metres, will differ with the voltages required when receiving on 20 metres, 31 metres, 80 metres and 160 metres.

## Anode Voltages

For example, depending on the valve used, better results are often obtained using a plate voltage of 40 volts or so on 160 metres, whilst 75 volts or higher may be necessary for 10-metre reception. Vary the positions of the wander plugs, and use 120 volts on the plate of the last valve; also adjust the grid-bias volts to valve-maker's recommendations.

Amateur 'phone reception is a very useful test ground, especially on 10 and 20 metres, and also on 80 metres and 160 metres.

## Results Obtained

With a good aerial, American amateurs on 10 and 20 metres can be received with ease during reasonably good conditions. On 40 metres British amateurs in all parts of the country can be heard at really good strength. Reception on 160 metres is, however, apt to appear a difficult problem, even though a considerable number of amateurs work 'phone on this band. It should be remembered that this, together with trawler bands, appear quite dead at intervals, so much so, that the beginner is apt to imagine the set to be unsuitable for reception on these bands. It is advisable to watch this band carefully, because it is possible under reasonably good conditions to obtain more satisfactory reception with a two or three-valver than with more ambitious receivers, due to the low noise level of the simple two-valver. The writer has not specified an L.F. pentode for use in the experimental receiver described, because he is of the opinion that for use with headphones, an ordinary power valve is satisfactory, and the listener who tunes carefully is unlikely to miss anything in the way of weak and distant signals, either 'phone, broadcast, or C.W., which are worth while. It is well to remember that the most successful DX enthusiasts are those who believe that everything heard is worth resolving, as a mere chirp may turn out to be a strong signal, and real DX.

## Join Newnes' Practical Group!

### PRACTICAL MOTORIST

The owner-driver's journal which tells you how to repair, overhaul and obtain the best performance from your car.

3d.—Every Friday.

### PRACTICAL MECHANICS

The only English journal of its type. It deals with every branch of Science, Mechanics, Invention, Model-making, Chemistry, Astronomy, Photography, Television.

6d.—Every Month

### THE CYCLIST

The leading weekly for every Cyclist, Clubman, Utility Cyclist or Tourist. Join "The Cyclist" Road Club and also take advantage of the FREE Insurance.

2d.—Every Wednesday

# Leaves from a Short-wave Log

## The Voice of Republican Spain

NEWS bulletins relating to the Civil War in Spain, and in particular to the exploits of the Republican Army, are now broadcast regularly through EAQ1, Madrid-Aranjuez on 30.43 m. (9.86 mc/s) nightly at G.M.T. 17.15, 19.00, and 21.15. They are heralded by a Military March, followed by the call: *Aquí la Voz de España*, or *This is the Voice of Spain*.

## Singapore Calling!

It is reported that the 500-watt short-wave transmitter ZHP at Singapore has started its initial tests on 31.48 m. (9.53 mc/s). Experimental broadcasts are carried out between G.M.T. 10.30-14.00. Reception reports should be sent to: Short-Wave Station ZHP, British Malaya Broadcasting Corporation, Singapore (Federated Malay States).

## German Mystery Station

Nightly at G.M.T. 21.30 you may pick up a broadcast in which the announcer states that it emanates from the *Deutsche Freiheitssender* (German Liberty station), with the added information that the channel adopted is roughly 29.8 m (10.067 mc/s). The wavelength is slightly altered as and when jamming takes place. The address given in announcements at the close of the transmission is 65, Boulevard d'Aragon, Paris (France).

## Colombian Stations on Higher Power

The following 5-kilowatt short-wave transmitters are reported to be under construction:

HJ4ABP, Medellin, 61.48 m. (4.88 mc/s); HJ3ABD, Bogota, 61.6 m. (4.87 mc/s); HJ1ABE, Cartagena, 61.73 m. (4.86 mc/s); HJ6ABE, Manizales (?), 61.86 m. (4.85 mc/s); HJ1ABD, Cartagena, 62.11 m. (4.83 mc/s); HJ7ABD, Bucaramanga, 62.24 m. (4.82 mc/s); HJ2ABA, Tunja, 62.37 m. (4.81 mc/s); HJ3ABA, Bogota (?), 62.5 m. (4.8 mc/s); HJ1ABC, Quibdo, 62.63 m. (4.79 mc/s); HJ7ABC (?), 82.89 m. (4.77 mc/s).

## More Facts About Guatemala

The Government of the Republic of Guatemala disposes of four channels for its broadcasting system in the Capital, namely, 16.85 m. (17.8 mc/s), used for day transmissions during the summer months; 19.78 m. (15.17 mc/s) for the winter months; 25.51 m. (11.76 mc/s) for evening and night broadcasts in summer, and 30.98 m. (9.685 mc/s) for relay services throughout the year. The transmitters are

rated at 10 kilowatts and the call-letters TGWA have been adopted for all frequencies. A smaller 200-watt transmitter has been installed at Quezaltenango to broadcast on 46.88 m. (6.4 mc/s). Tests are being carried out almost nightly after midnight. Reports should be addressed to: La Direccion General de Comunicaciones Electricas, TQQA, Quezaltenango, Republic of Guatemala, Central America.

## New Station in Ecuador

HC1RB, is the call-sign of a new transmitter at Quito (Ecuador) operating on 38.12 m. (7.87 mc/s) and of which the power is said to be 400 watts. Tests were recently logged between G.M.T. 01.30-04.30.

## Call-Signs of Rome's Short-wavers

With the addition of the 25-kilowatt transmitter 12R07, working on 16.88 m. (17.77 mc/s), the E.I.A.R. short-wave network now includes 12R08, 1 kW., 16.84 m. (17.82 mc/s); 12R06, 25 kW., 19.62



The Chesterfield Constabulary is now provided with S.W. equipment and the above illustration shows a police car fitted with radio.

m. (15.29 mc/s); 12R05, 25 kW., 19.78 m. (15.17 mc/s); 12R04, 25 kW., 25.4 m. (11.811 mc/s); 12R03, 25 kW., 31.13 m. (9.635 mc/s); 12R02, 25 kW., 42.98 m. (6.98 mc/s); and 12R01, 25 kW., 49.46 m. (6.065 mc/s). Other commercial stations of the Rome-Torrenova group are occasionally roped in for the purpose of relaying programmes to Tripoli, and other North and Central African colonies.

## Frequencies for Athlone

The channels allotted to the Eire (Irish Free State) for the Athlone short-wave station are the following: 16.82 m. (17.84 mc/s); 19.84 m. (15.12 mc/s); 25.55 m. (11.74 mc/s); 31.27 m. (9.595 mc/s), and 48.47 m. (6.19 mc/s).

## Another Call From Panama

HP5G, Panama City, is the call of a 750-watt station operating on 25.47 m. (11.78 mc/s). Reports of reception should be sent to Señor José Antonio Sosa M., Estación HP5G, Panama City, Republic of Panama (Central America).

# ON YOUR WAVELENGTH



## Maurice Reeve Broadcast

**M**AURICE REEVE, who broadcast in the afternoon programme on Wednesday, April 27th, exceeded expectations, not only for his execution but for his choice of subjects. I hope we shall hear more of him in the evening and week-end programmes. You see his photograph on this page.

### The Disease

**G**REAT minds think alike! You all know my views on that modern disease known as crooning, so allow me to have my views fortified by Sir Richard Terry, the famous composer, organist, and scholar, who died recently. This is what he had to say about crooners. "Jazz is not a musical question: It is a purely pathological question which should be dealt with pathologically. A crooner is not a singer, he is a disease. You have your choice whether to grow up into a man or a crooner. You cannot be both." He commented on a love song, thus: "If you had been a crooner you would have invited her to wipe her boots on you, and cried 'O cutie, why are you so hard on me?'" He also said that jazz conductors do not beat time. It is idle to say that the public likes jazz, or even wants it. It certainly gets it whether it likes it or not. Take the poets of the time of Christopher Marlowe. Here is a verse of one of his love songs:

Why so pale and wan fond lover,  
Prithce why so pale?  
Will, when looking well can't move  
him,  
Looking ill prevail?

What would the modern crooning counterpart of this be? Probably something like this:

Say, honey, what's got your goat,  
The make-up's coming off,  
Give him the air, and don't be a  
sucker,

He's sure not worthy of you,  
With your eyes of blue,  
The heavens above,  
Speak of love,  
So cutie chase the blues away,  
And live to love another day.

The above priceless example, which took me about five seconds, is strictly copyright in all countries of the world.

## By Thermion

Don't tell me that it doesn't rhyme. Sing it to any old collection of notes, engage a man with the palsy to play the piano, and a prancing lunatic as conductor, and your fortune is made. I shall issue licences in strict rotation to those who apply.

obtain the many guineas which a signed letter from me is worth. By the way, I have never written a book in my life, so this nut from Ireland is not only speaking and writing Irish but also double-Dutch. I am not a Grey Fowl, and my real name is not Boloney! I really shall have to add this McNutty person to my list of boneheads. My two office boys, however, are most pleased, for they have won a bet on him!

### Humours of Radio

**I** INVITED readers to let me have details of their most embarrassing moments in radio. Here are some entries.

B. M. M., of Chipstead, writes:

"The scene was an informal party with plenty of very merry young ladies and gentlemen present. The subject turned to radio, and as there was only one other wireless enthusiast there besides me, the conversation was fairly elementary.

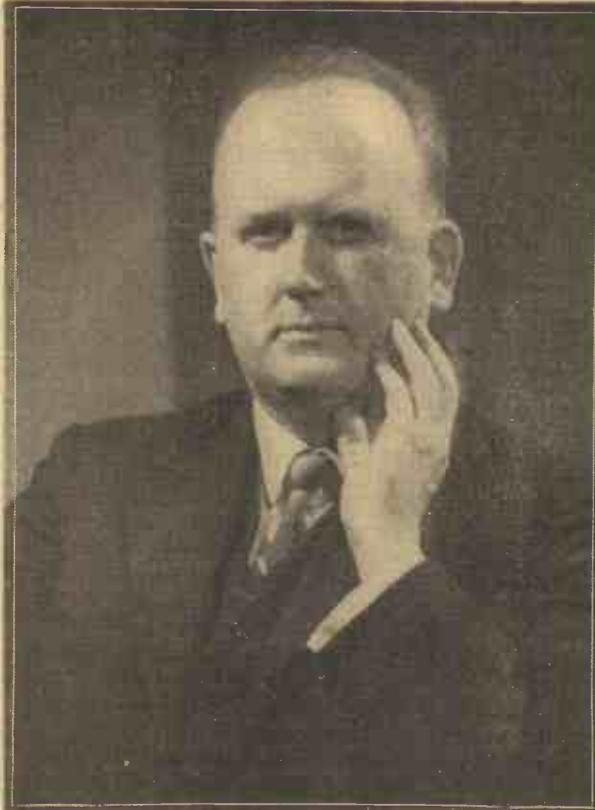
"Previously during the day I had been working on a mains superhet with a triode-pentode in the first stage. I had made some remark to myself that 'the worst of these triode-pentodes was that one could not find the blank pin on the 9-pin base.

"A lady friend of ours was telling the rest of the party of my prowess as a radio expert, and went on to say that as she passed my room earlier in the day she heard me

using the most revolting language about 'blankety-blank pins' and two words she could not repeat!

"My embarrassment, and the look of horror and disgust on the faces of the young ladies present, had to be seen to be imagined.

"Luckily the other radio fan came to my rescue and explained the



Mr. Maurice Reeve, the famous pianist.

### Nuts

**Y**OU remember that I published a letter from an Irishman named McNutty (!) who, in criticising my paragraph about the Spelling Bee, used the word *pronunciation* (his spelling, not mine!!). In my absence my efficient Secretary replied to his letter, so I am sorry McNutty cannot

meaning of the unrepeatable words."

W. F. P., of Aberdeen, writes:

"A young man of my acquaintance had a nine-valve superhet of which he was very proud. One day an aunt came to visit him. The set was exhibited and proudly tuned in to a variety programme which had a large and appreciative audience in the concert hall. The old lady seemed to enjoy the performance of a well-known comedian very much. When he finished his act, there was a tumult of hand-clapping, reproduced with great power by the nine-valver.

"The old lady looked at the set with a puzzled expression, then turned to the young man.

"Tell me, Jim," she said, "is that the sound of them winding it up for the next record?"

W. E. H. (Cheltenham) writes:

"A friend of mine knowing I am keenly interested in radio, said she had a small battery receiver, which was originally a one-valver; she also said her husband had added an amplifier in the shape of a transformer and small power valve, but even so, she said, they would like more volume, and asked if I could add a further amplifier. I readily consented to do so.

"Well, I did so, using a further transformer and power valve, and being in a hurry, I simply let them have the set one evening without bothering to try it at all.

"Next day they sent round and said the set was not so loud as it was previously with two valves, nor was it. They didn't want me to touch it again, so I said I knew an electrician and service man, who would attend to it cheaply, so next day I took him to see them. He took the set out of its cabinet, which I had not bothered to do, and found that the previous L.F. stage had been interposed between the aerial side of receiver, and I had also added an amplifier to that stage. Was I embarrassed!"

#### Books Awarded

I INVITED readers in our issue, dated April 16th, to give me a humorous answer to a joke. Here are some of the replies:

First passenger: "I connected my neighbour's and my own aerial together, and I got China."

Second passenger: "Yes! Thrown at you by the neighbour whose aerial it was." (R. P., Broxburn.)

"Maybe he was on good 'Peiping' strength with his neighbour, or perhaps 'The Good Earth' had something to do with it.

"And, as far as the ray business goes, the only ray which I know that irritates a human being is the one

## Notes from the Test Bench

### Soldering Hint

**I**N many radio components a wire is threaded through a hole for soldering purposes, and when tinning the component the hole becomes filled with solder, rendering it difficult to thread the wire through. Similarly, when fitting soldering tags it is often preferable to tin the tag first and this fills up the small hole which is provided for anchoring purposes. It is quite a simple matter to keep these holes clear, however, whilst still making quite a good job of the tinning, and the best plan is to hold the component in one hand whilst the iron is applied with the other. As soon as the solder has run nicely the component should be sharply shaken with the other end and the surplus solder will be thrown off, leaving the hole clear. Soldering tags should be held with a pair of pliers for this purpose. Do not be tempted to blow on the component, as there is a risk of the molten solder being thrown up into the eyes by so doing.

### Electrolytic Condensers

**I**T is often overlooked that electrolytic condensers pass a very small current, generally indicated on the case as the leakage current. When first brought into circuit this current may be fairly high, but it quickly drops to a negligible value. When a condenser of this type proves faulty a higher current will pass, and therefore when a condenser of the electrolytic variety is suspected it should be joined in a D.C. circuit with a milliammeter in series and the initial current and the final current may then easily be ascertained.

### Drilling Stops

**I**N many constructional jobs it becomes necessary to restrict the movement of the drill. For instance, when drilling through formers or strips of paxolin, it may be found that as soon as the drill comes through, the sudden release causes the drill to drop down and the chuck comes into contact with the material, perhaps fracturing it. Similarly, when making a hole for tapping purposes in some bakelite or ebonite articles it may be necessary to restrict the depth of the hole to a fraction of an inch to prevent it going right through. A simple way to arrange for either of these ideas is to place a small telephone-type terminal or similar device on the drill, locked at the requisite height. Alternatively, a piece of wood may be drilled through and left on the drill to expose only the depth required in the work in hand.

### WIRELESS COILS, CHOKES AND TRANSFORMERS

2/6, by post 2/10, from George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

crooners use, i.e., 'The Doh Ray.' (J. M., Glasgow.)

### The Listener's Barometer

**W**HEN I was up at Broadcasting House recently, Mr. John Watt gave me some interesting facts regarding the Listener's Barometer. You will remember that 2,000 log keepers in all parts of the country answered a special questionnaire which asked them to mark one of the following statements in respect of each of ten types of variety broadcasts:

"I think we get too much."

"I think we get the right amount."

"I think we don't get enough."

Results of the voting are given below. Many variety listeners voted, as it was realised they would, for more of every kind of light entertainment. Nevertheless, the votes provide useful comparisons between the popularity of different types of variety programmes.

The voting was as follows:

Types of programme	would like more	Percentage who think them	are satisfied
Straight Variety	70	1	29
Reginald Foort at the B.B.C. Theatre Organ	55	5	40
Comedy Shows	54	5	41
Concert Parties	44	8	48
"Interest" Programmes	41	7	52
Cinema Organs	41	8	50*
Serials	31	12	56*
Musical Comedy	29	19	52
Dance Music	17	28	54*
American and Foreign Relays	8	57	31*
Average	39	15	46

(\*—1 per cent. did not reply.)

The desire for more straight Variety was general. The demand for more broadcasts by Reginald Foort at the B.B.C. Theatre Organ was not quite so great among listeners under twenty as among other age groups; whereas the desire for more comedy shows was greatest among young listeners and grew less with each succeeding age group.

The reactions to dance music are, perhaps, particularly interesting, for nearly thirty per cent. of the voters want less of it. The proportion who think that there is too much dance music is greater among men than among women, greater in the North Region than elsewhere, much greater among listeners of thirty to fifty than among those under thirty, and greatest of all among listeners over fifty. Even among those who were reluctant to say there was too much dance music, namely, listeners under twenty, only thirty per cent. said they wanted more; whereas, for example, fifty per cent. of them wanted more broadcasts by the B.B.C. Theatre Organ.

A PAGE OF PRACTICAL HINTS

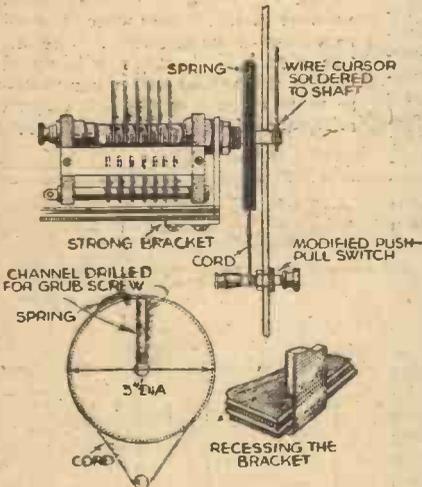
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Simple Slow-motion Dial

THIS simple dial which I have just constructed may be of interest to other readers. It will be seen in the sketch that the condenser is taken off the panel



Details for a simple slow-motion dial.

and set back on a bracket so that the spindle projects about 1/4 in. through the panel.

The driving disc is made of ebonite, or hard wood, with a groove filed round it for the cord. The bottom pulley spindle is an old push-pull switch with the contact strips removed.—G. BRUCE (Distington).

A Chuck for Small-gauge Drills

NOT all braces or hand drills are capable of taking the smaller gauge of twist drill often used by the radio constructor. This is owing to the V-shaped slots, which are cut in the jaws of the bit or chuck being too large to allow of the latter gripping the shank of the drill. Packing with a suitable material will usually overcome the difficulty, but is somewhat inconvenient when the frequent change of drills is necessary.

I find the most satisfactory method is to use a small supplementary chuck to grip the small drill, whilst these together are gripped by the jaws of the hand-drill itself. Most amateurs will no doubt have by them one of those old, and very efficient, loudspeaker cone grips. These will be found ideal for the purpose. The general assembly I have shown in the sectional view and plan in sketch, whilst the separate parts utilised are numbered 1, 2, and 3. I have omitted the metal cone pieces and milled nut, which also formed part of the assembly, as these latter are not required for the purpose in mind.

No constructional work was found necessary, the only alteration being the substitution of a larger nut (numbered 3 in sketch) which was found to be 2BA

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR 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 "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

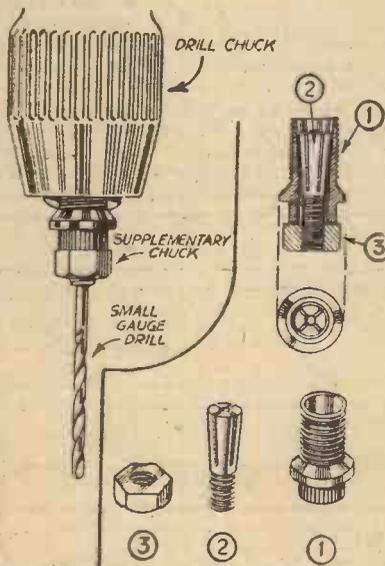
SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

in the component mentioned. This larger nut was found to facilitate tightening, etc.

The supplementary chuck can either be gripped in the jaws of the hand-drill first, the twist drill then being inserted and the nut tightened up, or it could be used for one particular drill, being left tightened on same, for use when required.

The chuck assembly described was usually supplied with two of the taper grips I have numbered (2), for use with varying diameters of speaker unit spindles, so that quite a range of small drills can be accommodated.



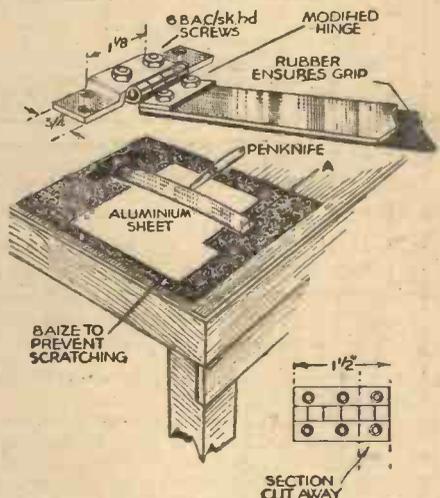
General view and component parts of a supplementary chuck for small drills.

Should any trouble be experienced owing to the sleeve piece (1) turning in the jaws of the hand-drill, a slight flattening on opposite sides of the periphery should overcome the trouble.—R. L. GRAFER (Gillingham, Kent).

A Marking-out Device

THE accompanying sketches give details of a very serviceable device for use in fashioning aluminium chassis. It consists simply of a length of mild steel strip, to the underside of which is glued a length of cycle inner-tube rubber. This clamping strip is secured to a small hinge, as shown, which in turn is fixed to a small raised bracket (made of 1/4 in. brass) by two 6BA nuts and bolts.

It is a simple matter when the sheet has been marked up to align the scribed line with the straight steel edge, pressing the end A down with the thumb, and, with a sturdy penknife, deeply scoring along the line. The sheet of aluminium being then turned over and the same



A useful marking-out device for aluminium sheet.

operation again performed. All that is then required is to carefully bend backwards and forwards along the scoring, preferably by placing the sheet on a flat surface, and applying the pressure with the scoring line immediately over the edge of the bench, or a suitable piece of wood.—A. L. WEATHERHOUSE (Luton).

NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

Edited by

F. J. CAMM

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.



# ALL-WAVE TUNER

incorporate Essential Valves  
the Tuner May Be Used  
LANEY

design for a receiver of the all-wave type to be built round the all-wave tuner is given in Fig. 3 with all essential valves, and it is recommended that a single chassis be employed for this. The approximate layout should follow the theoretical arrangement and the mains section is kept to one side of the chassis. To keep down the overall dimensions of the chassis it is recommended that the Bulgín I.F. transformer, type C.73 be used, as these are extremely small and compact, and the layout should follow the lines already mentioned. As we have already stated in other articles, the use of a group resistance board is not entirely desirable, and it is much better to place such

items as decoupling condensers, etc., right close against the component which is decoupled, and cathode resistances and similar items should be mounted right on the valveholder.

## Ganging and Trimming

When the receiver is completed it should be lined and trimmed as follows: (Incidentally, this process will be facilitated if the I.F. transformers are ordered ready adjusted, or are adjusted by the con-

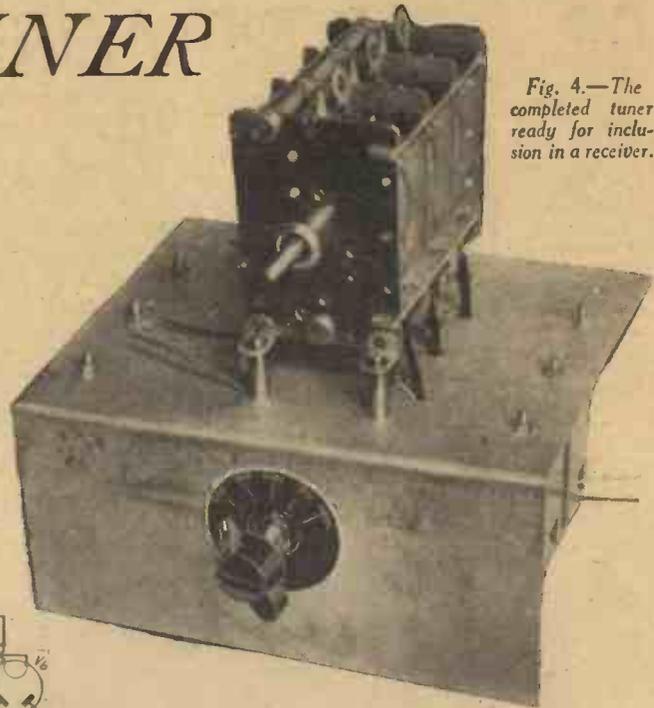
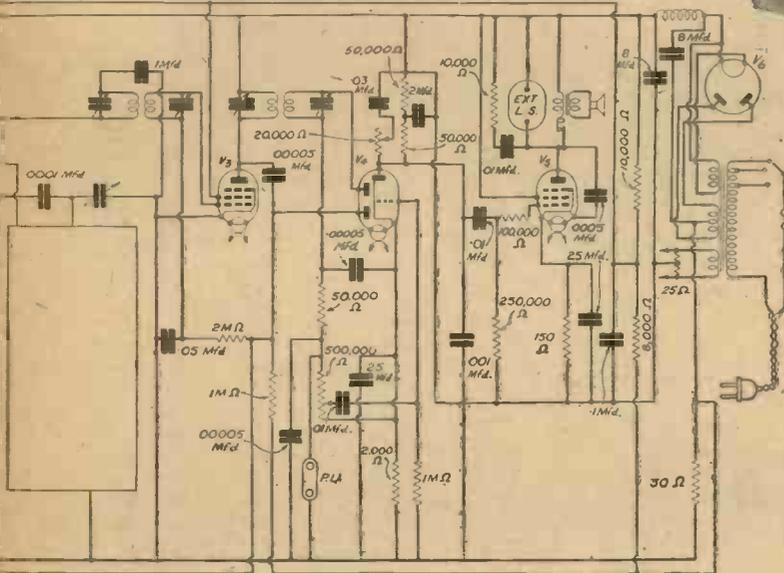


Fig. 4.—The completed tuner ready for inclusion in a receiver.



a powerful superhet built round the All-Wave Tuner.

structor by means of the ingenious Bulgín I.F. liner which is sold for the purpose). In Fig. 1 the underside view of the tuner is given with the various presets and trimming condensers identified by reference numbers, and the trimming is carried out in the following order:

First, switch to the ultra-short waveband (with the switch turned to its maximum position in an anti-clockwise direction). The chassis will now have to be turned over so that the trimmers are available. Turn the main tuning control until the B.B.C. television signal is picked up if you live within range of the Alexandra Palace, and, if not, try to pick up a local amateur transmitter. Trimmers T.11 and T.17 should now be adjusted for maximum response. Now turn the wavechange switch to its next position and try to pick up a fairly powerful station. Adjust trimmer T.6 to get the station in a suitable part of the dial, remembering that the wavelength range of this section should be approximately from 12 to 33 metres. The setting of the station will be moved up and down the dial by this trimmer. When a suitable position is found (knowing the wavelength of the station), adjust trimmers T.10 and T.16 for maximum response.

## Long Waves

Now turn to the next position on the switch and repeat the process, T.5 bringing the setting of the station into a suitable place on the dial and T.9 and T.15 providing maximum response when correctly aligned. On the medium waveband T.4 will govern the wavelength setting, and T.1 will have to be adjusted in conjunction with T.8 and T.14 for maximum response. On the long waves T.3 and T.7 will control the station setting on the dial, and T.2 will control maximum volume. It will thus be seen that the process merely consists of adjusting the oscillator trimmers to place the wavelength setting at a suitable position on the dial, and then the trimmers on the first two coils are adjusted to bring all circuits into line.

## Broadcasts of the Week

**MIDLAND (296.2 m.)**  
Wednesday, May 4th.—Variety from the Embassy Theatre, Peterborough.

Thursday, May 5th.—Unborn Tomorrow, a play for broadcasting by J. Alex Pemberton.

Friday, May 6th.—Send for Paul Temple, a serial thriller in eight episodes, by Francis Durbridge, episode 5.

Saturday, May 7th.—Orchestral Programme.

**NORTHERN (449.1 m.)**

Wednesday, May 4th.—The Chester Cup, a running commentary on the race from the Roodie Race Course, Chester.

Thursday, May 5th.—St. George's Bells; programme to celebrate the Chester Cup.

Friday, May 6th.—Bridge, Hand 2, by Captain Ewart Kempson.

Saturday, May 7th.—The Deputy, a

colliery play by Louis Hodgkiss and A. R. Walton.

**WELSH (373.1 m.)**

Wednesday, May 4th.—Choral programme.

Thursday, May 5th.—The Carmarthen County Women's Institutes Musical Festival, from the Drill Hall, Carmarthen.

Friday, May 6th.—Eisteddfod Memories, a talk.

Saturday, May 7th.—Winning Ways, a radio-comedy of the valleys of South Wales, by E. Eynon Evans.

**WEST OF ENGLAND (285.7 m.)**

Wednesday, May 4th.—Family History—2, by Lady Horner, from Mells Manor House, Somerset.

Thursday, May 5th.—Instrumental recital.

Friday, May 6th.—Seaview—3, A Horrible Holiday, a talk.

Saturday, May 7th.—Choral concert.



### ADJUSTABLE AERIALS

How to Obtain Maximum Signal Strength and Minimum Background Noise on Short-wave Signals.

A LARGE number of short-wave stations now employ 'directional aerials for the purpose of providing maximum signal strength in various countries, and a moment's consideration will show that the signals in this country will arrive in a definite direction from those transmitters which use such an aerial system. If you are now using a horizontal aerial this will be directional in a certain way according to the design of the aerial, and thus you may be so placed that your pick-up is a minimum in regard to certain stations. This may account for the fact that you find it difficult to get, say, the American stations which use this type of aerial. A vertical aerial is non-directional and will in many cases enable you to pick up stations which are now inaudible, but if you make use of an aerial of this type, plus a reflector system, you will not only improve signal strength but will also reduce background noises which are due to interference from electrical apparatus, or even ordinary static which will be picked up by a general type of aerial system.

We have already published details of dipole and similar aerials and a very good idea for a general-purpose aerial is to build a good dipole and to mount a reflector of a similar size behind it, supporting the two components on top of a fairly substantial mast. This may be of the built-up lattice variety, or a metallic post built up in sections. The former is to be preferred. This may be mounted on some type of base and supported in such a manner that it may be revolved, and tests will then show that by rotating it signals from various countries may be increased in strength and background noises considerably reduced. Although the dipole gives maximum results when used on certain wavelengths related to it, the idea may also be applied very successfully to the ordinary type of vertical aerial, taking the lead-in from the lower end and supporting a reflector two or three feet behind it. If you need such an aerial for general use, you should carry out a few tests to find the best length of aerial for your receiver and location, and with regard to the distance of the spacing between aerial and reflector to obtain the best performance from a point of view of interference reduction.

### WARD ALL-WAVE UNIT

A NOVEL all-wave tuning unit is now available from C. F. Ward, of Farringdon Street, E.C.4. This is built up on a chassis (on somewhat similar lines to the unit described in this issue) and is designed to tune from 4.5 up to 2,100 metres. Bandspread tuning is incorporated, and the range is divided into six sections—4.5 to 20, 18 to 32, 30 to 73, 71 to 200, 200 to 550, and 750 to 2,100 metres. The price is £5 10s., less valves.

### NEW MAZDA VALVES

MAZDA announce a new double-diode triode to be included in the range of octal based valves for A.C. mains receivers. The heater is of the standard 4-volt type rated at .65 amps. The anode rating is 250 volts maximum, and with an impedance of 13,000 the normal amplification factor is 30. The other valve is a 20-watt triode suitable for use in transmitting equipment. The base is of the UX type and the filament is rated at 7.5 volts 2 amps. The maximum anode voltage is 800, and the price is 17s. 6d.

# Everything RADIO FROM PETO-SCOTT

---POST ORDERS--- EST. 1919 ---CALLERS---  
 Prompt attention on receipt of remittance, deposit, or C.O.D. instructions. All orders over 10/- carriage and C.O.D. charges paid. Overseas Orders, please send full details and appropriate postage or half value and we will collect balance C.O.D.  
 All items offered available from our London branches daily: 9 a.m. to 7 p.m.; Saturdays: 9 a.m. to 1.30 p.m. Call in and let us help you in your choice of apparatus.

## HURRICANE ALL-WAVE 3

**PILOT AUTHOR KIT**  
**CASH 42/- or 2/6 DOWN**  
 or C.O.D. 42/- or 2/6 DOWN  
 Balance in 12 monthly payments of 4/-

**COMPRISING** complete kit of first specified components, including Peto-Scott Ready-drilled chassis and L.F. Transformer; but less valves, coils, cabinet, 'phones and speaker. Set of 3 Specified Hurricane valves. Cash or C.O.D. 5/8, or add 6d. to deposit and each payment.

**KIT "A10"** Comprising all parts exact to specification as in Kit "A", but with 5 pairs specified B.T.S. One-shot Inductors for 3 Short-wave, Medium and Long wavebands. Less valves, speaker, 'phones and cabinet. Cash or C.O.D. Carriage Paid, 6/11- or 6/- Deposit, and 12 monthly payments of 6/8.

**6/- DOWN**

**KIT "C"** Comprising all parts as Kit "A", but with 5 pairs B.T.S. One-shot Inductors. Set of 3 specified Hurricane Valves and specified Peto-Scott Hurricane Cabinet and drilled panel. Cash or C.O.D. Carriage Paid, 8/9- or Deposit 7/6 and 12 monthly payments of 8/-.

**7/6 DOWN**

---IMMEDIATE DELIVERY FROM STOCK---

### CHASSIS, AMPLIFIERS, RECEIVERS

**PETO-SCOTT Battery ALL-WAVE S.G.3 CHASSIS.** 4 wavebands, 14-2,000 metres. Aeroplane type station-name dial. Low H.T. consumption. Complete with S.G. Det. and Pentode valves. Guaranteed. Fully tested. 7/9 6/5- down and 11 monthly payments of 7/8.

**5-VALVE A.C. ALL-WAVE SUPERHET.** Excellent Radio or Radiogram Chassis 15-2,000 metres. Station-name dial. Automatic Volume Control. 6 tuned stages. Provision for Pick-up complete with specially matched Rokk mains speaker and 5 Valves. Guaranteed, fully tested. 26/6/- cash or 7/6 down and 17 monthly payments of 8/8. Chassis only, with valves, but less speaker. 24/17/8, or 7/8 down and 15 monthly payments of 7/11. For A.C. Mains only.

**AMPLIFIERS.** 6-7 Watt Model for A.C. Mains. Effective sound-range 300 feet. Ideal for home, club and sports meetings and at P.A. work. Assembled and fully tested, ready for immediate attachment to Microphone or Gramophone Pick-up, complete with 4 valves. List value £6 10s. 6d. Special Price £3 10/-, or 5/- down and 11 monthly payments of 6/8.

**COMMUNICATION RECEIVER.** New Peto-Scott Dual-Purpose Model. Wavelength 10-2,000 metres. The ideal set for the short-wave Ham—provides amazing performance on the Medium and Long waves. Speaker incorporated. Instrument housed in black crackle finish horizontal cabinet. Guaranteed, fully tested. Price 11/3 gas. 2/- down and 12 monthly payments of 20/3. Leaflet on request.

### PETO-SCOTT MAINS UNIT

**MODEL A.C. 12** Cash or C.O.D. 25/-  
 Or 2/6 down and 10 monthly payments of 3/-  
 This efficient model is suitable for sets operating on output of up to 12 m. a. For A.C. Mains 200-250-v. 40 to 100 cycles. Output 120-v. at 12 m. a. 4 tappings: 60-v., 75-v., 90-v., and 125-v.

**MICROPHONES** ★ *On the highest authority "equal to a" — £16 model.*  
 Table Model complete with transformer, 25/- cash or 2/6 down and 10 monthly payments of 2/6. Telescopic Floor-stand Model, real professional type. Chromium-plated. 2 gas. cash or 2/6 down and 11 monthly payments of 4/-

### ONLY OBTAINABLE FROM PETO-SCOTT

**DECCA 1938 MODEL 99 A.C. 6-VALVE ALL-WAVE SUPERHET**—Brand New. 12-2,000 metres. Easy-to-read station-name dial. Automatic volume control. Overize Moving-Coil Speaker. Provides a wonderful performance and unsurpassed reproduction. Really beautiful cabinet. Provision for Ext. Speaker and Pick-up. Covered by Maker's Guarantee. In original sealed cartons. Present List Price £14 3s. 6d. OUR PRICE 8/1 gas, or YOURS FOR 10/- down and 18 monthly payments of 12/6.

**DECCA 1938 ALL-WAVE BATTERY MODEL 33**—An amazing 3-valve 3-tuned-circuit receiver, 19-2,000 metres. Station-name dial. Hi-fidelity moving-coil speaker. Provision for Ext. Speaker and Pick-up. Tasteful Walnut Cabinet. Brand New. Covered by Maker's Guarantee. Sealed cartons. Present List Price £7 17s. 6d. OUR PRICE, £5 19s. 6d. CASH, or 5/- down and 18 monthly payments of 7/4.

**BRUNSWICK 1938 ALL-WAVE MODEL BPU/1.** A wonderful 6-Valve receiver, 19-2,000 metres. For all electric supplies 100-250 volts (A.C. 40/60 a/s.). Automatic volume control. Large easy-to-read station-name dial. Transportable, but provision for external aerial for distant stations. Brand New in sealed cartons. Maker's Guarantee. Present List Price £13 2s. 6d. OUR PRICE 8 gas, or 8/8 down and 18 monthly payments of 10/10.

### B.T.S. TROPHY RECEIVERS

**Record-breaking Short Wave Sets**  
 12/52 metres. An amazing advance in Short Wave technique... record breaking receivers offered for the first time as commercial instruments for the enjoyment of Short Wave listening. Based on the circuit design used by the World's Champion Short Wave Station "Jagger." The Trophy 3 in two Versions, A.C. Mains Model and Battery Model... designed for the reception of the World's Broadcasts on the Moving Coil speaker incorporated.



### TROPHY THREE

Employs highly efficient 3-valve circuit providing unique results on 12-52 metre waveband, with coils supplied. World-famous specially wound One-shot Inductors available for tuning from 6-650 metres. Wavelength-calibrated scale. Moving coil speaker fitted and provision for headphones. Steel cabinet in beautiful crackle finish. Complete with 2 coils and fully tested.

**BATTERY MODEL** (Less Batteries) **£5 15: 0**  
 Or 9/6 deposit and 18 monthly payments of 8/11.

**A.C. MODEL** 200 Volt v. 40/100 cycles. **£6 0: 0**  
 Or 10/- deposit and 18 monthly payments of 8/9.

● **S.T. 900 BATTERY ALL-WAVE** ●  
 Build now this amazing all-wave receiver tuning from Television — to 2,000 metres, Kit "A" comprising A.L.D. parts, less coils and valves, but with free station-name dial and full constructional details. 55/6 cash or C.O.D., or 5/- down and 11 monthly payments of 5/8.

### SPECIAL OFFER

**EXTRACTOR KIT.** Amazing offer of this S.T.900 special selectivity device. List Value 13/8. OUR Price 10/8.

**S.T. 900 B.T.S. ONE-SHOT INDUCTORS.**  
 2 Type 9.MW (190 to 550 metres) per pair 5/6  
 2 " 9.LW (300 to 2,000 " ) " " 6/6  
 2 " 9.S1 (8.5 to 27 " ) " " 5/-  
 2 " 9.S2 (15 to 43 " ) " " 5/-  
 2 " 9.S3 (24 to 70 " ) " " 5/-  
 2 " 9.S0 (Television Family) " " 5/6

**S.T. 900 VALVES** set of 5 as specified, 20/3 or 3/8 down and 11 monthly payments of 2/9.

**S.T. 900 COMPLETE KIT.** As Kit "A" but including all coils as detailed above. Station-name dial and full constructional details less valves. 76/8 cash or C.O.D. (You save 7/-) or 6/- down and 12 monthly payments of 6/6.

### POST THIS COUPON NOW

**PETO-SCOTT CO., LTD.,** *Clissold*  
 77 (Pr. W. 36) City Road, London, E.C.1. *0873-6-7*  
 62 (Pr. W. 36) High Holborn, London, W.C.1. *Bolton*  
*3248.*

Please send me.....  
 .....Cash/C.O.D. or H.P.

for which I enclose £.....

Name.....  
 Address.....

# Interference Suppression on Short Waves

UNTIL fairly recently it was often thought that interference—static, as it is generally called—was inseparable from short-wave reception. Whatever truth there might have been in that during past years certainly does not exist to-day, although interference is often experienced. But it should not be thought that interference is always worse on short waves than it is on the medium and long wavebands. In many instances, short waves are particularly free from interference when satisfactory long-wave reception is almost out of the question.

A good deal of the so-called short-wave interference is due to minor faults in the receiver, incorrect adjustment or unsatisfactory installation. Another point that is often overlooked is that the range of reception for a given transmission power is considerably greater on the wavelengths below, say, 50 metres than it is on the higher wavelengths. That being the case, it is not surprising if "interference" signals are more easily received in addition to the required programme.

## Sensitivity and Interference

It is this question of sensitivity which is very important. Sensitivity is a double edged sword, for the more sensitive any set is made, the more responsive must it be to interference of the static or electrical kind. Besides, it is more sensitive to faulty connections within the set which lead to erratic contact and to troubles that are often blamed on to electrical or atmospheric disturbances.

It should now be clearly understood that when there is a noisy background while listening to short-wave transmissions the first step should be to see that the fault is not within the set. Examine switches, wiring connections, frictional connections between valve and coil-pins and their sockets, and also between the moving vanes of variable condensers and their terminals. This particular aspect has been dealt with in recent articles in these pages, so it is not proposed to go over the same ground again here; the matter is mentioned because it is, logically, the one that must first be investigated.

## Preliminary Test

When there is some doubt as to whether the interference—noticed as a "crackling," "frying" or "sizzling" noise as a background to reception—comes from within or without the set, a rough test can be made by disconnecting the aerial and earth leads. Both before and after removing these leads, observe the effect of increasing and reducing reaction (when a "straight" set is used) and of rotating the tuning condenser throughout its full range. This is so that the tests can be suitably comparative.

## Mains Suppressors

When the disconnection has little or no effect, it is probable that the fault is within the set, and it will be worth while to carry out a few "internal" tests with a view to

Methods of Preventing Static from Interfering with Reception: Faults in the Set: Mains-lead Suppressors: Special Aerial Systems: Suppressors for Electrical Apparatus: Have a Good Earth. By FRANK PRESTON

verifying that theory. Particularly in the case of a mains receiver, or one fed from an eliminator, the test might be unreliable due to the fact that interference might be carried into the set through the mains leads. Mains-borne interference can nearly always be removed or reduced in effect by the well-known method of connecting the two end terminals of a double .1-mfd. fixed condenser to the mains terminals of the set and joining the centre terminal to the earth terminal or directly to an earth lead. That might not be fully effective, when it is desirable to include a mains-type H.F. choke in each lead. Both of these points are

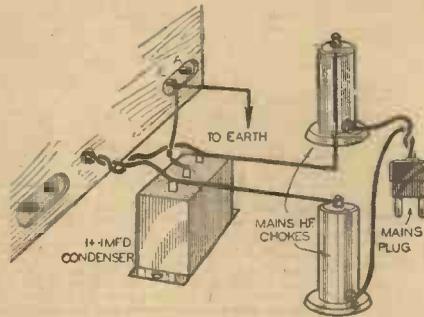


Fig. 1.—How a double condenser and mains H.F. chokes are included in the mains lead to the set to prevent mains-borne interference from entering the receiver. In some cases the condenser alone is sufficient to overcome the trouble.

illustrated in Fig. 1. Various special condensers and chokes are made for this purpose, some of them being illustrated in Fig. 2.

A convenient type of double condenser is in the form of a mains-plug adapter. This is fitted into the wall socket, the receiver plug being fitted into it, and an earth lead being joined to the single terminal. Although this is frequently sufficient to overcome the trouble it is sometimes better to have a double condenser as near as possible to the mains transformer. In that case, the condenser can be placed adjacent to the transformer primary terminals or at the back of the set close to where the mains leads enter.

## "Silencing" Electrical Apparatus

When the interference is transmitted through the mains leads it is better, where possible, to suppress it at its source. It might be caused by a refrigerator, vacuum cleaner, electric sewing machine or other domestic appliance. The simplest arrange-

ment is to feed the apparatus through the special plug adapter already mentioned, although it is better to connect the twin condenser directly to the electric motor. For this purpose it is advisable to employ a twin condenser of the type fitted with three rubber-covered leads so that no "live" metal parts are exposed. The method is to join the two red leads ("outside" connections to the series-connected condensers) to the brushes of the motor and to connect the black or centre lead to earth or to the metal frame of the machine. It is often considered desirable to insert fuses in series with the leads to the condensers, but this should not be necessary on normal A.C. or D.C. supplies, provided that only condensers of reliable make are used.

## Aerial Pick-up

Frequently the interference is picked up by the aerial-earth system, in which case there are a few possible alternative methods open to the user. One is to try the effect of modifying the aerial or changing its position and direction. The best of all is to use one of the many specially-designed anti-interference aerials that are now on the market. These are of various forms, and although they are not cheap they are well worth while as a means of ensuring really good short-wave reception. Before buying one of these it is well to try moving the original aerial. If, for example, it is found that interference is picked up from passing cars, the aerial could perhaps be moved to the other side of the house, where it is as far as possible from the source of interference. At the same time the aerial, if of the usual inverted-L type, should be placed so that it is at right angles to the road.

It is possible that the interference is being radiated in the house or block of flats; it might be from electric motors on that circuit or merely from the electric wiring. One idea is to reduce the height of the aerial so as to dispense with the need

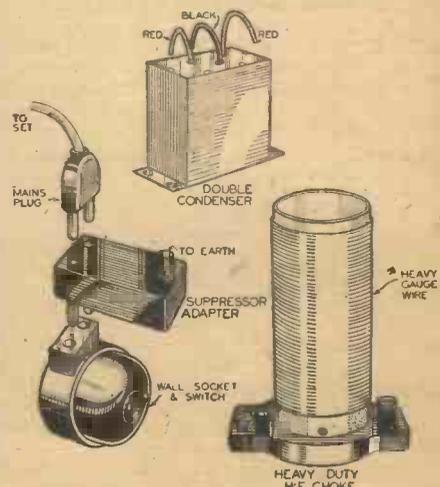


Fig. 2.—A few of the many types of mains suppressor condensers and H.F. chokes.

for a vertical lead-in. Another is to use a screened downlead which can be bought complete with two transformers—one fitting between the horizontal span and the lead-in, the other between the lead-in and the set. With this arrangement an earth connection must be made to the screening, and it is best to have this direct outside the window, as near to the end of the lead as possible.

There are various other useful anti-interference aerial systems, such as the doublet and dipole arrangement, but as these were explained last week there would be no point in describing them again. In passing, however, it should be explained that the doublet arrangement is not applicable to all sets, since it is necessary that the input tuning coil should have a separate aerial winding. This can often be provided by slightly modifying the set, but it is not always feasible in the case of an all-wave receiver.

**Receiver Screening**

In severe cases it might be desirable to screen the complete set by enclosing it in an aluminium box or by lining the inside of the cabinet with copper or aluminium foil. Care should be taken that every piece of metal used for screening is in good electrical connection with the others and that the whole are effectively earth connected.

A really good earth connection is often more useful than anything else in preventing interference, and no effort should be spared to ensure its efficiency. A deeply buried plate or metal box, an earth spike or a chemical earth are all good if the ground round them is kept moist by occasional watering or by pressing soft clay round the earth connector. Use a short lead of heavy cross section; if it must be more than a few feet long, insulate it. But do pay full attention to the earth.

**FRENCH RADIO EXHIBITION**

IN connection with the French Radio Exhibition which is to be held in Paris at the end of next month, an excursion is being arranged for Saturday, May 21st, which will give those participating a long day in Paris, with the option of an additional day at a small extra charge.

The train arrangements are as follows:—

- Victoria .dep. 8.20 p.m. Friday, May 20th.
- Paris .arr. 5.23 a.m. Saturday, May 21st.
- Paris .dep. 8.57 p.m. Saturday, May 21st.
- Victoria .arr. 6.5 a.m. Sunday, May 22nd.

The fare will be £2, inclusive of all port dues, etc., and no passports will be necessary.

For those wishing to spend an extra day in Paris this can be arranged for provided that it is requested when reservations are made, and an additional charge of 5s. 6d. will be applicable.

In response to many of those who made the trip last year, it has been decided that the invitation shall be extended to ladies, and they will be particularly welcomed this year. All money must be in by May 10th in order that the necessary reservations can be made with the railways, etc. All seats will, of course, be reserved on both the English and French railways.

All communications and inquiries should be addressed to: S. Gould, 65, Shortcrofts Road, Dagenham, Essex.

**NOW! THE RIGHT TIME TO BUY AT THE RIGHT PRICE**

**New Times Sales Co. RADIO BARGAINS**

ALL POST ORDERS SENT BY RETURN

**HURRICANE ALL-WAVE 3**  
THIS KIT SAVES YOU 10/-  
EVERY PART GUARANTEED  
MATCHED, PROVED, TESTED.

**KIT 1** Cash **32/-**  
or C.O.D. **32/-**  
Comprising Specified N.T.S. OR YOURS  
2-gang Condenser, N.T.S. FOR  
Hurricane S.M. Dial, Peto-  
Scott Steel Chassis, L.F. **2/6**  
Transformer and Fixed Con-  
denser, less Valves and Coils. **DOWN.**  
Balance in 12 monthly payments of 2/10.

**● SPECIFIED VALVES ●**

COMPLETE SET OF **3** Cash or C.O.D. **5/6** POST FREE  
Or available with Kit 1 for 2/6 down and 12 monthly payments of 3/5.

**KIT 2.** Complete Kit with 3 specified valves and set of 10 N.T.S. Hurricane coils, 5/7s or 4/9 down and 12 monthly payments of 4/11.

**HURRICANE CABINET**  
Peto-Scott recommended steel Hurricane cabinet. 12/6  
Or with drilled panel. Cash or C.O.D., 15/-,  
or add 1/3 to Kit deposit and monthly payments.

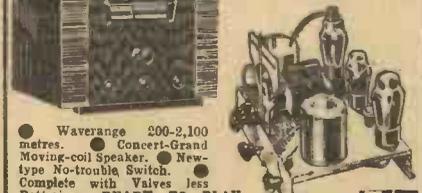
**HEADPHONES** 3/6  
N.T.S. recommended lightweight type, per pair Post bid.

**B.T.S. One Shot Inductors.** Complete set of 10 for Hurricane 3, 2/7- or 2/6 down and 12 monthly payments of 2/6.

**N.T.S. BATTERY S.G.3**

"A neat and efficient Receiver"  
Vide "Practical Wireless"

LIST VALUE £6 : 6 : 0  
**BARGAIN**  
CASH or C.O.D. **52/6**  
or 5/- down and 12 monthly payments of 5/-.



- Waverange 200-2,100 metres.
- Concert-Grand Moving-coil Speaker.
- New-type No-trouble Switch.
- Complete with Valves less Batteries. **READY TO PLAY**

Will bring you British and Foreign programmes with remarkable fidelity and volume. New screened-grid high frequency, high-efficiency detector, and Pentode output. Only 9 m.a. H.T. consumption. Latest improved components. Steel chassis. Slow-motion tuning. Illuminated wavelength scale. Beautiful walnut-veneered cabinet, 19 1/2" high, 14" wide, 10" deep.

**CHASSIS ONLY,** as employed in the above complete receiver. Ready for fixing in your own cabinet. Dimensions 10" wide 7 1/2" deep 8" high to top of scale. 10/6. **OR COMPLETE** with 3 matched valves. **CASH OR C.O.D. £2 2/0, or 2/6 down and 12 monthly payments of 4/-.**

**ALL-WAVE S.G.3 CHASSIS**

Complete with matched valves, knobs and escutcheon. List value £4 : 15 : 0  
Exceptional purchase. Pentode output. Wide choice British, foreign and short-wave stations 18-52 metres. Engraved dial 200-2,000 metres. Amazing tone and volume. Matched valves. Assembled and fully tested. Dimensions: 10" x 7 1/2" d. x 8" h. to top of scale. **BARGAIN 52/6**  
or 5/- down and 12 monthly payments of 4/10.

**A.C. BANDPASS S.G.4 CHASSIS**

LIST PRICE £6 : 6 : 0 **BARGAIN**  
Wonderful selectivity and sensitivity. £2 : 19 : 6  
4 British valves. Screened coils, slow-motion tuning. Wavelength dial. Gramo. pick-up sockets. 3 watts output. Wave range 200-2,000 metres. For A.C. Mains ONLY 200-250 volts, 40/50 cycles. Cash or C.O.D. or 5/- down and 12 monthly payments of 6/-.  
Or in beautiful walnut veneered cabinet complete with Matched Field Energised Moving-coil Speaker, ready to play. List price £8/8/0. Bargain price, £4/19/6, or 5/- down and 12 monthly payments of 8/9.

**WORLD S.G.4 KIT**



Four Matched FREE Valves  
List Value £4 : 17 : 6  
**BARGAIN 37/6**  
N.T.S. World S.G.4 is the ideal set for the short-wave enthusiast, provides an unsurpassed performance on the medium and long waves. Efficient circuit comprises Pre H.F. S.G. Detector, Screened Grid Audio and Pentode output stages, 2-gang condenser. Slow-motion tuning. Station-named dial for Broadcast and calibrated for short-wave bands. Designed specially for B.T.S. 6-pin One-shot Inductors or N.T.S. type S.T. 6-pin coils. Only N.T.S. are in the position to offer such an amazing bargain. Complete Kit with highest grade components only, with drilled metal chassis, transformer, condensers and all instructions. Less coils, 37/6 only or yours for 2/6 down and 12 monthly payments of 3/5. Valves FREE.

**COMPLETE KIT.** Comprising above but including 5 pairs 6-pin coils 8-2,000 metres, 5/9 6. or 5/- down and 12 monthly payments of 5/3. 4 Matched Valves FREE. **2/6 DOWN**

**● COMPONENT BARGAINS ●**

Orders over 5/- sent carriage paid  
C.O.D. charges extra under 10/-

**OUTPUT CHOKES.** Benjamin, Universal Class "B" tapped output chokes. List 11/-. Our price, 4/6. Telsen tapped Pentode output choke, 2/5. Telsen 1-1 output transformer, 2/-.

**TRANSFORMERS.** Telsen, 5/1 and 1.75/1, 2/-.  
**T.C.C. DUBILIER CONDENSERS,** Metal cases; 400 volt working; 8 mfd., 3/9; 1 mfd., 1/9.

**JACKS AND PLUGS.** B.T.S. Single and Double Circuit Jacks. List 2/3. 1/- each. Jack Plugs, 1/- each.

**VALVE HOLDERS,** Chassis type paxolin, 4- and 5-pin, 2/6. 7-pin, 3/6. Octal, 6d. Baseboard W.B. type, 4-pin, 2d. each, 5-pin, 3/6, each.

**GANG CONDENSERS.** Plessey type, shielded 3-gang condensers, with Trimmers, for Straight Circuits, New, 2/11. Superhet 2-gang type, shielded, same price.

**STEEL CHASSIS.** Ready drilled for 1-9 valve-holders, Electrolytics and mains transformer, Size 15 1/2" x 9 1/2" x 3 1/2", grey enamel finish. Bargain, 2/- each.

**SPEAKERS.** PM's, well-known makes, 8in. cone, for Power or Pentode, 12/6. Goodmans and Celestion, 6 1/2in. PM's, 7/6. Mains Energised. Rola, 6 1/2in. cone, Pentode Output, 2,500 ohm, 10/6. **ALL NEW.**

**TRICKLE CHARGER,** 2v. 1/2 amp. Model, Metal Rectifier, 10/-.

**STRAIGHT THREE CHASSIS,** ready assembled, less valves, fully tested, 10/6.

**KNOBS.** 1 doz. assorted control knobs, 1/-.  
**VOLUME CONTROLS, POTENTIOMETERS.** Well-known makes, all values up to 1 meg., 2/-; with switch, 2/6.

**VALVE SCREENS.** 3 portion, latest type, 1/- each.  
**TUNING CONDENSER.** .0005 mfd., Airspaced, 1/9.

**SENSATIONAL OFFER**

**BARGAIN PARCELS.** Value 25-30/-. Bargain 4/11, post bid. Exceptional opportunity for "Practical Wireless" readers. Huge stocks must be cleared of components, well-known makes, for Mains and Battery sets, building and repairs, comprising Mains and L.F. Transformers, Tuning condensers and coils, fixed and variable resistances, fixed condensers, switches and chokes, etc. Assorted parcels, our selection—but leave it to N.T.S. to give amazing value. 4/11, post bid. extra. Order Early.

**FREE. Send Coupon now for new giant bargain list reservation.**

**NEW TIMES SALES CO.,**

56 (P.W.63), Ludgate Hill, London, E.C.4.  
Please send me Cash, C.O.D., H.P.

NAME.....  
ADDRESS.....

EST. 1924.  
Please cross P.O.'s and register currency. Overseas orders post. extra.





# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

FOLK dance enthusiasts will no doubt appreciate the two attractive records of lesser-known folk dance tunes issued this month by the H.M.V. Company. They are "The Comical Fellow" and "Mutual Love" on H.M.V. B 8733 and "The Tempest" and "Thady, You Gander" on H.M.V. B 8732. These records have been approved by the English Folk Dance and Song Society, and are suitable for indoor and outdoor use.

### From the Films

ALLAN JONES has made a fine record of "The One I Love" and "Cosi Cosa" both from the film "Everybody Sing"—H.M.V. B 8724. Kate Smith, another American singer, has an extremely good recording voice. Her songs are "There's a Goldmine in the Sky" and "When the Moon Comes Over the Mountain" on H.M.V. BD 522.

Niela Goodelle, who is fast becoming a radio favourite, sings swing arrangements of "Comin' Through the Rye" and "D'ye Ken John Peel" together with "Thanks for the Memory" from the film "Big Broadcast of 1938"—H.M.V. BD 528. Revnell and West have recorded two more amusing numbers, "Hi-di-Ho" and "In the Days of the Bustle," on H.M.V. BD 521, and Max Miller sings two of his latest, "Winnie the Whistler" and "Doh-re-me," on H.M.V. BD 533. Elsie Carlisle has made a second medley of her successes on H.M.V. BD 525, which include "What is This Thing Called Love?" "My Heart Stood Still" and "Mean to Me."

A newcomer to H.M.V. this month is Paulo, the singing clown, in two of his best numbers, "Outside an Old Stage Door" and "Tears in My Heart"—H.M.V. BD 531. There is also a light vocal record from Betty Driver—"With You" from the film "Brief Ecstasy" and "I'm Getting Sentimental Over You"—H.M.V. BD 530; Dan Donova sings "All the Way from Ireland" coupled with "My Irish Song"—H.M.V. BD 517, and the Three Musketeers add to their recording reputation with "The Lonesome Trail Ain't Lonesome Any More" and "Just a Greenhorn"—H.M.V. BD 520.

### Dancing Time

AMONG the many dance titles issued this month there are two from Noel Coward's show "Operette." They are "Dearest Love" and "Where Are the Songs We Sung?" played by Roy Fox and his Orchestra on H.M.V. BD 5339. Jack Harris and his Orchestra have recorded that very popular number "Little Drummer Boy" coupled with "In my Little Red Book"—H.M.V. BD 5346. In correct dance tempo Henry Jacques has recorded "You're a Sweetheart" and "Just Remember," H.M.V. BD 5343, also "Two Dreams Got Together" and "Dearest Love"—H.M.V. BD 5344.

A novelty dance record this month is a special tap dance practice record played by Henry Jacques' Orchestra under the supervision of Victor Leopold. The titles are "Bye-Bye Blues" (fast time) and "Good-bye Blues" (slow time) on H.M.V. BD 5350.

The numbers issued for the swing fan are "Bei mir Bist du Schoen," played by Benny Goodman's Quartet—H.M.V. B 8725; "The Campbells are Swingin'" and "Midnite in Harlem," by Larry Clinton and his Orchestra, H.M.V. B 8726, also "If Dreams Come True" and "Life Goes to a Party," recorded by Benny Goodman's Orchestra on H.M.V. B 8727.

### Decca

THE amount of publicity being given to the "Snow White" film gives it pride of place from the recording point of view. The three Frank Luther records issued this month by Decca will have a very wide appeal, for they are the only ones specially adapted for children. The sound effects introduced are excellent and the continuity of the story is preserved throughout the six sides, but each record is complete in itself. The records are Decca F 6649-50-51.

Charlie Kunz has made yet another piano medley of popular tunes on Decca F 6644, whilst that popular radio star, Greta Keller, sings a hit tune of the moment, "Thanks for the Memory," coupled with "Once in a While" on Decca F 6640.

The rest of the Decca list consists of a varied and well-selected list of good tunes by popular artists. Phil Regan in "hits" from his film "Manhattan Music Box" on Decca F 6643 should appeal, whilst Lev Stone on Decca F 6641 presents two numbers also from this film.

### Rex

GRACIE FIELDS has chosen two of the tunes from the "Snow White" film for her latest record. Accompanied by Fred Hartley and his Orchestra, she sings "Some Day My Prince Will Come" and "Whistle While You Work"—Rex 9253. Jack Payne and his Band dig up some old favourites for their recording of "Sweethearts of Yesterday" on Rex 9233. On the reverse they play "The Village Band" which is a novelty waltz with vocal effects.

### Parlophone

A humorous record is supplied by Max Bacon with "Buy My Little Ten-a-penny Pills" and "I Can Get it For You Wholesale" on Parlophone F 1080. In the new swing style series we have "Midnight in Harlem" and "Night Time in Cairo," played by Eddie Carroll and his Swing-phonie Orchestra on Parlophone R 2504, and "Tiger Rag," played by Eric Siday and Reg Leopold (two violins and rhythm), on Parlophone R 2505. On the reverse is "Blues" played by The Rhythm Gangsters.

## ELECTRADIX



MOTORS.—A.C. Start on full load 1/60 h.p. with pulley, Type 50, 1,500 revs., 18/6. 1/25 h.p. Type 35.0, 3,500 revs., 27/8. 1/4 h.p. 2,000 revs., 45/6. Squirrel Cage 1/10 h.p. Motors, 2,500 revs., 35/6.

D.C. MOTORS.—1/40 h.p. 110 or 220 volts, series, Type K.B., 1,750 revs., 15/6. Type C. 1/25 h.p., 2,000 revs., 16/6. 1/12 h.p. Type C. 110 or 220 v. shunt, 1,700 revs., 30/6. Tiny Motors, 6v., 12/8. 50 v., 14/6.

100 v., 15/6. 12 volt 1/4 h.p. compound, 40/6. Electric Water Pumps, 67 6. Compressor Paint Spray Sets, 37/6. Electric Fans, 12/6. MOTOR GENS.—220 v. A.C. to 100 v. 1 amp., D.C., 60/6. Big stock all types.

SMALL CHARGERS.—From A.C. mains Midget for 2 volts, 1 amp., 12/6. 6 volts, 11 amps., 30/6. Phillips A.C. Mains Charger, giving 14 volts, 3 amps., D.C., 24. Trickle Charger for A.C., giving H.T. and L.T., 35/6. As we have a wide range of other sizes, kindly specify yours.

LIGHT RAY CELLS LESDIX CELLS are light sensitive, with gold grid, moisture proof, 5/- mounted in Bakelite Case, 7/6. Super-model in oxy-brass body, with window, 10/6. Photronic Self-Generating Light Cells. Latest model, 21/6. Complete Ray Burglar-Alarm Sets, 43 10s.



### SOUND RECORDING

Electric PRISM set has ball-bearing centre gear box and geared traverse rod. Set with Tracking Gear, Pick-up and Tone-arm fitted diamond, 37/6. Tracker gear only, less Pick-up and Tone-arm, is 21/6. Diamond Cutter Needles fit all pick-ups, 7/6. Blank Discs 4/- dozen. Complete Accurate Sets de Luxe, 18/-; No. 2, 10/6; Junior Type, 5/6 each, complete.

GRAMO-MOTORS.—A.C. Gramo motors and turntable, Victor, H.M.V. 230 volts, motor, 30/6.

MICROPHONES.—Lesdix Microphones reproduce your voice amplified from your radio set to loud speaker. SOLO MICROPHONES 1/-, A new Practical Solo Microphone for broadcasting at home. It is a general purpose, robust mike, with solid bakelite body, black terminals, front metal grille. No. 11. New design finely finished, 5/6. No. 11A. Special, in solid brass body, unequalled at the price on speech and music, 7/6. No. "NW" 11 Table Mike.—This is a splendid microphone for speech and music. The bakelite case, containing a 2m. mike and transformer, is on a brass pedestal. Switch and plug sockets are fitted on the case. It stands unrivalled for quality and price, 15/6.

TELEPHONES.—For all purposes. Table or wall, house or office phones, from 10/6. Portable Emergency Telephones and Cable Headphones. Pocket type W.D. leather Headbands, 2/6 pr. Sullivan Radio Aluminium Headbands, 9 pr. 4,000 ohm 8/W Lightweight Headphones, 4/6 pr.

CRYSTAL SETS.—Buy one, they cost nothing to run. No battery or valves wanted. Quiet and efficient reception. Shop-sold sets cheap. Enclosed type, 5/6 and 7/6 each.

FIXED CONDENSERS for odd smoothing jobs, 5,000 Mansbridge 11k. Condensers to clear up 5/- doz., 20/- gross.

PARCELS of experimental odd coils, magnets, wire, chokes, switches, terminals, etc., post free; 10 lbs. 7/-; 7 lbs. 5/-.

Over 1,000 Other Bargains in our enlarged Illustrated 1938 List "N."

Have you got our new MAY SALE LIST?

FREE for stamped addressed envelope.

ELECTRADIX RADIOS

218, Upper Thames Street, London, E.C.4

Telephone: Central 4611

## EVERYTHING RADIO

SUPPLIED FOR CASH OR

ON EASY TERMS

	Cash Price	De-posit	Monthly Payment
R.T.200 Complete Kit	5 15 0	10/-	11 of 10/7
W.B. Sientoran Senior 288	2 2 0	2/6	11 of 4/6
Garrard A.C.6 Radiogram Unit	3 15 0	5/6	11 of 7/6
Garrard A.C.6 Motor only	2 2 6	4/6	10 of 4/3
Rothermel Piezo-Electric Pick-up	2 2 0	4/-	10 of 4/3
Avonminor Test Meter	2 5 0	5/-	10 of 4/6
Goodman's L.S. Twin-Cone Unit	3 10 0	6/0	11 of 6/5

CASH or C.O.D. ORDERS DELIVERED BY RETURN OF POST. We can guarantee such prompt delivery only because we carry large stocks and, being placed so favourably, we are able to secure anything Radio or Electrical immediately.

Write us your requirements—we will quote best terms by return.

**LONDON RADIO SUPPLY ESTD COMPANY 1925**  
11, OAT LANE, NOBLE ST. LONDON, E.C.2.  
Phone: NATIONAL 6828-9

Add 50/- WEEKLY to your earnings

Charge accumulators in your spare time.

Complete Charger, incorporating Westinghouse Metal Rectifiers. Will charge 24 accumulators weekly.

Price £4.4.0 or 8/- monthly.

Send for full particulars.

M.P.R. ELECTRICAL CO., 352, Victoria Road, Romford, Essex.

# A GOOD JOB IN RADIO FOR YOU

The Radio Industry is short of trained men. You may still be an untrained assistant in a wireless shop, or doing a dead-end job on the bench, yet you have a grand opportunity to get a progressive, highly paid post—if you equip yourself for it by spare-time study.

Whatever branch of the Industry appeals most strongly to you, the International Correspondence Schools have a Course to fit your needs. Under I.C.S. direction, you study when and where you like. You are guided throughout by highly qualified instructors, whose advice and assistance is yours just as often as you care to ask for it. Nearly half a century of unrivalled experience is at the back of this work.

The I.C.S. are the creative pioneers of vocational training by the postal method, and by far the largest, greatest and most successful correspondence institution in the world. You can trust I.C.S. Instruction. It is sound, practical and profitable.

Write for our free "Radio" booklet, stating your subject—or use the coupon below if you wish.

## THE ADVISORY DEPARTMENT INTERNATIONAL CORRESPONDENCE SCHOOLS Ltd.

94, INTERNATIONAL BUILDINGS, KINGSWAY, LONDON, W.C.2

Radio Engineering.	I.E.E. Grad. Exam.
Complete Radio.	I.W.T. Exam.
Radio Servicemen's	C. & G. in Radio Com. Exam.
Elementary Radio.	P.M.G. Certif.
Radio Service and Sales.	Air Ministry Prov. Certif.
Television.	

Mark X in front of Courses in which you are interested.

Name..... Age.....

Address.....



# RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

## RADIO, PHYSICAL AND TELEVISION SOCIETY

OWING to the interest shown in an article on "Valves" translated by Mr. C. W. Edmans, and recently published in PRACTICAL AND AMATEUR WIRELESS, several members of the above society asked to have a lecture dealing further with this subject. Accordingly, on Friday, April 22nd, Mr. Edmans delivered a lecture in which he outlined not only the fundamental theory and practice of the use of thermionic valves for radio purposes, but also the general application of man's present, but still very imperfect, knowledge of electronics, to the manufacture of such apparatus as photo-electric cells, neon tubes, gas-discharge lamps, and electron-multipliers. The relative advantages and disadvantages of different types of emitters were described in brief, and general particulars were also given of various pumps, getters, and other paraphernalia used in the manufacture of modern vacuum-tubes. The lecture was fully demonstrated, particular interest being shown in a series of experiments with high voltages, and tubes containing different gases in various degrees of vacuum.

Meetings of the society are held every Friday evening during the winter months at 72A, North End Road, West Kensington, when there are lectures on radio and other subjects of general scientific interest. During the summer there are field-days and visits to places of interest. Further particulars of the society may be obtained by writing to the hon. secretary at the above address.

## KINGSTON AND DISTRICT AMATEUR RADIO SOCIETY

ON Wednesday, April 13th, thirty-five members of the Kingston and District Amateur Radio Society listened to a very interesting lecture on "Piezo Electric Crystals" by Mr. E. Dedman (G2NH), of The Quartz Crystal Co. After describing the various angles at which the blanks are cut, Mr. Dedman went on to describe the advantages of X.Y. and A.T. cut crystals. Much interest was shown in the description of the apparatus used in determining the frequency of the crystals. The lecturer concluded his talk by describing some of the lesser-known uses to which crystals were put. An interesting lecture has been arranged for Wednesday, May 11th, at The Three Fishes Hotel, Richmond Rd., Kingston, to be given by Radio Graphic, Ltd. Visitors are cordially invited, and for further particulars apply to the hon. secretary, D. N. Biggs, 44, Pooley Green Road, Egham, Surrey.

## MAIDSTONE AMATEUR RADIO SOCIETY

ON Tuesday, April 10th, Mr. H. Bowen gave an interesting lecture entitled "Modern Valve Developments." This subject is so vast that Mr. Bowen limited himself to discussing the use of valves on the ultra-short waves.

A general meeting will be held on May 10th, to decide what members wish the society's policy to be throughout the summer months. All meetings are held in the clubroom, 244, Upper Fant Road, Maidstone, unless otherwise announced.—Hon. secretary, P. M. S. Hedgeland (2DBA), "Hill View," 8, Hayle Road, Maidstone.

## EDGWARE SHORT-WAVE SOCIETY

THE Junk Sale which was held at Headquarters on April 6th was a great success, and the club benefited considerably. Everything from a transmitting valve to a receiver was auctioned by the Chairman, Mr. P. Thorogood. On April 13th, a demonstration of an RME69 and DB20 receiver was given, and this was inspected afterwards by the members. Considerable discussion was started over the R-strength meter.

The society is shortly to be affiliated to the Radio Society of Great Britain, and Mr. L. Gregory (G2AI) has kindly consented to be the President of the society. Future engagements include a visit to the International Telephone Exchange, and a lecture to be given by Messrs. Ferranti. There will also be a 6-metre night.—Secretary, Mr. F. Bell, 118, Coln Crescent, Colindale, N.W.9.

## PROPOSED CLUB FOR TEIGNMOUTH

SHORT-WAVE enthusiasts residing in Teignmouth and district, and who may be interested in the formation of a local club, are invited to get in touch with Mr. V. Harrison, 2, Westbrook Avenue, Teignmouth, Devon.

## BOOTLE AND DISTRICT AMATEUR TRANSMITTING CLUB

THIS newly formed club holds its meetings each Monday evening at 363, Stanley Road, Bootle, Liverpool, 20. The club was formed with the idea of enabling enthusiasts to meet regularly to discuss transmitting and radio in general to their mutual benefit. Several lectures and field-days are being arranged for the summer months.

Any persons in Bootle and the surrounding districts interested in the club are requested to write to the Hon. Secretary, C. E. Cunliffe, 363, Stanley Road, Bootle, Liverpool, 20, when full particulars and application forms will be sent to them. One of our members Mr. J. D. MacKenzie (2AII), has just obtained his full ticket after only five months on A.A.



Wailed Smithers, "Oh pity my plight,  
On the tiles I must spend half the night.  
When I first fixed this lead,  
I forgot what I'd need,  
To fix it for good—that's  
FLUXITE!"

See that FLUXITE is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 2d., 1/4 and 2/8.

Ask to see the FLUXITE SMALL-SPACE SOLDERING SET—compact but substantial—complete with full instructions, 7/6. Write for Free Book on the art of "soft" soldering and ask for Leaflet on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE.

TO CYCLISTS! Your wheels will NOT keep round and true, unless the spokes are tied with fine wire at the crossings AND SOLDERED. This makes a much stronger wheel. It's simple—with FLUXITE—but IMPORTANT.

## THE FLUXITE GUN

is always ready to put Fluxite on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages. Price 1/6.



ALL MECHANICS WILL HAVE

# FLUXITE

IT SIMPLIFIES ALL SOLDERING

FLUXITE LTD. (Dist. W.P.) DRAGON WORKS, BERMONDSEY STREET, S.E.1.

# DO YOU WASTE MONEY—

when you use your camera? So many people take photographs on a "hit or miss" principle. But you can be certain of really good results—photographs worth entering in the various competitions held at this time of the year—by reading regularly

## The HOME PHOTOGRAPHER

The Helpful Monthly for the Amateur.

6p.

Of all Newsagents and Bookstalls.

May Number Out Now.

# LETTERS FROM READERS

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).

## “Series” and “Parallel” Adapters

SIR,—I should like to draw the attention of readers to a small matter of common interest. A friend of mine had an all-mains receiver which he installed himself. In a statement to me, he said: “I switch on the set and the kitchen light comes on very dim and the receiver does not function. . . .” On inspecting his installation I found he had no switch plug to provide the necessary power supply, so this was taken from a “split adapter” in the common kitchen light socket, i.e., lamp to one side, radio to the other. The point I should like to stress is that my friend had overlooked the fact that there are two types of “split adapters.” There is a “series” connection and a “parallel” connection, and the adapter in this case was “series” and so placed the lamp and radio in series, causing the lamp to dim and the latter not to function. The sketch showing the wiring connections of the two adapters may prevent other readers from making this simple error.—JOHN W. LEECH (Llandudno).

## Radiation Interference

SIR,—There has been much controversy over the two-station phenomenon experienced by J. W. (Wigan). I notice that most readers put it down to re-radiation due to the relay system, which is, of course, a very likely source.

However, just recently I built a short-wave two, using standard four-pin coils, and experienced precisely the same effect as J. W. So far, I have been unable to find an explanation, but I am sure in my case the relay system has nothing to do with it. I happen to live in an even more isolated position than J. W., seven miles from the nearest town, and the nearest cables are at least a quarter of a mile distant. There is no possibility whatsoever of the presence of these two stations being due to the relay system.—C. WILSON (Chieveley, Berks).

## Readers' Thanks

SIR,—I wish to thank you for “Everyman's Wireless Book,” which was awarded me for solving one of your problems. It was very interesting, and could, I think, be quite aptly renamed “The Home Servicer,” as I think it deals mainly with servicing—a subject in which I am very interested.

I have built a five-valve short-wave superhet from information gleaned from your pages, and am now going to try it out.

Some time ago I built your Simplest Short-wave Two from spare parts, and have since logged all Continents on it. The first station I heard being a VP3. It's a good set.—V. HARRISON (Teignmouth, Devon).

SIR,—May I express my appreciation of the very fine book you awarded to me in connection with Problem No. 289.

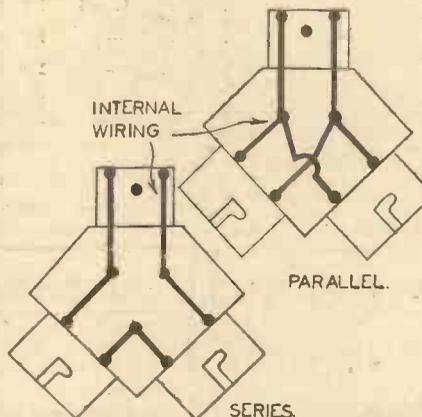
This is the third book I have had from

the house of Newnes, and it is a worthy companion to the other two. I have really been a reader since No. 1, and my news-agent holds a standing order.—JOSEPH T. SHAW (Belfast).

## A High-quality Amplifier

SIR,—I have duly noted Mr. Noel Bonavia-Hunt's and Mr. S. R. Pratt's replies to my letter published in the issue of March 26th.

Unfortunately the poor linotyper, who has to work so fast that masses of noughts and “points” must mean nothing to him,



The internal connections of a “series” adapter and a “parallel” adapter referred to in Mr. J. W. Leech's letter.

made a slip and both Mr. Hunt and Mr. Pratt spend most of their time in replying to him. I quoted Fig. 2 (P. 699) correctly.

Nevertheless, I stand by every point that I made against Mr. Hunt's direct-coupled amplifier, and I wish to emphasise the warning I gave to beginners regarding shorting-out the coupling condensers in R.C. amplifiers. I am sorry Mr. Hunt found himself misprinted, but am glad to have drawn attention to that fact.

I also wish to emphasise that a condenser of 100 micro-microfarads from plate to ground, as shown in Fig. 2, page 699, causes a deplorable loss of high audio frequencies, and has no legitimate place in an audio-amplifier circuit aspiring to high quality, however necessary it may be for efficient anode-bend detection circuits. In the case of Fig. 2 the result is calamitous because the anode resistance for V1 has the high value of 250,000 ohms.

Mr. Pratt states coupling condenser theory in correct terms, but they do not excuse Mr. Hunt's statement that the coupling condenser causes amplitude distortion for frequencies above 4,000 cycles per second. Actually, a coupling condenser can be chosen in practice to give an even response from frequencies below audibility

to far above audibility. The trouble with R.C. coupling originates in stray capacities, across resistances. Any television engineer covers more than the audible frequencies with his R.C. coupled amplifiers!

And, finally, I thank you, sir, for the past courtesy of your columns.—W. FINDLAY PIRIE (Aberdeen).

## New Station at Lahti

SIR,—I wonder if any of your readers has picked up the new station at Lahti, Finland? I was wandering about the 31-metre band the other night, when my attention was caught by a woman announcer requesting reports, to be addressed to the Finnish Broadcasting Company, Helsinki, Finland. This was at about 21.00 B.S.T. I listened until 22.19 B.S.T., when, after a programme which included a march by Sousa, and one of Tchaikovsky's works, the same announcer paused for station identification, and another request for reports in English and, presumably, Finnish, respectively.—A. L. KING (Clacton-on-Sea).

## Reaction Circuits: A Correction

SIR,—May I point out a slight misprint which occurs in my article entitled “Reaction Circuits” which was published in the April 16th issue. In the sentence referring to ohmic impedance “ $\frac{1}{\omega C}$  or  $\frac{1}{\pi f C}$ ”

should read  $\frac{1}{\omega C}$  or  $\frac{1}{2\pi f}$ .

—R. J. STRICKLAND.

CUT THIS OUT EACH WEEK.

## Do you know

- THAT the waveband covered by a tuning coil may be modified by moving the end turns, or by placing a metal screen near the coil.
- THAT when mounting a moving-coil loud-speaker the bass response may be reduced by mounting the speaker slightly clear of the baffle.
- THAT the inductance of a choke varies with the amount of D.C. current passing through its windings.
- THAT in a powerful self-contained receiver vibration from loud signals may result in a form of fading due to vibration of the tuning condenser.
- THAT ordinary H.F. chokes must not be connected in the mains leads for preventing interference, as they will not carry the high current.
- THAT shorted turns on an H.F. choke will prevent it from carrying out its function and will result in erratic reaction effects.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Neumes, Ltd., Tower House, Southampton Street Strand, W.C.2. Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

## THE WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA

By F. J. CAMM 6th Edition 5/- net  
(Editor of “Practical and Amateur Wireless”)

Wireless Construction. Terms, and Definitions explained and illustrated in concise, clear language.

From all Booksellers, or by post 5/6 from George Neumes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS CRYSTAL SETS	No. of Date of Issue.	Blueprint.	F. J. Camm's "Sprite" Three (HF Pen, D, Tot)	26.3.38	PW87
Blueprint, Cd.			Four-valve : Blueprints, 1s. each.	1.5.37	PW16
1937 Crystal Receiver	0.1.37	PW71	Sonotone Four (SG, D, LF, P)	8.5.37	PW11
<b>STRAIGHT SETS. Battery Operated.</b>					
One-valve : Blueprints, 1s. each.			Fury Four (SG2, D, Pen)		
All-wave Unipen (Pentode)		PW31A	Beta Universal Four (SG, D, LF, Cl. B)		PW17
Beginner's One-valver	19.2.33	PW85	Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B PW34C
Two-valve : Blueprints, 1s. each.			Fury Four Super (SG, SG, D, Pen)		PW46
Four-range Super Mag Two (D, Pen)		PW36B	Battery Hill-Mark 4 (HF Pen, D, Push-Pull)		PW46
The Signet Two (D & LF)	29.8.36	PW70	F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Three-valve : Blueprints, 1s. each.			All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2	"Acnie" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Selectone Battery Three (D, 2 LF (Trans))		PW10	<b>Mains Operated.</b>		
Sixty Shilling Three (D, 2 LF (RC & Trans))		PW34A	Two-valve : Blueprints, 1s. each.		
Leader Three (SG, D, Pow)	22.5.37	PW35	A.C. Twin (D (Pen), Pen)		PW18
Summit Three (HF Pen, D, Pen)		PW37	A.C. D.C. Two (SG, Pow)		PW31
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39	Selectone A.C. Radiogram Two (D, Pow)		PW19
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41	Three-valve : Blueprints, 1s. each.		
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48	Double-Diode-Triode Three (HF Pen, DDT, Pen)		PW23
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49	D.C. Ace (SG, D, Pen)		PW25
Genet Midget (D, 2 LF (Trans))	June '35	PW1	A.C. Three (SG, D, Pen)		PW29
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51	A.C. Leader (HF Pen, D, Pow)		PW35C
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)		PW53	D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Battery All-Wave Three (D, 2 LF (RC))		PW55	Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
The Monitor (HF Pen, D, Pen)		PW61	Armada Mains Three (HF Pen, D, Pen)		PW33
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62	F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
The Centaur Three (SG, D, P)	14.8.37	PW64	"All-Wave" A.C. Three (D, 2 LF (RC))		PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66	A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)		PW56
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69	Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72	All-World Ace (HF Pen, Dn, Pen)	28.8.37	PW80
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82	Four-valve : Blueprints, 1s. each.		
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78	A.C. Fury Four (SG, SG, D, Pen)		PW20
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84	A.C. Fury Four Super (SG, SG, D, Pen)		PW34D
			A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45

These Blueprints are drawn full size. Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the Blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless .. 4d. Post Paid  
Amateur Wireless .. 6d. " "  
Practical Mechanics .. 7d. " "  
Wireless Magazine .. 1/3 " "

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, P.M. to Practical Mechanics, W.M. to Wireless Magazine.

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

Universal Hall-Mark (HF, Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81
<b>SUPERHETS.</b>		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet		PW58
F. J. Camm's "Vitesse" All-Wave (5-valver)	27.2.37	PW75
<b>Mains Sets : Blueprints, 1s. each.</b>		
A.C. £5 Superhet (Three-valve)		PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)		PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW50
F. J. Camm's Universal £4 Superhet 4		PW60
"Qualitone" Universal Four	16.1.37	PW73
<b>SHORT-WAVE SETS.</b>		
One-valve : Blueprint, 1s.		
Simple S.W. One-valver	9.4.38	PW88
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)		PW33A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Pow)		PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen) Pen)	29.8.36	PW68
<b>PORTABLES.</b>		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's £1F Three-valve Portable (HF Pen, D, Pen)		PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77

THE SUM TOTAL OF A GOOD CIGARETTE



04646 L. PLAYER'S NAVY CUT CIGARETTES 'MEDIUM' OR 'MILD' 10 FOR 81 20 FOR 1146

Just Published

## INDOOR MODEL RAILWAYS

Dealing with HO and OO Gauges

By E. W. TWINING

The famous model railway expert

Demy 8vo ; 151 pages ; hundreds of photographs and diagrams drawn to scale.

This book provides the model railway enthusiast with a standard textbook and work of reference, dealing in an exhaustive and authoritative way with the subject.

### LIST OF CONTENTS

Early small-gauge railways ; origin of HO and OO gauges. Gauges, scales and dimensions.  
Electric traction motors, rotation and reversing.  
Prototype locomotives and modelling same.  
Motor mechanisms and their adaptation to prototype engines.  
The twin railway, its locomotives and electrical working.  
Electric motor coaches, carriages, wagons and auto-couplers.  
Track, lay-out and engineering works.  
Third-rail and two-rail systems, control and signalling.  
Architectural features.

5/- NET (5/6 post free)

GEORGE NEWNES, LTD.,  
Tower House, Southampton Street, Strand, W.C.2



# QUERIES and ENQUIRIES

you published details as to the best way of doing this. I have no doubt it would interest many of your readers."—J. D. (Sanquhar).

## S.W. H.F. Stage

"I am going to add the H.F. stage described in September 11th, 1937, issue to the Simplest S.W. Two-valver. Unfortunately I am not sure which valve should be used. Could you please tell me the valve from the Hivac range, and also the number of pins—5 or 7?"—R. W. D. (N.W.11)

THE circuit as shown requires a straight or normal H.F. pentode, that is, one without variable- $\mu$  characteristics. In the Hivac range this is type number HP. 215. This is supplied with a 7-pin base, and you should make the standard connections, joining the metallised surface and the suppressor grid direct to the earth terminal. Remember not to place the valve too close to the coil so as to avoid losses due to the metallic surface.

## Making a Tuner

"With reference to your recent article on All-wave Tuners, do you think that it is possible to make coils suitable for an all-wave tuner similar to the Bulgin? Is there a tuner or coils in your book 'Wireless Coils, Chokes and Transformers.' What sort of tuner is in the 'Acme' receiver?"—J. R. C. (Leicester).

IT is certainly possible to make a tuner of the type referred to, and in the book you mention you will find a complete table of coil winding data which will enable you to make the necessary individual coils. The circuit in last week's issue under the article an "All-Wave Tuner" will show the lines upon which the coils should be wired and you can select coils from the book in question to cover the ranges you need. In the Acme receiver we used a special coil unit supplied by Messrs. Peto-Scott, but this is not an all-wave tuner in the same sense as those referred to by you. It consisted of a pair of standard broadcast coils in screens with a separate short-wave coil mounted beneath the chassis and brought into circuit by a switch.

## Ever-Ready Valves

"I have three valves made by the Ever-Ready Company, but cannot find out what they are for they are not on the lists. I wonder if you could give me some data on them, they are marked K.30.C. and K.30.G. The K.30.Cs. are metallised and K.30.G. plain. I have tried them in my set which is an S.G.4, and they seem the same in any position, but I should like to know what they really are."—C. H. J. (Hull).

THE K.30.C. is a general-purpose triode, and thus may be used as a detector or L.F. valve. It has an impedance of 20,000 ohms and an amplification factor of 28. The K.30.G. is an output triode, and thus you could plug this into any stage with more or less satisfactory results, but as it has a low impedance—3,600 ohms—and an amplification factor of 12.5, it should be plugged into your output stage. The remaining two valves may be used as detector and first L.F.

## Forming a Radio Society

"I am anxious to form a local radio club, and I think it would be a good idea if

WE have published details on the subject on several occasions, the last being in the issue, dated May 4th and 11th, 1935. Briefly, you should get together a number of interested amateurs and rent a small room at which you could hold the necessary meetings. Avoid a room on licensed premises for various reasons. Draw up rules, appoint officers, and insist on rigid adherence to all the rules and regulations which you prepare. A good local dealer may be able to help by loaning apparatus or arranging for the visit of various representatives of well-known firms for lectures, etc. Advertise in the local paper, and send reports of meetings to that paper and to use for inclusion in our pages.

### RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

## "Straight Three"

"Have you a back number of your paper with a diagram of a straight three, as I am unable to get one locally?"—F. C. (Leytonstone, E.11).

WHAT is a "straight three"? This term is often used by amateurs, and it means nothing. An H.F., Detector, L.F. set is straight, and consists of three valves, and the same thing applies to a Detector, 2 L.F. receiver. The term was used in the old days to distinguish between simple receivers and those utilising "stunt" circuits, but now there are so many straight-forward circuit designs, and three valves may be employed in so many different ways, that the term means nothing. Perhaps you can explain clearly which type of circuit you need when we think you will be able to find a blueprint for a suitable receiver in our blueprint list.

## Transformer Ratio

"Yesterday I asked a radio dealer in Dublin for a B.T.S. 3-1 L.F. transformer, and was offered a Graham Farish 1-3 transformer. I pointed out to the assistant the difference in ratio, and his explanation was that they were both L.F. step-up transformers, that all manufacturers did not mark them alike even if they were the same ratio. I could not be made to believe that a

step-up transformer was the same as a step-down. Would you kindly explain the point for me? I was of the opinion that for L.F. coupling a step-down transformer was used in battery sets and a step-up in mains sets. What ratio would you advise for a two-valve (Def. L.F.) short-wave set?"—W. C. (Mountrath, Leix).

YOUR dealer was quite correct. Manufacturers do not all adopt the same type of marking. Actually, the majority are marked incorrectly, the term 3 to 1 and 4 to 1 being quite common. The standard L.F. transformer is a step-up and therefore the figure 1 should come first, as in the Ferranti components. A Class B transformer is a step-down component, but it is not correct that step-down is employed for battery sets and step-up for mains sets. For the type of set you mention either 3 to 1 or 5 to 1 may be used. Provided you obtain a standard L.F. transformer, therefore, it will not matter whether it is marked 3 to 1 or 1 to 3.



## Replies in Brief

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

E. B. (Peasmarsh). The majority of signals will be found on 900 metres.

J. E. (Leicester). You could try a separate mains unit, but will experience difficulty in avoiding interaction.

H. E. W. (Leeds). Neither of the components can be used in a modern set, and they could not easily be modernised.

H. S. (Cardiff). We suggest that you dig much deeper, when we are certain that results will be improved. As now in use the earth may be ignored.

E. G. C. (S.W.12). The Class B arrangement operates by a fluctuating current and this will result in a fluctuating voltage output from your eliminator. You must use a Neon stabiliser across the output and it may also be necessary to include decoupling components in some of the anode feeds.

J. O. (Blackpool). We have not described a crystal set of the type you mention, and so far as we are aware there is no such set available.

W. E. (Sunderland). The coils you mention are those recommended for the set in question, and details concerning the method of connecting them were given in our issue dated January 26th, 1935. The aerial is joined to terminal 7 on G1 and terminal 8 is earthed. The tuning condenser is joined between earth and terminal 1 on G1, G2 and G3, and the oscillator grid is joined to terminal 2 on G8. Terminal 5 on this coil is earthed and terminal 6 joined to H.T. The oscillator anode is joined to terminal 8.

P. N. (Reyton). The address is 21, Gt. Sutton Street, London, E.C.1.

J. M. (Macclesfield). The book you need is "The Mathematics of Wireless," published by us at 5s. (5s. 6d. by post). This will meet your requirements.

J. A. (E.5). We do not think you can use the set now, but suggest you communicate with the makers who will be able to advise you definitely.

F. G. H. (Bermansley). The parts are obtainable from Messrs. Bellis & Lee, Cambridge Arterial Road, Enfield.

E. W. T. (Newry). We regret that no further issues of the book in question are available.

E. M. (Rotherham). You would need a good moving coil speaker to handle the volume mentioned. The main requirements of the larger models are stronger cones and cone supports, and greater field strength.

A. S. (Breckley). We do not advise the change to variable- $\mu$  valves in this particular circuit.

F. J. S. (W.11). We have published many designs and without more details of the exact type of set we cannot recommend any particular blueprint. You would probably find a superlattice essential to give the selectivity desired, unless you were content to use a simple wave-trap in conjunction with an ordinary set.

The coupon on page iii of cover must be attached to every query.

## Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

## RADIOMART

### SPECIAL BARGAIN OFFERS

W.B. 8' Permanent Magnet Speakers at One-third Cost.

Extension Type (no transformer) 7/6 Standard Type (with transformer) 12/6

GARRARD SENIOR AUTOMATIC RECORD CHANGER Standard 12 guinea model, but fitted with high fidelity Piezo Crystal Pick-up. Limited number. £4.12.6

### RECEIVERS (FOR CALLERS ONLY)

Cosser, Alba, Decca, Aerodyne. Prices from £1.19.6 to £4.17.6. Battery and mains models. Only a few left. For callers only.

### SHORT-WAVE CATALOGUE

New Edition with dozens of new lines. 1½d. post free.

### G5N's 66-PAGE MANUAL

The greatest value and most comprehensive Manual ever published in this country. 7½d. post free.

## RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

**V**AUXHALL.—Polar Midget condensers, 2-gang, 0s. 8d.; 3-gang, 8s. 9d.; 4-gang, 13s. 6d. Polar full vision horizontal drives, 5s.

**V**AUXHALL. Hivac valves, entire range, full discounts. Polar station-named scales for horizontal drives, 1s.

**V**AUXHALL. T.C.C. electrolytic condensers, 8 mfd. and 4 mfd. 500 volts, 2s. 6d. 50 mfd. 50 volts, 1s. 6d.

**V**AUXHALL. Iron-cored coils, 3-gang, on base, with circuit, 17s. J.B. drives with station-named scale, 5s. 6d.

**V**AUXHALL. Magnavox and Rola P.M. speakers. 7in. cone, 16s. 6d.; 10in. cone, 22s. Energised models, 2,500 Beld coils, 7in., 12s. 6d.; 10in., 17s. 6d.

**V**AUXHALL UTILITIES, 163a, Strand, W.C.2. Temple Bar 9338. Send postcard for free list. Post paid 2s. 6d. and over, or C.O.D.

**C**OUPLPHONE SUPER 8 All-wave, 8 valves, 8 watts. Paraphase Push-Pull Output, Mullard Valves. 10in. High Fidelity Speaker. Aerial tested. 12 months' guarantee.—COUPLPHONE, ORMSKIRK.

**C**ONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components.

**W**ARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

**H**UGE Purchase of famous manufacturer's MAINS TRANSFORMERS. Shrouded, Screened Primaries. All L.T. Centre Tapped. 350/80 m.a., 12/6; 350/120, 15/-; 425/150, 17/6; 500/150, 22/6. Rola G.12's, 42/6; P.M.'s, 55/-.—COUPLPHONE, ORMSKIRK.

**B**ANKRUPT Bargains.—List free. All new goods. Decca 1937 A.C. 6v. superhets, 97/6. Decca 1938 model 55 A.C./D.C. all-wave transportables, 25. Philco 3v. all-wave 1938 battery, £4. Truphonic 1938 A.C./D.C. all-wave 6v. superhets, 7 gns. Brunswick 1938 battery 6v. all-wave superhets, £6/10/0. Phillips 1939 A.C. 5v. all-wave chassis, with valves and speakers, £5/15/0. Plessey 4v. battery superhet chassis, valves and speakers, 57/6. Lotus 4v. A.C./D.C. complete, 57/6. All types of valves. Battery from 1/9, mains top price, 6/8. All components, speakers, motors, etc.—Butlin, 6, Stamford Avenue, Brighton. Preston 4030.

**A.C.** ST.900 Author's Kits A, £8/15/0. ST.900 Battery Kits, complete with ten coils and valves, £4/15/0. ST.700 Kits A, £1/16/0.—Servwell Wireless Supplies, 64, Prestbury Road, London, E.7.

# PREMIER SUPPLY STORES

## POST ORDERS

Jubilee Works,  
167, Lower  
Clapton Rd.,  
London, E.5.  
Amherst 4723.

## CALLERS

165 & 165a,  
Fleet Street, E.C.4  
Central 2833.  
50, High Street,  
Clapham, S.W.4.  
Macaulay 2381.

Premier 90 Page Giant Illustrated Catalogue, Handbook and Valve Manual Now Ready, Price 6d.

**SPECIAL OFFER ROLA SPEAKERS.**  
8" P.M.'s, 15/-; 10" P.M.'s, 19/11; G.12 12" High Fidelity P.M., 79/6; G.12 Mains Energised, 57/6.

**U.S.A. GEN. E. MOTORS STEP-UP**, 12 volts to 285 volts at .06 amps. D.C. output. Complete in Metal Case 6in. x 5in. x 3in. 25/- each.

**BATTERY VALVES**, 2/9. Var-mu-S.G. 4- or 5-pin Pentodes, H.F. Pens, V-mu-H.F. Pens, 5/- Class B, 5/- Freq. Changers, 7/6.

**EUROPA MAINS VALVES**. 4v. A.C. Types, A.C./H.L., A.C./L., A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P., and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens., I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. changers, 8/6; Double Diode Triodes, 7/6; Triode Hex. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 3½ watt, D.H. Triode, 7/6.

**UNIVERSAL TYPES**. 20v. 18a. S.G., Var-mu, S.G. Power, H.F. Pen., Var-mu, H.F. Pen., 4/6 each. 13v. 2a. Gen. Purpose Triodes, 5/6; H.F. Pens and Var-mu. H.F. Pens. Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

**AMERICAN VALVES**. We are sole British Distributors for TRIAD High-grade American Valves. All Types in stock. Standard types, 5/6 each. All the new Octal base Tubes at 6/6 each. 210 and 250, 8/6 each; 81 and 2A3, 8/- each.

**PREMIER COMPONENTS** for Economy "One-Valver" in last week's issue. Complete Kit of Premier Parts with 2-watt valve and 4 coils, 23/6. Post Free.

**PREMIER TRANSFORMERS**, wire-end type with screened primaries, tapped 200-250 v. Filaments. Guaranteed one year, H.T. 8 or 9 or H.T.10 with 4 v. 4 a. C.T. and 4 v. 1 a., C.T., 10/-, 250-250 v. 60 m.a., or 300-300 v., 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T. 10/-, 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., 13/- With engraved panel and N.P. terminals, 1/6 extra. 500-500 v. 150 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 21/- 500-500. 200 m.a., 5 v. 3 a., 4 v. 2 a., 4 v. 2 a., 4 v. 3.5 a., all C.T., 25/-.

**FILAMENT TRANSFORMERS**, Tapped Primaries, 200-250 v. All secondaries C.T. 4 v. 3 a., 8/6; 4 v. 5 a., 9/6; 7.5 v. 3 a., 8/6; 6 v. 3 a., 8/6; 2.5 v. 8 a., 8/6; 6.3 v. 3 a., 8/6; 5 v. 3 a., 8/6.

**NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT**. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. VALVE GIVEN FREE!

**DE LUXE MODEL**, 14 to 170 metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

**S.W. SUPERHET CONVERTER KIT**, for A.C. Mains Receivers, 22/6. A.C. Valve given FREE!

**NEW 2-VALVE S.W. KIT**, 13 to 86 metres without coil changing. Complete Kit and Circuit, 19/6. VALVES GIVEN FREE.

**DE LUXE MODEL**, 14 to 150 metres, complete Kit and Circuit, 4 Coils and all parts, 25/- VALVES GIVEN FREE.

**NEW 1938 S.W. S.G.3 KIT**. Pentode H.F., Detector and Pentode. 14 to 170 metres. Complete Kit of Parts with 3 Tested Valves, 59/6. Metal Cabinet, 7/6 extra. Ideal for Amateur Reception.

**CENTRALAB POTENTIOMETERS**, all values, 2/- With Switch, 2/6.

**MOVING IRON METERS**. Any range between 10 and 500 m/a. Also 1.3 or 5 amps. Read A.C. or D.C. Flush Bakelite case, 2½in. diam. B.E.S.A. standard specification 80, 5/9 each.

**MOVING COIL METERS**. 1 m.a. Scale. 100 ohms resistance. Diameter 3½in., 22/6. Flush mounting. Bakelite case, B.E.S.A. first-grade accuracy. Multipliers for above, 1/- each. 50 ma., 27/6.

**PREMIER "TROLITUL" Short-Wave CONDENSERS**. Certified superior to Ceramic. All-brass Construction, 15 mmfd., 1/6, 40 mmfd., 1/9, 100 mmfd., 2/-, 160 mmfd., 2/3, 250 mmfd. 2/6; Double Spaced 15 mmfd., 2/9; 40 mmfd., 3/6; S.W.H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion. .00015 Tuning, 4/3; .00015 Reaction, 3/9. UTILITY 4" MICRO-CURSOR DIALS. Direct and 100 : 1 ratio, 3/9 each.

**SHORT-WAVE COILS**, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. coil, 11-25, 10-43, 38-86 metres. Suitable any type circuit, 2/6.

**COIL FORMERS**, 4- or 6-pin low-loss, 1/- each.

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

## RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1. Holborn 4631.

**SPECIAL! SPECIAL!** We score again by a keen purchase of the entire Radio Stocks of Messrs. Gambrells, enabling us to offer same at a fraction of the original cost. Stock includes Chassis and complete Table and Console Receivers. The demand is sure to be heavy, **ORDER EARLY TO AVOID DISAPPOINTMENT.**

**GAMBRELL 7-valve All-wave, All-stage Chassis.** Constructed throughout of heavy Cadmium plated steel. This Chassis represents a real engineering job. Fitted with all the latest refinements, including Six Harries All-stage Valves, one Valve for All Positions, plus standard Hivac UU/120/350 Rectifier. Wave Band Ranges: Long Wave 800 to 2,000 metres, Indicator Light Red; Medium Wave 200 to 550 metres, Indicator Light Yellow; Short-wave Band 2, 30 to 75 metres, Indicator Light Green; Short-wave Band 1, 12.5 to 30 metres Indicator Light Blue. Provision for Pick-up and External Speaker. Fitted 2-speed Drive, Built-in Visual Tuning. Wave-change Switch, Combined Volume Control, Push-pull Tone Control and Mains On-Off. The Dial is a really magnificent affair, size 9ins. long and 5ins. wide. Tuning Indicator being built in the Dial. The Chassis throughout is heavily screened, thus providing stability on all bands, with the finest all-round performance. Valve Screens spun from one piece. Transformer and Choke are of massive construction. In fact, the Chassis through is constructed in such a way that overloads, etc. are provided for without strain. Size of Chassis, 14½ins. long, 10½ins. wide and 3½ins. deep. Pre-H.F. stage operates on all bands. Reports from satisfied customers more than confirm our contention that this chassis represents the finest value we have ever offered to the Public. Supplied complete with Six of the latest Harries All-stage Valves, plus Rectifier, 24 9s. 6d. each.

As above, but with Celestion 10in. Moving Coil Speaker, 24 19s. 6d. each.

As above but fitted in Handsome Table Piano Finish Walnut Cabinet, complete with Valves and Speaker, 25 10s. each.

As above, but fitted in handsome Piano Finish Walnut Console Cabinet, complete with Valves and Speaker, 26 6s. each.

Hunt's 1,000 mid. Cardboard Electrolytics, Wire Ends, Peak Voltage, 12 volts, 2/- each.

Special offer in 81 gross lots only, T.C.C. 0.1 Wire End, Tubulars, 15/- per half gross.

Polar N.S.F. Resistances, Our Selection, 1, ½, 1 and 2 watt, 4/- gross.

Tubular Condensers, our selection, 1/- dozen. Dubilier ½ meg. Volume Controls, with Switch, standard model, very compact, 1/6 each.

H.T.8 Type Rectifiers (skeleton type). A really splendid job, 4/6 each.

5 Bank 4 Position Xalyle Type Switches, beautifully finished. Each Bank 5 Contact Type, plus Common. 5/- each.

Visual Tuning Indicator, m/a type, complete with mounting Bracket, 1/3 each.

3-gang .0005 Straight Condensers. A precision instrument with Ceramic Insulation, suitable for all Circuits, including All Wave, 3/- each.

Dials for above, 2-Speed type, 9" Long, 5" Wide. Station Marked for 4 Wave Bands, Two Short, Medium and Long, 4/6 each.

465 I.F.s, Iron Cored, with Trimmers, 2/6 each. Plessey Can Type Condensers (Electrolytics), complete with Fixing Clamp, 8 plus 16 Mfd. 8 Mfd., working voltage 450, 16 Mfd., working voltage 350, 2/- each.

Plessey 16 Mfd., 150 volt working, 1/3 each. Special offer Mains Transformers, 350-0-350, 120 m.a. 15 volts C/T at 4 amp., 4 volts C/T at 2.5 amp. Mains Input Adjustable 200-250 volts. Heavily Shrouded, 4/6 each.

20 Hy, 100 m.a., 500 ohms Choke, Unshrouded, 5/11 each.

350/120 Indirectly Heated Rectifier, Octal Base type, well-known make, complete with Octal Base Valve-holder, 4/6 each.

All orders 5/- or over, post free; orders under 5/- must be accompanied by a reasonable amount for postage; C.O.D. orders under 5/- cannot be accepted. All enquiries must be accompanied by 1½d. stamp if reply expected. Hours of business 9 a.m. to 7 p.m. weekdays; 9 a.m. to 1 p.m. Saturdays.

**RADIO CLEARANCE, 63, High Holborn, W.C.1. Holborn 4631.**

**ALCO** Eliminators and Chargers. 5 H.T. taps, standard outputs, 18/- With charger, 24/-, also Class "B." Year's guarantee. Details free.—P. & D. Radio, 1, Gooding Road, N.7.

**25 ONLY FOR SALE**.—3-valve kits with valves and diagram, 12/6; 3-valve 8/G kits with valves and diagram, 20/- Orders executed in rotation.

—Universal Radio Co., 221, City Road, London, E.C.1.

## NEW RECEIVERS, COMPONENTS AND ACCESSORIES

7/- only.—New R. and A. 8in. energised speakers with transformer, any field; carr. paid.—Electrical & Telephonic, Ltd., Lower Goat Lane, Norwich.

# The HOME MECHANIC SERIES

Each 1/- net *Illustrated*

*These Inexpensive Books will help you . . .*

**THE HOME WOODWORKER.** The various examples of woodwork described in this handbook have been designed by practical craftsmen. They are modern in style, and their construction is well within the powers of the average home-worker who follows the instructions given.

**THE HANDYMAN'S ENQUIRE WITHIN.** Hundreds of practical ideas and hints—many not hitherto published. Classified according to the subjects dealt with, an index being provided to facilitate speedy reference.

**POWER-DRIVEN MODEL AIRCRAFT.** All about petrol, compressed-air and steam engines, wheels, carburettors, ignition systems, rotary engines, etc., with special constructor's chapters, ranging from compressed-air models for beginners to advanced petrol-engined planes. With 130 sketches, diagrams, and photographs.

**MODEL AIRSHIPS AND AEROPLANES.** This handbook is intended as a guide to the beginner in model aeronautics. It presents in clear language the first principles of aviation and incorporates these in various forms of simple flying models. Profusely illustrated.

**ACCUMULATORS.** An accumulator (whether for wireless or the car), if properly used and cared for, is an extremely reliable piece of apparatus. Proper care and proper use can only follow a possession of the knowledge which study of this book will impart.

**SIMPLE ELECTRICAL APPARATUS.** Interesting and useful apparatus, easily constructed, with which the student is enabled to test for himself the theory and practice of electricity as laid down in the text-books. 138 illustrations.

*All fully illustrated.*

*1/2 each post free, from the Publishers :*

**GEORGE NEWNES, LIMITED,**  
Tower House, Southampton St.,  
Strand, London, W.C.2

*George Newnes, Ltd.*

## NEW RECEIVERS AND CHASSIS

**A**RMSTRONG Company pioneer firm supplying all British Radio receivers in chassis form, announce several new models as under:  
**A**RMSTRONG Model 3NBP/T, 7v. (including Cathode Ray), all-wave radiogram chassis, complete with moving coil speaker, £7/18/6.  
**A**RMSTRONG Model RF73/T; this 8-valve chassis has been designed in answer to many requests for a luxury chassis with smaller output.  
**A**RMSTRONG Model RF94/T 10-valve Radiogram Chassis, with 10 watts push-pull output; £19/13.  
**A**RMSTRONG Latest Catalogue Contains Illustrated Technical Data of Model 3NBP/T; also many new models.  
**A**RMSTRONG Chassis Carry Generous Guarantee, no charges for material, labour, or carriage for 12 months.  
**A**RMSTRONG Chassis Sent on 7 Days' Trial, packing and carriage free.  
**A**RMSTRONG Co., 100, King's Road, Camden Town, N.W.1. Gulliver 3105.

## LOUDSPEAKER REPAIRS

**L**LOUDSPEAKER repairs, British, American, any make. 24-hour service, moderate prices.—Sinclair Speaker, Alma Grove, Copenhagen Street, London, N.1.

**R**EPAIRS to Moving Coil Speakers, Cones and Coils fitted and Rewound. Fields altered. Prices Quoted including Eliminators. Loudspeakers Repaired, 4/-, I.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service, Estimates Free.—L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

## CABINETS

**M**ANUFACTURERS' surplus cabinets for Radiograms, Radio sets and Loudspeakers. Large and varied stock. Inspection invited, or send particulars of your requirements, with measurements of chassis. Photos sent for selection. (No catalogue.)—H. L. Smith & Co., Ltd., 287-289, Edgware Road, London, W.2. (Pad. 5891.)

## TUITION

**"R.T.I."**—established 1929—still lead. Get free particulars latest Radio and Television courses: postal and private.—Radio Training Institute, 40a, Earl's Court Road, London.

## SITUATIONS VACANT

**W**ANTED—ambitious young men, to prepare for well-paid posts in TELEVISION, the great career of the future. Apply for free booklet from BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 18P, Stratford Place, W.1.

**D**RAUGHTSMEN.—Numerous vacancies in Engineering, Building, G.P.O., etc., for men age 17-40. Exp. unnecessary if willing to learn. Details of openings, salaries, etc., FREE on application to N.I.E., (Dept. 371), Staple Inn Bldgs., W.C.1.

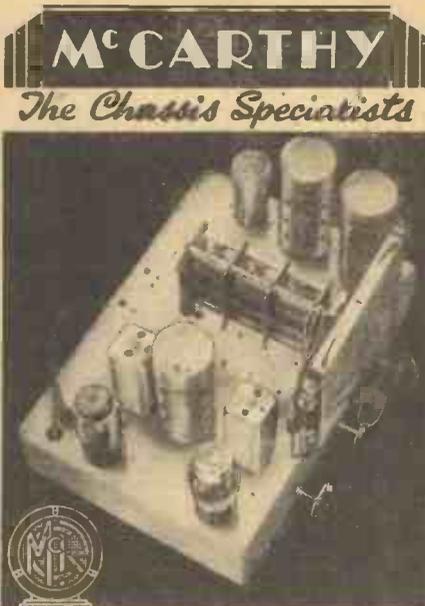
## MISCELLANEOUS

**T**HE PRACTICAL MOTORIST'S ENCYCLOPEDIA, by F. J. Camm, 3s. 6d. net. A lucid exposition of the principles, upkeep and repair of every part of the car. 442 illustrations. From booksellers everywhere.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

**T**ELEVISION.—Newnes Television and Short-wave Handbook, by F. J. Camm, deals authoritatively with Scanning Systems, (Drums, Mirror Screws, Discs, etc.), Neon Lamps, The Cathode-Ray, Oscillograph. How to build Short-wave and Ultra-short-wave Receivers. Fully illustrated, 3s. 6d. net. From your bookseller.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

## ADVERTISEMENT INDEX

	Page
British Institute of Engineering Technology	Cover iii
Electradix Radios	203
"Exit" . . . . .	Cover iii
Fluxite, Ltd. . . . .	204
International Correspondence Schools, Ltd.	204
London Radio Supply Co. . . . .	203
M.P.R. Electrical Co. . . . .	203
McCarthy Radio, Ltd. . . . .	Cover iii
New Times Sales Co. . . . .	201
Peto-Scott Co., Ltd. . . . .	199
Player's Navy Cut Cigarettes . . . . .	206
Premier Supply Stores . . . . .	208
Wills's Gold Flake Cigarettes . . . . .	Cover ii



A new 4-Wave Battery Receiver, price 9 guineas complete with valves, with exceptionally lively performance, unusual waveband coverage, and satisfying output. 7 stages, 19 separately tuned circuits. Circuit comprises: R/F amplifier; triode-hexode frequency changer with separate oscillator; I.F. amplifier; double diode-triode detector, A.V.C. and L.F. amplifier; double pentode quiescent output valve. Wave-ranges: 12.8-33, 28-80, 190-550, 1,000-2,000 metres.

Full technical details, catalogue, easy terms on application.

**Mc CARTHY RADIO LTD**  
44a, Westbourne Grove, London, W.2.  
Telephone: Bayswater 3201/2.

**"ENGINEERING OPPORTUNITIES" FREE!**

This unique Hand-book shows the easy way to secure A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T., A.M.I.R.E., and similar qualifications. **WE GUARANTEE—"NO PASS—NO FEE."** Details are given of over 150 Diploma Courses in all branches of Civil, Mech., Elec., Motor, Aero, Radio and Television Engineering, Building, Government Employment, etc.

Write for this enlightening Hand-book-to-day FREE and post free. British Institute of Engineering Technology, 409, Shakespeare House, 17, 18, 19, Stratford Place, W.1.



**"EXIT" STATION SEPARATOR**  
AMAZING RADIO GADGET CUTS OUT UNWANTED STATIONS. No more "three programmes at once."  
No loss of signal strength. No fiddling adjustments. Does away with aerial if required.  
**SPECIAL TRIAL OFFER 1/6 EACH POST FREE**  
"EXIT," 11, New Station Street, Leeds, 1.

## FREE ADVICE BUREAU COUPON

This coupon is available until May 14th, 1938, and must accompany all Queries and Wrinkles.  
PRACTICAL AND AMATEUR WIRELESS,  
7/5/38.

# FREE *Blueprint*

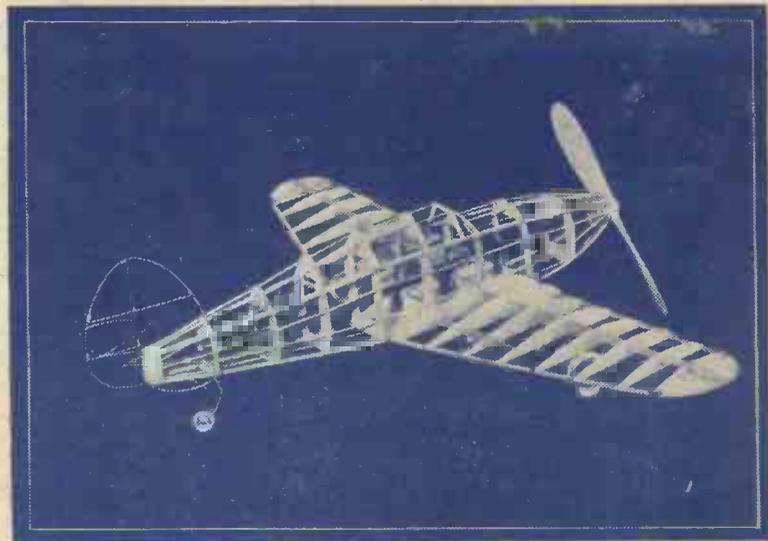
VALUE  
ONE SHILLING

## for Flying Model of the "HAWKER HURRICANE"

*The Fastest Fighting 'Plane in the World*

EVERY aero-model enthusiast has been waiting for a model of the World's Fastest Fighting 'Plane with the astonishing speed of 407 miles per hour. To-day in PRACTICAL MECHANICS you are given all working instructions and a Free 1/- FULL-SIZE Blueprint for making a strong, realistic flying scale model of THE HAWKER HURRICANE. The Model will be capable of duration flights, and it will last indefinitely!

There will be a big rush for this number so go to your newsagent for PRACTICAL MECHANICS at once!



INSIDE THE MAY

# PRACTICAL MECHANICS

*The Magazine of Modern Marvels*

YOU CAN WIN A PRIZE OF

**£20**

WITH YOUR "HAWKER HURRICANE" MODEL!

Full particulars of the Competition in which the above and many other Prizes are to be won will be found in this Free Blueprint number of PRACTICAL MECHANICS.

**6<sup>D</sup>**

Of all Newsagents and Bookstalls, or by post 8d. from the Publisher, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

George Newnes, Ltd.

# A SIMPLE VALVE-VOLTMETER— See page 211.

# Practical and Amateur Wireless

**3<sup>d</sup>**  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 12. No. 95.  
May 14th, 1938.

AND PRACTICAL TELEVISION



**JUST OUT!**

## WIRELESS COILS, CHOKES AND TRANSFORMERS: AND HOW TO MAKE THEM.

By F. J. CAMM.

An important new Handbook for every home constructor and anyone interested in radio. With Special Chapters on Selectivity, Break-through, Coil Winders, Coil Troubles and their Remedies. 180 pages, cloth bound, with 126 easy-to-follow illustrations.

2/6 By post 2/10.

GEORGE NEWNES, LTD., Tower House, Southampton Street, Strand, LONDON, W.C.2.

WHY GUESS *at the* TROUBLE?  
*Find it with an*  
**AVOMINOR**

*Regd. Trade Mark*  
**ELECTRICAL MEASURING INSTRUMENT**

The precision and accuracy of the Avominor speedily and efficiently tracks down faults in valves, resistances, batteries and power units, etc. Enables you to keep your set always in perfect working condition. Each model covers a wide field of measurement and provides testing facilities unrivalled by any other meters in their price class.

**The UNIVERSAL AVOMINOR**

A precision moving-coil instrument for A.C. and D.C. testing. Has 22 ranges. Gives direct readings of A.C. voltage, D.C. voltage, current and resistance. Total resistance of meter—200,000 ohms—ensures accurate readings. Complete with leads, testing prods, crocodile clips and instruction book.

£5 10s.

- The D.C. AVOMINOR**  
 measures
- CURRENT**  
 0—6 millamps  
 0—30 "  
 0—120 "
- VOLTAGE**  
 0—6 volts  
 0—12 "  
 0—120 "  
 0—240 "  
 0—300 "  
 0—600 "
- RESISTANCE**  
 0—10,000 ohms  
 0—60,000 "  
 0—1,200,000 "  
 0—3 megohms

45/-



*Sole Proprietors & Manufacturers:*  
**THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.,**  
 Winder House, Douglas St., London, S.W.1

*Phone:*  
 Victoria 34047.

*Write for fully descriptive pamphlet.*

Deferred terms if desired.

BRITISH MADE

THE SUM TOTAL OF A 6000 CIGARETTE



66421E. PLAYER'S NAVY CUT CIGARETTES 'MEDIUM' OR 'MILD' 10 FOR 8V 20 FOR 11V4F

# Squadron in Disgrace

By  
**Wilfred Tremellen**

Scout Pilots of Three Squadrons were being branded as deserters while two worthless air mechanics were enjoying unlimited wine and cigars—until Teddy McFane, the most persistent amateur detective in the R.F.C., made his daring exposure of the cruellest masquerade of the War!



*The boy in the white helmet stumbled, riddled by the hail of lead from that murderous Camel.*

**OTHER CONTENTS INCLUDE:**

**TERROR OF THE SKIES** by J. H. Stafford  
 Air pirates on a Continental route! The very idea seemed absurd, until the amazing affair of the Pegasus sent the R.A.F. into action against a new terror of the skyways.

**TRIAL BY TROPHY** by John Roll  
 The Hitchcock Trophy Race was a high-speed gamble with sudden death, and a searching test of weakness in machines—and men.

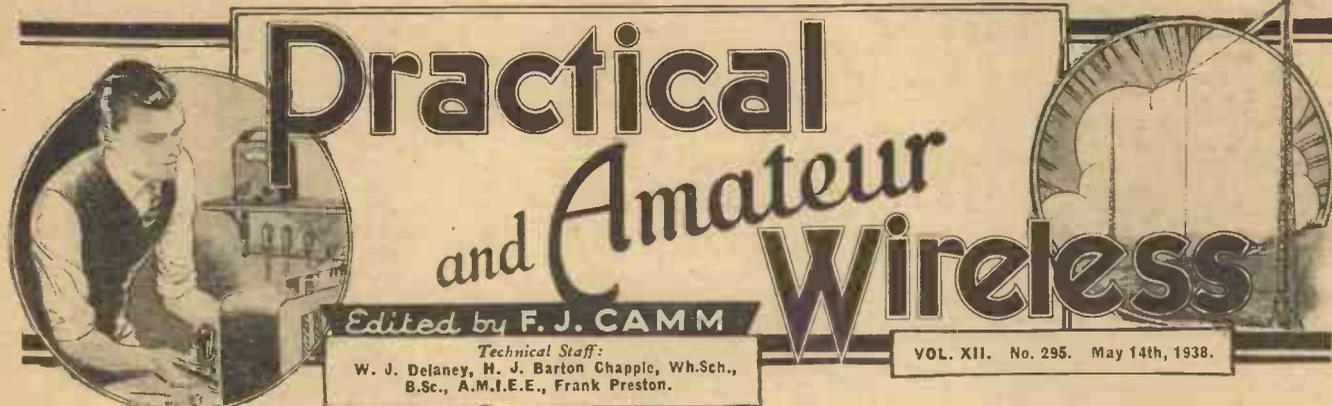
**WARRIORS OF THE AIR** by A. H. Fritchard  
 Compiled from official records and private documents—a dramatic account of the achievements of Britain's Air Services during the Great War.

IN THE JUNE

# AIR STORIES 9D

Of all Newsagents and Bookstalls, or by post 11d. from the Publisher, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

**VOLTS, WATTS AND AMPS. — SEE PAGE 213.**



**Practical and Amateur Wireless**  
 Edited by **F. J. CAMM**  
 Technical Staff:  
 W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.  
 VOL. XII. No. 295. May 14th, 1938.

**ROUND *the* WORLD of WIRELESS**

**Summer Conditions**

THE approach of the summer months brings many interesting branches of radio into prominence. The heat and continued sunshine cause an increase in the amount of atmospheric or static disturbance which is experienced, whilst the drying out of the earth in many cases leads to reduced signal strength. A keen amateur will, of course, remember to keep his earth connection well moistened, but the range of reception will be found less in the summer due to many facts. The longer hours of daylight will prevent reception of those stations which are only heard well during the hours of darkness and thus during this time of the year the listener needs to use a more powerful receiver if he wishes to maintain the same listening conditions as have obtained during the past few months. Outdoor listening is also introduced now, and portables and schemes for using loud-speakers out of doors are brought to the fore. In this issue we give details of the principles underlying the design of various types of portable receiver, and suggestions for using the domestic receiver out of doors. It may again be emphasised that when listening in the garden the volume which is adopted should be such that interference or annoyance is not caused to neighbours.

**A.R.P. and Amateurs**

MAJOR MORGAN, a member of the Glamorgan County Council A.R.P. Committee recently suggested that the amateur transmitters in this country should be enrolled to assist in Air Raid Precautions schemes. It will be recalled that official bodies of the transmitters have before offered their services to the country for emergencies. We understand that no official plans have yet been drawn up.

**American Viewpoint**

MR. E. J. COHAN, the Director of General Engineering for the Columbia Broadcasting System, recently returned to America and admitted that England was far in advance of any other country in the field of television. He expressed his surprise, however, at the public response to television and he stated that the main attitude of the English public was one of curiosity, rather than one of enthusiasm.

**Glasgow's Change-over**

TO-DAY (May 14th) marks the end of the Glasgow studios in Blytheswood Square. These studios will close down and

the first programmes from the new studios, which have been erected in Botanic Gardens, will be heard to-morrow. The Blytheswood studios have been in operation since 1934 when they took over from the original 5SC transmitter.

**Aeroplane Television**

WE recently mentioned the use of television transmitters in aeroplanes, and it is interesting to note that owing to considerations of size and weight, only simple types of transmitter can be

said they depended upon newspapers mostly. The main reason given for preferring radio was on the score of speed, the news being received quicker by radio than from a paper.

**Negative Feedback and Tone**

THE increasing use of negative feedback circuits in America has led to some interesting developments. The latest scheme is to use variable components in the feedback circuit for the purpose of tone control. It is claimed that unlike other tone controls these circuits enable the response to be raised or lowered at each end of the frequency band.

**Lisbon Call-sign**

THE call sign of the Radio Coloniale station at Lisbon is no longer CT1AA. The new call is CS2AA, and confusion which has arisen by the receipt of this call should now be removed. A new station has been heard several times on the air under the call CS2WD, and this is also in Lisbon. Reports of reception should be sent to Rua Capelo 5.

**Police Radio**

SOME indication as to the peculiarities of short-wave transmission may be gained from a report received from Australia. It is stated that an amateur in Victoria has successfully picked up at good volume the police radio station W9XKG. This station is situated at St. Joseph, Mo., which is almost 10,000 miles away from the listener's post. The set was a home-made six-valve superhet, and the signals are reported as QSA5.

**Band Boomerang**

THE first of the new series of "Band Boomerangs" will be heard on May 12th, when Debroy Somers, in London, and Otto Dobrindt's band, in Berlin, will open the series. It will be remembered that in this broadcast the bands take it in turns to play each number, the items being announced in English and in the language of the country in which the other band is playing. The idea comes from a German programme known as "Ruck-zuck," which is stated to be extremely popular. If the idea takes favour here it will be extended.

**ON OTHER PAGES**

A Simple Valve-voltmeter ..	211
Volts, Watts and Amps ..	213
The Cairo Conference ..	214
On Your Wavelength ..	215
Technical Fundamentals ..	217
Readers' Wrinkles ..	219
Outdoor Radio ..	220
British Long-distance Listeners' Club ..	222
Practical Television ..	224
Leaves from a Short-wave Log ..	225
Trade Notes ..	226
Short-wave Section ..	227
Club Reports ..	228
Readers' Letters ..	229
Queries and Enquiries ..	231

used. This means low-scanning speeds which may result in distortion when the aircraft is travelling at high speed. Messrs. Baird have now patented an ingenious invention which enables the scanning to be compensated to allow for the motion of the transmitter and this should have great value in time of war.

**Radio News**

A BALLOT was recently held in America to decide how much importance was attached to broadcast news by the listening public. As a result, it is stated that 23.5 per cent. said that their main source of news was the radio, whilst 45.2 per cent.

# ROUND the WORLD of WIRELESS (Continued)

**Belgium's New Broadcasting House**  
THE new headquarters for the *Institut National de Radiodiffusion*, the Belgian organisation responsible for the programme broadcasts through the Brussels No. 1 and No. 2 stations, and the short-wave transmissions from Ruysselede, will be formally opened in August. A series of special concerts, of which the first is to be relayed to a number of European countries, will celebrate the inauguration of the Brussels Broadcasting House.

**Holland's Radio Express**  
FOR the conveyance of guests invited to the Hilversum radio studios, the A.V.R.O. programme organisers are now running special trains from Amsterdam.

**Success of Leipzig Fair**  
THE results of the last Leipzig Spring Fair held from 6th-14th March, 1938, exceeded by far those of the Spring Fair, 1937. Provisional returns give the number of exhibitors as 9,549, which means an increase of 7.5 per cent. over the 1937 Spring Fair, and an increase of 49 per cent. over the 1933 Spring Fair. The sections of the Great Engineering Fair and Building Fair which broke all records included machine tools, power plants, electrical machinery, and the Printing Machinery Fair. Considerable expansion was recorded, too, in the raw material section housed in the newly erected Raw Material Hall 20. The outstanding feature of the Sample Fair was the growth of the textile and clothing sections. The Leipzig Autumn Fair of 1938 will be held from August 28th to September 1st.

## Stratosphere Investigations

WITH a view to investigating stratosphere conditions in the United States, it is proposed to make regular meteorological observations by aircraft in the sub-stratosphere up to a height of 50,000 feet, and pilot-less balloons carrying automatic radio-meteorographs are to be employed.

## Carl Rosa Singers in "Maritana"

MEMBERS of the Carl Rosa Opera Company will visit the B.B.C. studios on May 15th to sing favourite songs and choruses from one of the most popular British operas, Vincent Wallace's "Maritana," with words by Edward Fitzball and Alfred Bunn. This broadcast will be given in the Regional programme.

## Dublin's New Airport

THE four 100 ft. steel masts, recently erected at Collinstown airport, will carry the aerials of Ireland's new Direction-

## INTERESTING and TOPICAL NEWS and NOTES

Finding Station which has just been completed by Marconi's Wireless Telegraph Co., Ltd.

It is anticipated that the station will be operating fully when the De Havilland Albatross arrives at Collinstown early in

## Northern Concert Party

LISTENERS to the Regional programme on May 13th will hear Northern Concert Party entertainment from the Palace Theatre, Burnley—an excerpt from the Arcadian Follies' show (an Ernest Binns production) with Harry Korris, the well-known North-country comedian, in the company. At lunch-time on May 11th part of the rehearsal for the show from the theatre stage itself will be broadcast.

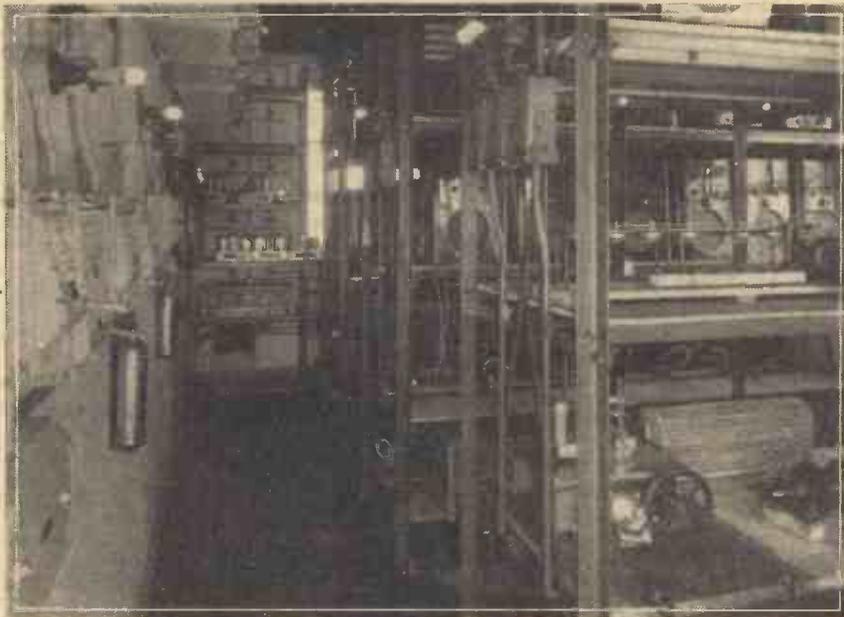
## Theatre Variety

MIDLAND and Regional listeners will hear a half-hour's broadcast from the New Theatre, Northampton, on May 19th. Among the artists appearing are De Haven and Page, Harold Walden, Harry Heinsley, and Renara.

## London

### Music Festival

WE are informed that Ethel Bartlett and Rae Robertson will play the four-hand piano part in the Brahms "Liebeslied Walzer" at the fifth concert of the London Music Festival, 1938, which Toscanini will conduct in the Queen's Hall on June 3rd. This will be the first time that Ethel Bartlett and Rae Robertson have played under Toscanini.



A view of the Ekco Life-Test Department where the first sets of each new production are subject to 5 years' wear and tear in less than 48 hours. By this means the slightest flaws that may arise during the life of the receiver can be detected and put right before any are sold.

June to make an experimental flight to America. For safety purposes all wires in the vicinity are being laid underground, and even though the radio masts have been erected in a field outside the airport, the "lead in" wires are also laid underground.



George Barclay, the popular vocalist of Bert Firman's orchestra.

## SOLVE THIS!

### PROBLEM No. 295

Harbutt had a standard three-valve with a 4 to 1 L.F. transformer coupling an output triode. He decided that increased volume would be desirable and obtained a Class B valve. For economy he decided to retain his transformer and to adopt the idea which is fairly common to obtain a tapped secondary on the transformer, namely, to include two resistances across the secondary winding. He used two 50,000-ohm resistors, but when he tried out the receiver volume was very much less than with the triode, and quality was very poor. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 295 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 16th, 1938.

### Solution to Problem No. 294

Thackeray overlooked the fact that power cannot be gained in a transformer. When the voltage is stepped up the current will fall, and the output wattage will thus be less than the input wattage, owing to losses in the transformer. Thus although he stepped up the voltage to 4, the output current was insufficient to operate his valve. The following three readers successfully solved Problem No. 293 and books have accordingly been forwarded to them: G. Moore, c/o 62, Wednesbury Road, Walsall, Staffs; H. Venis, 26, Byron Mansions, Uppminster, Essex; T. Moss, Highfield, Willslock, Utttoxeter.

# A Simple Valve-Voltmeter

*This Article Deals With the Construction of an Inexpensive Instrument for which the Home Constructor will Find Many Uses*

**A**LTHOUGH instruments play an important part in every branch of radio designing and experimenting, it does not necessarily follow that work without these would be impossible. It may be so as far as manufacturers are concerned, but several amateurs have managed to construct their own multi-valve receivers with only a voltmeter to help them.

The instrument is not particularly expensive, and it is so useful that its value

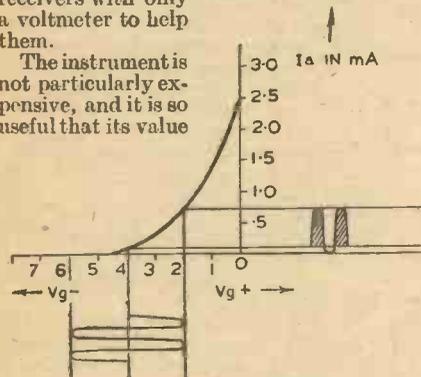


Fig. 1.—Curve illustrating the method of rectification in the valve-voltmeter.

soon becomes apparent. Its outstanding feature is that it is almost entirely independent of frequency, and consequently may be employed to measure the radio-frequency voltages present across tuned circuits, as well as being able to measure such voltages as that of the heater of an indirectly-heated valve, or the output voltages across the loudspeaker windings. As a sensitive output meter the instrument is invaluable and, of course, it will be used in this capacity when a receiver is aligned. In this case the leads from the meter are connected across the secondary of the output transformer, and a maximum reading in the milliammeter will indicate that the set is correctly aligned, as explained later.

Another very useful application is to employ the valve-voltmeter as a means of ascertaining whether or not an R.F. oscillator is functioning. This can be done by connecting the meter leads across the tuned circuit of the R.F. oscillator. The presence of an oscillatory voltage will be indicated by a rise in the mean anode current registered by the meter. These are only a few of the many uses to which the instrument may be put, and others are described later.

## Principles of the Valve-voltmeter

The valve-voltmeter in its simplest form consists of a valve operating on, or near,

the cut-off portion of its  $I_a/V_g$  characteristic. The effect of this is shown in Fig. 1, where a triode valve is being used with a standing negative bias of four volts on its grid to enable it to be worked at the cut-off. The anode current in these circumstances is zero, or practically so, depending upon the exact nature of the valve characteristic (no two valves have exactly the same characteristic curve). When the alternating voltage to be measured is applied to the grid, half-wave rectification takes place, the positive half-cycles being amplified whilst the negative are suppressed. The result of this is a rise in the mean anode current which is indicated by a rise in the

construction. On the front panel are mounted a milliammeter, a potentiometer, and two terminals. The full-scale deflection of the milliammeter is 2 or 2.5 mA, as this is suitable for any standard make of battery triode (detector type). Should a 2 or 2.5 mA scale be unobtainable a 1 mA instrument may be converted to have a suitable full-scale deflection by connecting a shunt resistance across the movement. The shunt should be of the same resistance as the meter movement, and this value will double the full-scale deflection. The milliammeter incorporated in the valve-voltmeter should be a moving-coil instrument, since it has a uniform scale. The grid-bias is potentiometer controlled, which allows for an exact adjustment of the grid voltage. No particular make of valve has been specified owing to the suitability of almost any type of two-volt triode detector valve, but as hitherto mentioned different valves will possess different characteristics and require various values of grid-bias to produce zero anode current, which is the condition of "cut-off rectification."

The potentiometer value is approximately 50,000 ohms, although a lower value would serve just as well, but the current through it would be greater, and in consequence the grid-bias battery would not have such a long life. The constructor need not conform rigidly to the construction layout shown in Figs. 2, 3 and 4. For instance, he might be desirous of making a midget valve-voltmeter, in which case he would find it necessary to incorporate his own modifications, which would no doubt include a midget valve and a minute milliammeter.

The leads attached to the terminals on the front panel should preferably be screened, to avoid spurious readings due to capacity effects which would occur with unscreened wire. A crocodile clip soldered

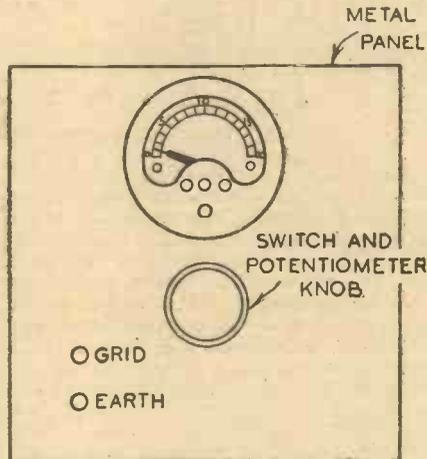


Fig. 2.—Front view of the finished unit. The whole may be housed in a metal case.

meter reading. Various voltages will produce various values of anode current, and the relationship between them is found graphically, as explained later.

## Construction

The three diagrams, Figs. 2, 3 and 4, illustrate a suggested method of con-

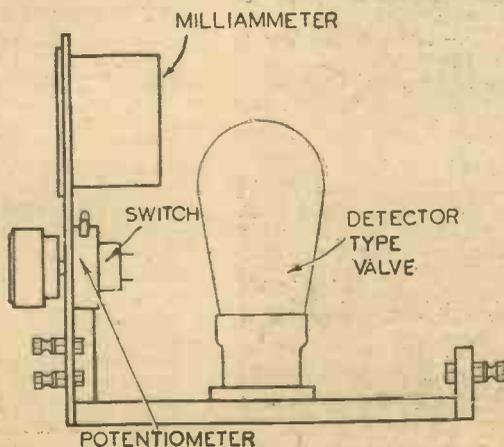


Fig. 3.—Side elevation of the valve-voltmeter.

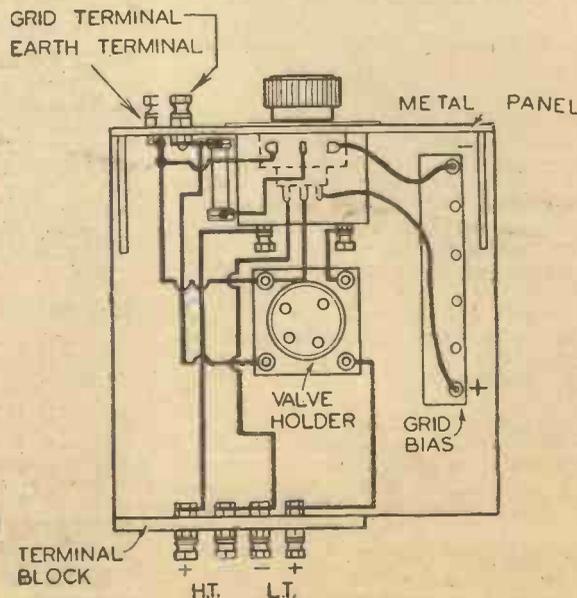


Fig. 4.—Wiring connections.

to the end of each lead will prove excellent for quick manipulation.

### Calibration

The valve-voltmeter has many uses as an uncalibrated instrument, and when thus employed, the moving-iron, which is a cheaper type of meter, can be effectively substituted for the moving-coil instrument. The calibrated instrument, whilst performing all the functions of the uncalibrated one, has a variety of other uses.

The simplest method of calibrating the instrument is by practice, in which case calibration takes place in conjunction with a standard A.C. voltmeter. Low-frequency readings are obtained at each volt over a range of about six volts on the A.C. voltmeter, and the corresponding needle indications of the valve-voltmeter are carefully tabulated. For example, three volts A.C. may produce a reading of three mA in the valve-voltmeter milliammeter. To obtain the intermediate readings in the instrument, a graph must be drawn of A.C. volts against anode current. The tabulated readings are marked on the graph and all the points joined. The result will not be a straight line, and for this reason care must be taken to avoid kinks in the line drawn through known readings. If the graph is drawn carefully the calibration will be quite accurate. When completed the graph may be pasted on the top of the valve-voltmeter cabinet, thus providing a convenient reference chart.

### Uses of the Uncalibrated Instrument

In its uncalibrated state the valve-voltmeter can be used as an output meter for aligning receivers, by connecting the leads from the meter terminals across the secondary of the output transformer. A peak reading is then obtainable when the receiver is correctly aligned. By means of the potentiometer the meter reading can be adjusted to a suitable value for trimming purposes.

The sections of ganged condensers may also be accurately aligned with the uncalibrated meter, which would have to be used in conjunction with a test oscillator. The out-

put from the oscillator is applied across a standard medium-wave coil, tuned by a section of the condenser being tested, and a reading will be obtained in the meter. This reading should be noted, the condenser section disconnected, and another one wired across the coil—without altering the position of the condenser vanes—a difference in the meter-reading indicating that the condenser is mis-aligned.

By gradually bending of the split end-vanes the original reading can again be recorded. After one section has been

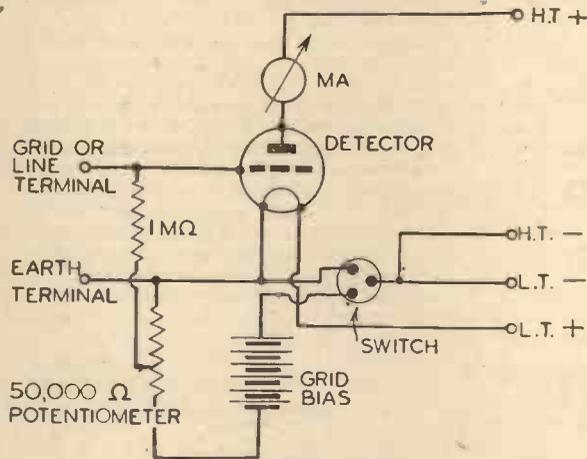


Fig. 5.—Theoretical circuit diagram.

correctly aligned the same process is applied to each remaining section and repeated at different positions of the condenser vanes until all sections are correctly aligned.

Since the input impedance is extremely high, the valve-voltmeter can further be used for measuring D.C. volts in high-resistance circuits; for instance, measuring the A.V.C. voltage on the grids of H.F. variable-mu valves, and since a voltage indication is often all that is required, the uncalibrated instrument can still be adopted. As the A.V.C. control voltage is likely to be rather high on local reception, the poten-

tiometer on the meter should be adjusted to increase the bias on the meter valve, and consequently extend the range of the instrument.

### Uses of the Calibrated Valve-Voltmeter

Almost any A.C. measurement likely to be required in a receiver can be obtained by the calibrated meter—with the exception of high voltages beyond the range of the instrument—since it is practically independent of frequency. The heater volts of an indirectly-heated valve, the R.F. voltages across tuned circuits, and A.C. voltages across the speech coil of the loudspeaker, are some of the many A.C. measurements which may be required, and can be accurately ascertained by the instrument. It is also suitable for measuring low voltage D.C. readings, and its range can be increased by using the potentiometer; i.e., by increasing the bias. Such readings as cannot be carried out with other instruments, for example, the grid-bias on resistance-capacity-coupled stages, or grid detectors, are successfully found by the valve-voltmeter which causes negligible damping on the circuit across which it is placed.

In calibration, and when using the graph for measuring purposes, the potentiometer should be adjusted to give zero reading in the milliammeter.

#### NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

## Important Broadcasts of the Week

**NATIONAL (261.1 m. and 1,500 m.)**  
 Wednesday, May 11th.—County Cricket: Commentaries from Lord's, and Aigburth Cricket Ground, Liverpool.  
 Thursday, May 12th.—Eight Bells: Variety programme.  
 Friday, May 13th.—Cabaret from Paris.  
 Saturday, May 14th.—Palace of Varieties programme.

**REGIONAL (342.1 m.)**  
 Wednesday, May 11th.—Variety from Holborn Empire.  
 Thursday, May 12th.—Marriage is no Joke, a play by James Bridie.  
 Friday, May 13th.—Old Time Music-Hall.  
 Saturday, May 14th.—Death of a First Mate, a play by Jack Inglis, based on a novel by "Sapper."

**MIDLAND (296.2 m.)**  
 Wednesday, May 11th.—Elizabethan Pastorals: choral programme.  
 Thursday, May 12th.—Cricket Interval: Commentary on current events by Cricketers for Cricketers.  
 Friday, May 13th.—Dance band music from the Civic Hall, Wolverhampton.

Saturday, May 14th.—Modern Miscellany: Orchestral programme.

**WEST OF ENGLAND (285.7 m.)**  
 Wednesday, May 11th.—Seaview—4, Where are you going? a talk.  
 Thursday, May 12th.—Out of the Blue—concert party programme from the Pavilion, Torquay.  
 Friday, May 13th.—Organ recital from the Central Hall, Devonport.  
 Saturday, May 14th.—Mrs. Proudie and her times, readings from Barchester Towers.

**WELSH (373.1 m.)**  
 Wednesday, May 11th.—Annual Festival Concert from the Prichard-Jones Hall.  
 Thursday, May 12th.—Choral programme from the Tabernacle Chapel, Cardiff.  
 Friday, May 13th.—Are you Superstitious? Feature programme.  
 Saturday, May 14th.—Programme of old Welsh Folk Songs.

**NORTHERN (449.1 m.)**  
 Wednesday, May 11th.—Variety from the Grand Theatre, Blackburn.

Thursday, May 12th.—Spotlight on Sport—31, Tennis, a talk.  
 Friday, May 13th.—Concert Party programme.  
 Saturday, May 14th.—Not very long ago, a talk on sport in the first half of the nineteenth century.

**SCOTTISH (391.1 m.)**  
 Wednesday, May 11th.—Gaelic Concert.  
 Thursday, May 12th.—Marriage is no Joke, a play by James Bridie.  
 Friday, May 13th.—From Father to Son—Seven Centuries of Farming, a talk.  
 Saturday, May 14th.—Organ recital from St. Giles Cathedral, Edinburgh.

**NORTHERN IRELAND (307.1 m.)**  
 Wednesday, May 11th.—Choral programme.  
 Thursday, May 12th.—Music by Ianthe Dalway: vocal and instrumental programme.  
 Friday, May 13th.—Orchestral concert.  
 Saturday, May 14th.—North West "200": Running commentary on the start of the North of Ireland Motor Club's motorcycle race over the Portstewart, Coleraine, Portrush circuit.

# VOLTS, WATTS AND AMPS

Wattless Current : Measurement of Wattage : Estimating the Cost of Running a Mains Receiver : Maximum Undistorted Output and Anode Dissipation. By The Experimenters

THE relationship between electrical pressure (voltage), current (in amperes) and power (in watts) is clearly established by Ohm's Law. This law is known to almost everybody who takes any interest in radio and electrical matters, and when it is mentioned in company you generally see a few knowing winks, faint smiles or sarcastic grins. Those who resort to the last-mentioned generally consider Ohm's Law to be so simple as to merit the attention of the schoolboy only, but many of them would easily be "caught" by simple problems involving its use.

If only to avoid a few of those sarcastic grins, we are going to assume that every reader knows just as well as we do that the law states, in effect, that current in amps. is equal to voltage divided by resistance in ohms, and that the equation can be rearranged to show that resistance is equal to voltage over current, and that voltage equals current times resistance. Another rearrangement that is not quite as well known is that wattage can be found by multiplying the resistance by the square of the current. Power in watts is, of course, found by multiplying voltage by current.

## A Peculiar Point

These formulæ apply to direct current only, and when alternating current is considered various complications arise. One of these is in connection with what is often referred to as a wattless current. You can actually connect a high-voltage A.C. supply to the ends of a choke or transformer winding, which might have only a few hundred ohms (D.C.) resistance without any power being drawn from the supply. Expressed very simply, the reason is that the alternating current falls out of step with the alternating voltage (not a very good term) with the result that the two tend to "balance out," so preventing the consumption of power. For this state of affairs to come into being it would be necessary to design the choke to suit the voltage and periodicity—number of cycles per second—of the supply, but it can be done.

## Power Consumption

One of the best-known examples of an almost wattless current is to be found in the case of a bell transformer of good design. The A.C. mains can be permanently connected to the primary winding, the bell pushes being in the secondary winding without any measurable consumption of power from the mains except for the period during which the bell included in the secondary winding is being operated. A similar condition often arises when an eliminator is fed from A.C. mains, but in this case a small current does flow, although it is not registered by the supply company's meter.

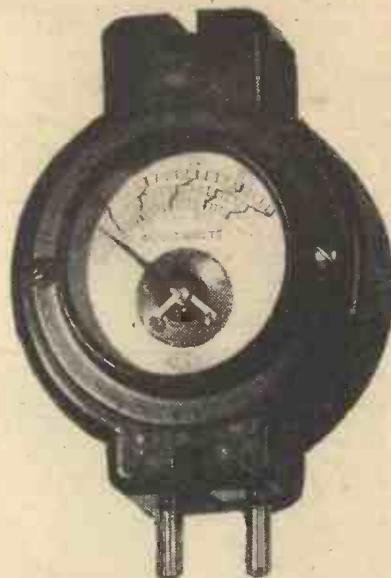
It is not easy outside the laboratory to take accurate readings of power consumption of small mains-operated receivers, although fairly accurate indications can be obtained by means of a volt-ammeter, which is often described as a wattmeter. An A.C.-D.C. wattmeter can be bought in convenient form, however, for fitting the mains socket. It has twin sockets into which the mains plug from the receiver can be fitted. It is made in two models, one for reading up to 125 watts, and the other for reading up to 250 watts, and is accurate to within plus or minus five per cent. when used with a supply of 200 to 250 volts. Naturally, it is more accurate—or at least easier to read accurately—toward the full-scale deflection of the needle, and is therefore most suitable for use with larger mains sets or with radio-grams.

The volt-ammeter type of instrument consists essentially of an ammeter, but the scale is calibrated in watts so that approximately accurate readings can be obtained when used on the supply voltage for which the scale is marked.

By means of a wattmeter it is an easy matter to estimate the cost of running a mains set. Thus, if it is found, for example, that the wattage consumption is 100 it will be known that the set can be run for 10 hours for the cost of one "unit," which is 1,000 watt-hours, equivalent to one watt for 1,000 hours, 10 watts for 100 hours, and so forth.

## Estimation of Wattage

When a measurement of wattage consumption cannot be obtained by direct measurement, it is still possible to obtain a fairly accurate idea. For example, take a four-valve A.C. receiver using four 4-volt, 1-amp. A.C. valves and a 4-volt, 2 amp. rectifier. The cathode and filament consumption of these is four times four, plus four times two, which is 18 watts. And if the maximum H.T. voltage is 350 and the total anode current is found to be 100 mA, by inserting a milliammeter between the smoothing choke and the main H.T. positive line, the wattage consumption is again found by multiplying the maximum voltage by the current. In this case do not forget that the current is 100/1,000 amp. Thus, the H.T. wattage is 100/1,000, or 1/10 times 350, or 35 watts. It can



A useful wattmeter manufactured by Messrs. Bulgin.

now be seen that the total consumption is 18 plus 35, or 53 watts.

But the transformer and rectifier do not operate at the ideal of 100 per cent. efficiency, and therefore allowance must be made for this. A fair allowance is 75 per cent., which means that our 53 watts is about 75 per cent. of the total power drawn from the mains; to find the input to the set we must divide 53 by three and multiply the result by four, which gives us just about 70 watts.

It must not be assumed because the full H.T. output is not applied to the anodes of all the valves that allowance must be made for this. A certain amount of power is "lost" in the voltage-dropping, decoupling and bias resistors.

## D.C. Sets

Similarly, when dealing with D.C. or Universal receivers, the power consumption is found by multiplying the mains voltage by the current drawn from the mains, since the voltage "dropped" by the barretter and series resistors is wasted. To take another example, a four-valve set with valves taking .3 amp. heater current consumes .3 times the voltage of the mains—say 220. The L.T. consumption is thus about 73 watts, to which must be added the H.T. consumption of, say, 60 mA. This is equivalent to a wattage of roughly 13 so the total consumption would be 86 watts.

## The Output Valve

A point which often leads to confusion is in connection with the wattage rating of an output valve. As a very well-known example, we might take the PX4 output triode, which has a rated maximum undistorted output of 3½ watts. This is the greatest signal output which it can handle without causing distortion, but the H.T. consumption of the valve when giving this maximum undistorted output is 12 watts—250 volts at 48 mA. This consumption is generally referred to as the maximum anode dissipation and has no direct relation to the signal-handling capacity.

If you look round you will find many other interesting and sometimes confusing applications of that much-maligned Ohm's Law.

## NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

2nd Edition

By F. J. CAMM

Price 3/6 or 4/- by post from the Publishing Dept.,  
George Newnes, Ltd., Tower House, Southampton  
Street, Strand, London, W.C.2.

## LESLIE JEFFRIES:

### A Brief Biography

AS a lad Leslie Jeffries could draw sweetness from a violin. Boys of eight years of age are often given a pocket-knife on their birthday; he preferred a violin. This was a Strad. In a dressing-room in the States he hid it behind a mirror after a matinee, and when he came back it was gone. He was heart-broken, and for many years never told his father. He has never had another Strad, but from that day to this another violin has gone everywhere with Leslie Jeffries, and he has travelled over half the world.



Leslie Jeffries, the well-known violinist, who will shortly resume his broadcasting activities.

England, Scotland, the Continent, New York, Cuba, Buenos Aires, Rio de Janeiro and back to London again. He formed a quartet here, a quintet there, and an octet somewhere else. He has conducted his own orchestra at Covent Garden, and another in the Argentine. But just as big success seemed to be coming the wanderlust came first, and he wanted to be off again.

It was while he was playing in Hungary that an idea came to him. The throbbing, lilting, rhythmic tunes of the country got hold of him. The English loved them. Why should he not go back to England and form an Hungarian orchestra?

He secured an Introduction to the B.B.C. and began broadcasting as a soloist, and then he put forward his idea. Pedro Tillet saw eye to eye with him, and Leslie Jeffries, looking around for a name, thought of the one he had used in the Argentine. "Valdenaro and his Royal Hungarian Orchestra" gave their first broadcast. It was an instantaneous success. But events were moving. Mr. Samuel Eeley, the managing director of the Grand Hotel, Eastbourne, was looking for a successor to Tom Jones, and one night when Valdenaro was on the air, Mr. Eeley was listening. An audition followed, and Leslie Jeffries went to Eastbourne with a two years contract in his pocket.

His first broadcast as leader and soloist of the Grand Hotel Orchestra was followed by the receipt of hundreds of letters of congratulations. His success is perhaps due to the fact that he believes in suiting all tastes.

Leslie's study is his holy of holies.

Hobbies: Swimming, rowing, golfing, walking and riding.

# The Cairo Conference

## Details of the Wavelength Changes which have been Decided Upon at the Recent Conference

**M**ANY listeners appear to be concerned that their receivers will be rendered obsolete due to wavelength changes arising out of the Cairo Conference which concluded last month. Last week Sir Noel Ashbridge made quite clear to us the final decisions of the conference and we may here state that no set will be rendered obsolete at least before September 1st, 1939, and in any case, after that date very little difficulty should be encountered. A number of new wavelengths have been allotted for broadcasting purposes and the principal changes are as follows:

On the Long waveband no changes will be brought into force.

On the Medium waveband an additional band from 200 down to 192.3 metres (1,500 to 1,560 kc/s) has now been allotted and some stations may eventually make use of this additional band. In any case it should be remembered that should the B.B.C. decide to take advantage of this additional band it will be purely for local station work and thus will not greatly affect listeners outside the area selected.

An Intermediate Waveband has now been allotted from 2,300 kc/s to 4,965 kc/s (130.4 to 60.42 metres) and this is of great interest to listeners abroad. It is to be used for broadcasting within tropical and semi-tropical countries and for countries between 30°N and 30°S latitudes. In other words there will be three new wavebands (120 to 130.4, 85.71 to 90.91 and 60.42 to 62.89 metres) restricted according to latitude.

### Short Waves

It is on the short wavelengths that the greatest changes are to be made and this is to endeavour to alleviate much of the trouble caused by the large number of stations which now use short waves. Apart from the restriction due to amateur and commercial stations, trouble is now experienced owing to the very close working of many stations, and the sun-spot period also gives rise to difficulty on certain wavelengths. The new allocation of short wavelengths is as follows: From 6,000 to 6,200 kc/s (50 to 48.39 metres) which provides an additional 50 kc/s (accommodating roughly 5 stations). A new band from 7,200 to 7,300 kc/s (41.67 to 41.10 metres) comes next followed by the band from 9,500 to 9,700 kc/s (31.58 to 30.93 metres) representing an increase of 100 kc/s. The following two bands remain as heretofore, namely from 11,700 to 11,900 kc/s (25.64 to 25.21 metres) and from 15,100 to 15,350 kc/s (19.87 to 19.54 metres). On the next band an additional 50 kc/s has been allotted, bringing it to 17,750 to 17,850 kc/s (16.90 to 16.81 metres), whilst 200 kc/s have been allotted to the

next band. This now ranges from 21,450 to 21,750 kc/s (13.99 to 13.79 metres) and this is especially of use in the sun spot period. The last band remains as before (25,600 to 26,600 kc/s or 11.72 to 11.28 metres).

### Ultra Short Waves

The increasing use of television apparatus has lent especial interest to the ultra-short wavelengths and on these bands there has been no allocation. It remains as before at 40.5 to 58.5 mc/s (7.407 to 5.128 metres); 64 to 70.5 mc/s (4.688 to 4.255 metres); 85 to 94 mc/s (3.259 to 3.191 metres) and 170 to 200 mc/s (1.765 to 1.5 metres). Sir Noel pointed out that on these wavebands there is still much to be decided, as although on the face of things there is very little room for more television stations it should be remembered that the service area of such a station is limited and thus wavelengths may be duplicated in adjacent countries, or even in the same country without difficulty.

The bands enumerated provide room for 11 stations in a given area, adopting as the necessary band-width that now required for the B.B.C. television transmission and he pointed out that the present French transmissions are not at the moment found to interfere with the English transmissions, although both can be picked up on the South Coast. Obviously, if it is found that interference takes place it will seriously curtail the development of television. We could not obtain any definite information from the B.B.C. regarding forthcoming television transmitters nor with regard to the broadcasting of high-quality sound programmes on the television sound wavelength, although Sir Noel admitted that experiments are always being undertaken with regard to programme improvements.

Amateur transmitters may feel some concern at the restriction of the wavebands now available to them, but it is felt that in the interests of commercial broadcasting some restriction must be made, and no doubt amateurs will find various methods of overcoming their difficulties. Single side-band transmissions or other devices will no doubt be made the basis of many experiments and it is also possible that once again the amateur will be the pioneer in new methods or on new wavelengths, just as he has been in the past. It must be remembered, of course, that the amateur was the first to explore the now popular short waves, and he was forced down there when broadcasting started on the normal or medium waves, and all the preliminary ground work in short-wave working may be said to have been covered by the amateur.

It may be mentioned, finally, that although no frequency band lower than the first band (6,000 to 6,200 kc/s) has been allocated for long-distance broadcasting, it has been approved that Great Britain may use, by agreement with America, a frequency in a band of the order of 3,500 to 4,500 kc/s (85.7 to 66.67 metres) for trans-Atlantic broadcasting in the exceptional period when, owing to the sun-spot cycle, the higher frequencies are not effective for this service.

**THE WIRELESS CONSTRUCTOR'S  
ENCYCLOPÆDIA**

By F. J. CAMM  
*(Editor of "Practical and Amateur  
Wireless")* 6th Edition **5/-** net

Wireless Construction, Terms, and Definitions  
explained and illustrated in concise, clear  
language.

From all Booksellers, or by post 5/6 from George  
Newnes, Ltd., Tower House, Southampton Street,  
Strand, London, W.C.2.

# ON YOUR WAVELENGTH



## Another Increase

I LEARN that at the end of March listeners' licences totalled 8,583,876, which is an increase for the month of 28,980. The estimates which all of us made five years ago as to the peak point in the number of listeners are wildly out. Each return issued by the G.P.O. shows an increase, and I should not be surprised if eventually the 10,000,000 mark is reached.

## Portables

ACCORDING to a trade announcement this will be a portable summer, or, to be grammatically correct, a summer in which more portables will be used than in previous summers.

I hope it will, because with so many small and lightweight components, the problem of the midget portable capable of receiving the locals and a high-powered foreigner or two is not nearly so great as it was five years ago. Several firms are returning to the portable market, I notice. Those readers who are interested in building such a receiver should remember that we have several excellent lightweight portables in our blueprint list.

## Television at the Ideal Home Exhibition

ALTHOUGH the special television demonstration at the Ideal Home Exhibition attracted large crowds, I am unaware that a great amount of business was done, and I think that this is because the public is awaiting the production of better programmes. They have improved during the past month, but they are still not of a standard which will create a big demand.

## Man-made Static

I AM continually receiving complaints from readers all over the country regarding interference from domestic electric apparatus such as refrigerators, hair driers, sewing machines, electric fans, motors, and so on. It is true that you can purchase apparatus to get rid of the noise, but it is my firm opinion that this is a burden which should be placed on the user of the offending apparatus. Sooner or later legislation will be introduced making it an offence to

## By Thermion

cause interference with wireless reception, and I note that a move is on foot already pressing for such legislation. At present you can complain to the Post Office, who will send down an engineer to investigate your complaint free of charge. Quite often, however, he is unable to trace the exact source, although he can indicate the direction. He can tactfully suggest to the owner of the offending apparatus that he should do something about it, and perhaps indicate *what* he should do about it. He has no power to *compel* the offender to do anything about it. Thousands of people in this country are having their listening ruined by overhead trams, generating stations, electric motors, and other devices, and I imagine that very soon it will be made an offence.

## Leaving School

R. B., of Ipswich, is in that eager, hopeful stage of life which all of us attain when we leave school. The world is in front of him, and he finds himself having to make the difficult choice of a job. A false step made at this time cannot always be rectified, but R. B. has made up his mind to enter the wireless trade. He has passed the General Schools Examination, says that he has a pretty complete knowledge, even at the age of 16, of wireless, and is quite prepared to start at a low wage. I advise this reader to take a Correspondence Course, and to write to the various large wireless firms asking for an interview. They are glad to get hold of intelligent youths who have passed General Schools Exams., and I wish R. B. the best of luck. There is something glamorous about the threshold of a career. You start out full of hope, and using energy and enthusiasm you hope to reach a particular goal. You may not do

so, but at least you can look back in 20 years' time and pleasantly reflect upon the struggles, for the struggling period is the best of all. Personally, I see no glamour in the radio industry as such, and it is not noted for paying particularly high salaries. It is my opinion that the television engineer, taking the long view, is the man who will make good money. If any manufacturer is interested in R. B., of Ipswich, I shall be glad to forward his name and address.

## More Humour

HEREWITH some more letters from readers in answer to my request for letters dealing with "My Most Embarrassing Moment in Radio."

J. R., of East Finchley, writes:

"I had some friends staying with me during the Easter Holidays, and we all experimented with my home-made one-valver.

"Good Friday night saw us all set, with the 'phones and the batteries all in working order. I started to search around the dial, meaning to show my pals just how many stations I could get. After searching for some time, I could hear faint sounds of music and described just what it was like to the boys, but didn't they laugh! They could hear the same music much plainer than I could, as it was the National Programme from the wireless in the flat below. Was my face red?"

H. E. P., of Gosport, sends the following:

"Many years ago I was serving as a young telegraphist on board one of H.M. cruisers in the Baltic. This particular ship was equipped with a now obsolescent Poulsen Arc transmitter, which, as you may know, was water-cooled, the water being conveyed from a tank by means of a system of copper and rubber tubing to the water jacket of the arc chamber.

"One day there appeared at the door of the office an important-looking civilian, accompanied by a messenger who introduced him as Major—, the Captain's guest, and would I please show him the W. T. office?"

"Well, I cocked my chest and got going—switched on the generator,

circulating motor, and finally the arc itself. Everything was going merrily, I feeling very proud of 'my set,' and demonstrating a few 'V's' on the key, when suddenly there was a loud bang, rubber tubing flew in all directions smothering the office and visitors in steam and hot water, and myself in acute embarrassment!

"I had forgotten to open the outlet tap of the water tank and the water remaining in the jacket and tubing had promptly boiled!"

#### An Embarrassing Moment

**W.** E. P., of West Ham, writes: "I had the following experience when asked to build and test a S.W. converter. It was taken round to the person's abode and connected to his 6-valve superhet, the latter tuned to the usual long wavelength used for conversion. The set and converter was switched on, and my friend drummed his fingers impatiently on the table, waiting for the valves to warm up. His wife was sitting down reading, oblivious of everything except her book.

"Gradually a faint hum was heard from the speaker, getting louder and louder, when suddenly—S-C-R-E-E-E-C-H—a very unhealthy sound broke the spell. It was a piercing H.F. howl—4 watts of it. The lady dropped her book and clapped her hands to her ears, while her husband jumped back a few feet. I tried to stop it, but no amount of juggling with the darned converter seemed to do any good—I switched both sets off, bewildered and red about the ears. Out came the D.C. instrument, and I tested every component and wire for short or open circuits, but everything was above suspicion. Eventually, however, the trouble was traced to the HT lead on the converter leading to the superhet. When it was changed from the plate of the IF valve to the speaker field, all was perfect. When Schenectady, Pittsburg and Wayne all rolled in at R8/9 it fully compensated for my most embarrassing moment in radio."

**E. Y.**, of London, writes:

"It was Armistice Day. I was very proud of my 'Class B Four,' with its three watts pure undistorted, and I was putting it to good use on that solemn morning letting friends, and strangers, know that a service was in progress at Whitehall.

"Our own little Cenotaph, too, was the scene of great solemnity, and, as is the local custom, everyone was on their respective doorsteps to take part in the service. By this time, the service at Whitehall had come to the waiting stage, and all was quiet.

## Notes from the Test Bench

### The Acme Receiver

**AFTER** investigating a few complaints of poor results on the Acme receiver it has been found that in the majority of cases this is due to the use of too high a voltage on the screen of the detector valve. If reaction is found erratic, too fierce, or uncontrollable, the H.T. plug for this point should be moved. In most cases a value of about 36 volts is found to provide most satisfactory results. Similarly, if it is found that there is no reaction on any particular waveband, the H.F. volume control should be adjusted in conjunction with the detector control, when a point will be found where smooth reaction effects are obtainable on all bands.

### Short-wave Mains Sets

**I**N many cases of hum on a short-wave receiver it is found that the heater supply is responsible. After some experiments it has been found that there is some form of interaction between the H.F. heater and the remaining heaters, and this is overcome in the majority of cases by decoupling the heater supply. Several schemes are possible, and one of the simplest which is effective is to connect .1 mfd. fixed condensers from the heater terminals of the H.F. valveholder direct to the chassis. In some cases it will be found that results will be affected by the method of connecting the condenser if this is of the tubular type. Where the condenser bears a coloured ring on the casing that end of the condenser should be in contact with the chassis.

### Mains Valve Voltmeter

**I**N this issue we describe a valve voltmeter for battery use, and some experimenters may desire to use a similar piece of apparatus for mains working. The adjustment of bias for various reasons may be carried out by using the standard grid bias battery or by auto-bias methods. In the latter case a set of resistors should be included in the cathode lead with a multi-point selector switch to enable the appropriate bias resistor to be chosen. For the no-signal condition, a potentiometer may be joined across the H.T. supply with the arm joined to the arm of the selector switch and by suitable choice of resistance values it will be found possible to obtain sufficient bias voltage to bring the anode current to nil. The H.T. supply should, of course, be adequately smoothed by means of the normal choke and high-capacity electrolytic condensers.

"At eleven o'clock, the local Territorial bugler sounded the 'attention' and the church clock chimed the hour; once more all was quiet.

"Suddenly, to my horror, I remembered our radio, which was still silent, but alas, I was too late; a stentorian voice shouted, 'Attention!' and a bugle again sounded, but this time from our doorway, causing much distress along the ranks of soldiers.

"To complete the disturbance, Big Ben then chimed out.

"How was I to know our town clock was three minutes fast!"

### Warming Up the Valves!

**A.** L. M., of Leicester, sends me the following note:

"Some time ago I went to a small village about ten miles out of Leicester with a friend of mine to see some of his old relatives. The house was one of those rare thatched roof cottages where oil lamps were used for illumination. Well, after tea, the old gent lit the lamps, and sat against the fire smoking and chatting to us, when my friend asked if he could put the wireless on, which he had told me previously was an old three-valve battery set. 'Certainly,' said he; so up got my friend and switched on! Nothing happened; on looking in the back he turned round and said 'where are the valves, Uncle.' 'Bless my soul,' he said, 'I left them in the oven.' 'In the oven,' I said, amazed. 'Yes, they go a lot better after they have been warmed for five minutes; they must have been in all night. I forgot all about them,' he said."

### Service!

**T.** H. G., of London, W., writes:

"Whilst trying to find a fault in my home-made superhet, now being discarded, I put a high voltage across the milliamp. section of my meter, and a flash occurred.

"I sent same to the makers and had a letter back saying that it had been examined and would cost 15s. 6d. to repair, so I decided to have a go at it myself, and had it returned.

"When I took it to pieces, I found that two small resistances had burnt out on the side of the part that turns round for the different scales.

"I put some turns of wire back in their place, and put it all together again, and found everything worked, except for a difference in reading.

"So for two small bits of wire I was to pay 15s. 6d., and I feel sure, after reading your columns in PRACTICAL WIRELESS, you will say that it is not playing the game.

"Do you think the makers would supply the wire if I wrote to them? I doubt it!"

# Technical Fundamentals—8

In this Eighth Article of the Series the Triode as H.F. Amplifier and Grid Detector are Dealt With

A CHANGE of grid potential will cause a change of anode current, and if an H.F. voltage is set up between grid and cathode there will be an H.F. variation of anode current, i.e., the anode current will rise above and fall below its mean value at high frequency.

We have previously emphasised the fact that the anode current value is very dependent upon the grid potential, but this, in itself, does not indicate the possibility of obtaining H.F. voltage amplification. Essentially, H.F. amplification in a radio receiver implies that a small H.F. voltage operating in the grid circuit causes a much greater H.F. voltage to become available in the anode circuit. The action of the grid potential in causing an anode current variation is only part of the story, even though it may be an important part. It is necessary, for H.F. voltage amplification, that the anode circuit shall contain some form of H.F. impedance. Then such changes of anode current as do occur will give rise to an H.F. potential difference across this "load" impedance, and the H.F. voltage established across the "load" will, if conditions are suitably arranged, be greater than the H.F. grid voltage.

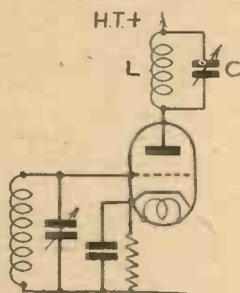


Fig. 30.—The tuned-grid tuned-anode arrangement.

If the feed-back voltage is 180 degrees out of phase with the signal voltage it will cut down the amplitude of the oscillations in the grid circuit, and the amplification will be reduced.

Three possibilities have been mentioned. Is any particular one to be anticipated as the most likely? As a matter of fact, it all depends upon the character of the anode load. If this is behaving effectively as a resistance the feed-back voltage will be 90 degrees out of phase with the signal voltage. If it is essentially capacitive in character there will be a large component of the feed-back voltage producing phase opposition in the grid circuit. If the load effective impedance is inductive in character, then the in-phase condition will apply in the grid circuit.

Fig. 30 illustrates the tuned-grid tuned-anode arrangement, and if the stage has anything like low-loss design it will almost certainly be troublesome to operate. All of the three possibilities mentioned can occur, according to the setting of the anode tuning condenser. If the anode circuit LC is tuned to resonance it will, as we know,

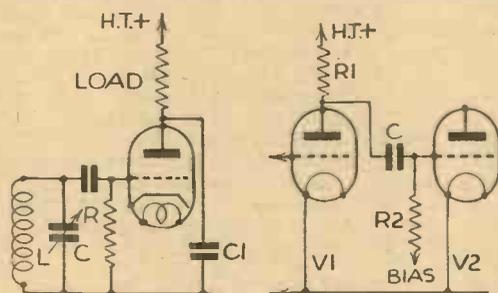


Fig. 31.—The standard leaky-grid detector circuit.

Fig. 33.—The resistance-capacity coupling.

behave as a resistance. If LC is tuned above the signal frequency it becomes equivalent to an inductance, while if it is tuned below the signal frequency it becomes equivalent to a capacity. Thus, small tuning changes about the resonant point may give drastic changes in the action of the H.F. stage. A jump from low amplification to fierce and uncontrollable oscillation can be caused by a fractional change of the anode tuning.

### The Triode as Grid Detector

Although diodes (in the larger receivers) and H.F. pentodes (in the smaller receivers) represent the most commonly used detector types to-day, nevertheless the triode has by no means completely gone out, and it is advisable to know something of its action as a grid detector.

Fig. 31 illustrates a basic form of grid detector circuit. The grid and the cathode can be regarded, from the detection point of view, as forming a diode valve, the grid leak R, functioning as the load resistance. The rectified voltage developed across R will act between grid and cathode, and therefore affect the value of anode current. An increase of amplitude of the H.F. in the tuned circuit LC will cause the grid to become more negative, and reduce the anode current, while a decrease of H.F. amplitude will cause the grid to become less negative,

and increase the anode current. If the anode circuit contains something which will form an anode "load" at low frequency, such as a resistance, L.F. choke or L.F. transformer primary, then, since the grid potential fluctuation contains a component corresponding to the H.F. amplitude modulation, it follows that the anode current fluctuations will produce across the anode load a voltage at modulation frequency.

Thus a modulated H.F. input will give rise to a modulation frequency output voltage.

It must be understood that the actual detection process takes place in the grid circuit, and that the grid-to-anode action, is one of L.F. amplification. The subject of valve characteristic curves has recently been thoroughly dealt with in this journal, but Fig. 32 is given to make clear one or two points that we wish to emphasise in connection with the valve-operating conditions for grid detection. The curve of Fig. 32 is an anode current/grid volts characteristic curve, and is to be regarded as a dynamic curve (due allowance being made for the presence of the anode load). The no-signal grid potential will be very near zero, perhaps slightly positive, and it will be observed that the point on the curve itself corresponding to no-signal conditions will be a point on the straightest part of the curve. It will also be understood, from what has been written above, that the part of the curve over which the operating point can be considered as running during reception lies to the left of the vertical zero grid-volts line. (Remember that rectification produces a negative grid voltage, and a fall of anode current if unmodulated H.F. oscillations are applied.) If we inspect the section of the curve to the left of the zero grid-volts line we can see clearly that any semblance of a linear relation between changes of grid potential and the consequent changes of anode current will be lost if the excursions of the operating point trespass on the lower bend, where the slope of the curve varies so rapidly. Trouble will occur in this connection if the valve is given too large a signal input, so the signal handling capabilities of the grid detector are limited

—very limited, as a matter of fact, with low H.T. By using higher H.T. the anode current/grid volts curve is made longer and straighter, and a greater signal input can be accepted before input overloading takes place.

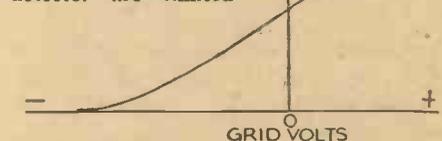


Fig. 32.—The anode current/grid volts characteristic.

Although the main purpose for using the triode grid detector is concerned with the

**TECHNICAL FUNDAMENTALS**

*(Continued from previous page)*

production of the audio-frequency output voltage in the anode circuit, yet it so happens that there is, in addition, an H.F. component in the anode current fluctuations, and it is inevitable that this should be so, since there is an H.F. voltage acting on the input side of the valve. Apart from the possibility of making use of the H.F. anode current component for reaction purposes (see later), its presence in the anode circuit tends to have undesirable effects in so far as it may make the anode potential fluctuate at high frequency. We have already dealt with H.F. feedback between anode and grid circuits through the inter-electrode capacity of the valve. We were considering then a triode H.F. amplifier, but the feed-back can occur just as readily with the triode grid detector. With the detector, however, the feed-back voltage in the grid circuit will be of the "opposing" variety because the anode load impedance will be essentially capacitive for high frequency. The reason for this is that the anode load is designed for L.F. work, and if the load component is an L.F. choke or an L.F. transformer primary the H.F. will be so very far above the natural resonant frequency that the effective impedance at H.F. must necessarily be capacitive in character. The case of a resistance load might, at first thought, seem to be an exception, but here, too, the effective impedance at H.F. is capacitive owing to the presence of stray capacities acting across the resistance.

If the inter-electrode capacity feed-back of the detector is allowed to occur without some kind of check, the valve will produce a very heavy damping effect in the input circuit, but, fortunately, there is a simple means of minimising the trouble. Fig. 31 shows a condenser C1, connected between anode and cathode. This condenser will reduce the impedance to H.F. between anode and cathode, and in so doing, will reduce the amplitude of the H.F. potential fluctuations at the anode, and therefore lessen the feed-back. Although the aim is to "tie down" the anode potential as regards H.F. variation, we obviously do not want to reduce the L.F. variation, and it is therefore necessary to adopt a compromise for the value of C1. It must certainly not be so large that it leads to loss of the higher audio frequencies in the output of the detector stage. Values used in practice vary with the design of the receiver, but .0001 mfd. to .0005 mfd. covers the commonly used values.

**The Triode as L.F. Amplifier**

The triode is still well in the limelight as an L.F. voltage amplifier, although we very frequently find it in use now as part of a multiple valve (double-diode-triode).

For L.F. voltage amplification the anode circuit must contain some form of L.F. "load." Then L.F. voltages applied between grid and cathode will cause the anode current to fluctuate at low frequency, and the anode current fluctuations will develop across the anode load an amplified output voltage. Freedom from distortion demands as linear a relation as possible between input and output voltages. This implies, among other things, that grid current must not be permitted, because once grid current pulses are set up, the consequent rectification effect in the grid circuit will prevent changes of anode current being in proper proportion to the changes of input voltage. Prevention of grid current can only be secured by negative biasing of the grid potential.

Fig. 33, illustrates resistance-capacity coup-

ling. R1 is the load resistance for the valve V1, and the voltage at LF, set up across R1, is applied across CR2 in series. The L.F. voltage across R2 forms the input voltage for the next valve (V2).

Fig. 34 shows simple transformer coupling. Here the amplified voltage developed across the transformer primary by the valve V1 is stepped up by the transformer, and applied directly to the next valve.

Fig. 35 shows "parallel-fed" transformer coupling, which is to be particularly advised if the transformer is of the midget type, with high permeability core. This coupling is really a combination of resistance-capacity and transformer coupling, and confers benefits by virtue of the fact that D.C. is kept out of the transformer primary.

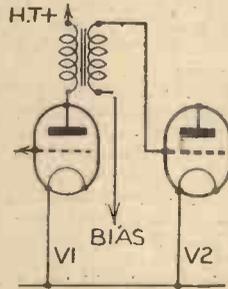


Fig. 34.—The L.F. transformer coupling.

tying stages. The output valve, like the preceding ones, has an anode "load" but the "load," this time, is essentially a power-consuming one, for it is the loudspeaker. Consistent with the rather considerable demands of minimum distortion, the object here is not so much that the L.F. input voltage shall give rise to an amplified L.F. output voltage, as that it shall lead to the maximum production of audio-frequency power in the loudspeaker. The requirements of maximum audio-frequency power on the one hand and minimum distortion on the other are, to some extent, conflicting and call for some care in regard to the relation between the

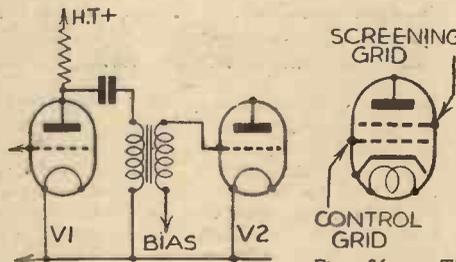


Fig. 35.—A parallel-fed L.F. transformer coupling. Fig. 36.—The elements of an S.G. valve.

anode load and the valve's anode impedance. (Where a triode output stage is concerned the dynamic resistance set up by the speaker should be of the order of two or three times the valve's anode impedance.)

There is much to be said in favour of the triode as an output valve, and there is no doubt that it would be seen in more frequent use if it were not that output pentodes and tetrodes have gained popularity on the score of their greater sensitivity.

**The Screen-grid Valve**

With the electrode assembly of the screen-grid valve the valve manufacturer shows us a direct attack upon the problem of reducing the internal capacity existing between anode and grid. Comparing the triode assembly with the S.G. assembly we can say that the S.G. valve contains one additional electrode. This is an electrode of grid construction, known as the screen-

ing grid, and is placed between the control grid and the anode. Fig. 36 shows a diagrammatic sketch of the electrode assembly of an indirectly heated S.G. valve.

The capacity between anode and control grid would be completely removed if an earthed metal sheet were placed between anode and grid. Obviously, it would be ridiculous to attempt to employ such a screen, because then there could not possibly be any movement of electrons from cathode to anode. The screen must, therefore, be of wire grid construction, which implies that the screening cannot be perfect from the electrostatic point of view. To earth the screening grid will also be out of the question because a zero potential electrode right in front of the anode would greatly lessen the positive attraction tending to pull electrons away from the cathode region. However, it is not so important that the screening grid shall be at zero potential as that it shall be at constant potential (at least as far as H.F. is concerned). In practice the screening grid is given a positive potential (about two-thirds of the anode potential), and its potential is suitably "tied down" to a constant value by the use of a condenser between screen and cathode, this condenser sometimes being associated with a decoupling resistance. The residual anode/grid capacity which remains in the screen-grid valve is very greatly reduced below that of the triode and, as a result, the screen-grid valve can give a very satisfactory account of itself as an H.F. amplifier. The story of the screen-grid valve does not end with the matter of reduction of inter-electrode capacity for, it is to be anticipated that the presence of the screening grid is bound to have considerable influence upon the characteristics of the valve.

**Mutual Conductance**

As the screen is at a positive potential some of the electrons passing through the control grid will be diverted to the screening grid, away from the anode, yet it will be appreciated that the actual controlling action of the control grid will not be greatly influenced by the presence of the screen. That being so, it follows that the mutual conductance of the S.G. valve will not be markedly different to that of a triode (ignore the output triode). Comparison, in any valve list, of the mutual conductances of triodes and S.G. valves, although it will disclose certain differences between individual valve types, will show on the whole that the values are of much the same order for the two groups.

It was stated in an earlier article of this series that the anode impedance of a valve is equal to the ratio of a small change of anode potential to the corresponding change of anode current. To get some idea of what order of anode impedance can be expected with the S.G. valve we have only to consider what sort of effect upon anode current will be caused by a small change of anode potential. When we remember that immediately in front of the anode is the screening grid, at a positive potential which is high with reference to cathode, it needs little imagination to appreciate that a small change of anode potential will affect the anode current, only to a very small extent (much less than in the case of the triode). The conclusion, therefore, is that the anode impedance of the S.G. valve will be very much greater than that of the triode.

It was also stated in the earlier article that the amplification factor of a valve is the ratio of the change in anode potential to the change of grid potential which would produce the same change of anode current.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA

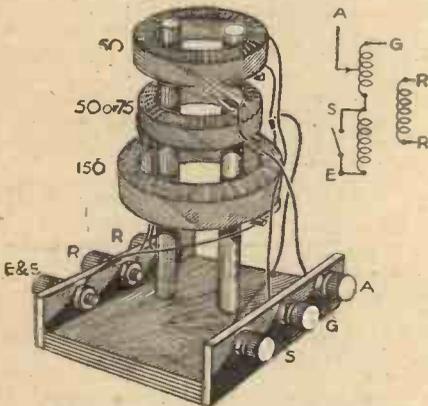
READERS WRINKLES

THE HALF-GUINEA PAGE

A Dual-range Coil

THE useful dual-range coil shown in the accompanying sketch is made with old plug-in coils.

The coil mount consists of a wooden base



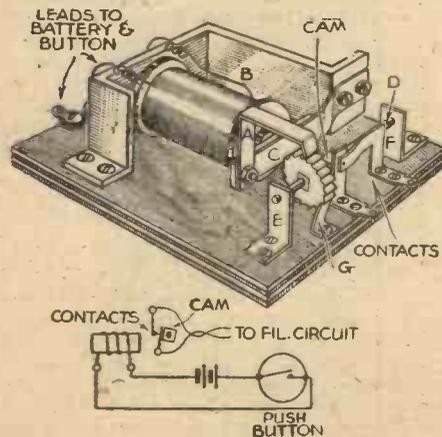
A dual-range coil made with old plug-in coils.

with ebonite end pieces for terminals, and two wooden uprights to support the coils. The uprights have small holes drilled to adjust the height of coils by inserting small pegs for which matchsticks can be used. By this method the coils can be adjusted to the best advantage for tuning. The windings can be scraped and tapped by a crocodile clip. The old coil mounts are removed from the original coils and the wire ends taken to their respective terminals.—CHAS. SPEED (Ferndale, Glam.).

A Remote-control Device

THE accompanying sketch shows a device I have made up for switching off filaments from a distance. The part B was taken from an old electric bell, and the bent arm A was made from a piece of brass, and fixed by means of a small bolt to the arm C.

The toothed wheel was made from a



This simple remote-control device is made chiefly from parts taken from a disused electric bell.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR 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 "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

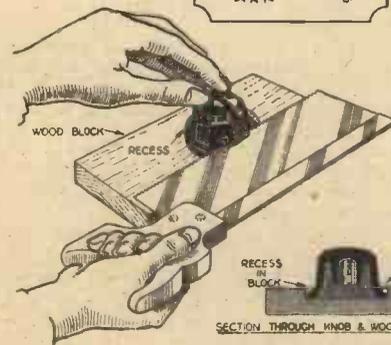
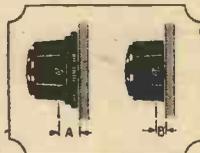
piece of hard wood, and the spindle D was fitted securely and supported by the arms E and F. The contacts were cut from sheet brass and bent to shape, being fixed down securely to the base by small screws.

The pawl G prevents the wheel from turning backwards.—ALEX THOMSON (Anstruther, Fife).

Adapting Knobs for Short Component Spindles

MOST of the up-to-date components on the market are fitted with ample spindle projection (in one or two cases I believe with adjustable spindles), but, it sometimes happens that owing to thickness of cabinet, etc., the spindle of the com-

A method of adapting knobs for use with short component spindles.



ponent being used does not project far enough to allow the grub screw of the knob gripping same.

I have found that many designs of moulded knobs can be adapted to overcome this trouble, without seriously altering the general appearance of the set. This can be done by cutting off the bottom section of the moulding, to a depth just clear of the bushing, which will bring the grub screw nearer (by that amount) to the cabinet.

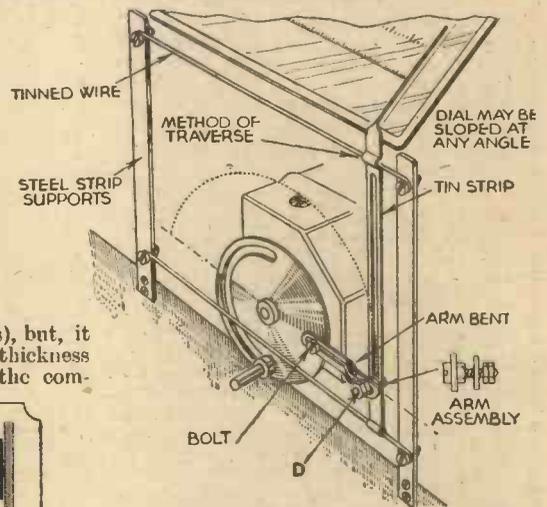
To get a clean and even cut, a simple method is to drill a recess in a block of

planed wood, the recess being slightly less in depth than the required amount of cut-off. Then a small toothed hand saw should be laid flat on the wood block, the knob held firmly in the recess, and a clean and even cut can be made.

The sketch illustrates the method, which is quite simple. In the inset the original distance of grub screw from cabinet or panel, and that of the modified knob, is indicated at A and B respectively.—R. L. Graper (Gillingham, Kent).

A Horizontal Drive

THE accompanying sketch shows a horizontal drive I have made, and which may interest other readers.



An easily-contrived horizontal drive.

The sketch is self explanatory, except for a few minor details. The pointer is made from a strip of tin 1/4 in. wide at lower end, and slightly thinner at the upper end, where it is twisted through a right angle.

An ordinary friction drive is used, and a piece of tin, cut as shown, is bolted on to it, leaving a slot for adjustment.

Two steel strips were screwed to the chassis, and pieces of 20-gauge tinned wire are fixed across them with small bolts and nuts. As the drive rotates the bolt, D, moves up the long slot and the slotted strip moves along the guiding wires. The pointer can be bent in any direction, so that the dial may be sloping, horizontal or vertical.—LAURIE CRAWFORD (Holyhead).

EVERYMAN'S WIRELESS BOOK

By F. J. CAMM

Wireless Principles and Fault Tracking simply explained.

3/6 or 4/- by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

THE topic of Outdoor Radio may be divided into two sections, the design and use of portable receivers, and the extension of a loudspeaker from a domestic receiver for use in the garden. Portables are of many types, from the simple miniature one- or two-valve set for the use of hikers and others to whom transport presents a difficulty, to the multi-valve set which may be transported by a car for use on picnics and similar excursions. The smaller type of receiver will obviously include only the bare essentials and will undoubtedly be designed for head-phone use to reduce the weight which would be given by a loudspeaker. For similar reasons of portability and lightness this type of receiver will not be provided with a frame aerial, but a throw-out aerial device will be used. To make the most of this type of receiver miniature valves should be employed, and these are available from Hivac, G.E.C., Mullard and others. The great advantage of these small valves is that the necessary H.T. is reduced, a maximum of 60 volts giving the necessary loading, and the many new midget components which are now available will enable the most compact type of receiver to be built up. Weight may be still further reduced by using dry I.T. supplies in place of an accumulator, and in this connection the special cycle-lamp batteries should be used.

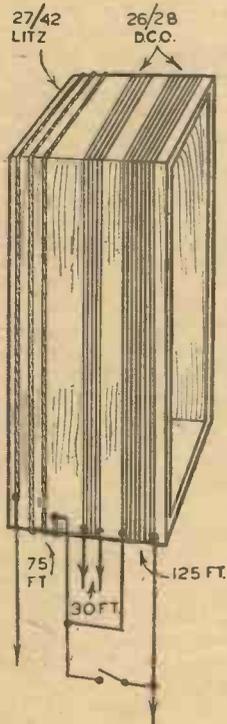


Fig. 1.—This diagram shows the main details of a standard frame aerial suitable for a reacting detector input stage. Where an H.F. stage is employed the reaction winding will be omitted, of course, and the medium and long-wave windings may then be placed close together and considered as a single winding. This type of frame aerial is generally inefficient where the sides are less than 12 inches in length, and it is also found that results are best when the sides are of equal length.

**Portability**

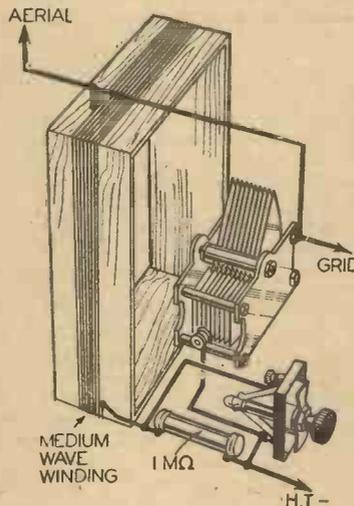
For added convenience the receiver may be placed in one carrying case, and the batteries and phones in a second case, the load then being shared by two people or otherwise disposed of. Canvas or similar carrying cases will enable weight to be cut down to a minimum, whilst chassis should be made from aluminium, or even perforated sheet.

In our issue dated March 19th last we gave a design for a portable based on these lines, and this will serve to show the main features of design. Modifications may be introduced by making the set entirely self-contained, providing a separate section in the cabinet for batteries; and for the aerial,

making use of a length of thin flex rolled round a strip of cardboard when not required.

**Frame Aerials**

A throw-out aerial need not be very long, 15ft. or so, giving adequate pick-up, it being assumed, of course, that for portable use only the local stations are really necessary. When distant stations are required a more ambitious receiver would be employed, and this will introduce the need for a good frame aerial. The larger type of receiver will make use of the ordinary type of valve, and the increase of size will enable a frame aerial to be wound round the containing case, it being remembered that for best results the sides of a frame aerial should be not less than 12in.



in length. It may also be mentioned here that the frame aerial takes the place of a tuned circuit. Many amateurs continually write to us asking how to add a frame aerial to an existing receiver, or why an added aerial fails to work, overlooking the fact that the existing input-tuned circuit will have to be removed when the frame is added. This means that a simple detector-L.F. receiver may very conveniently be converted for portable use by adding an H.F. stage, as another tuning coil will not be needed, the frame taking its place.

Two alternatives are available in the frame aerial—it may be wound with two separate sections, one for medium and one for long waves, or the latter winding may be omitted and a loading resistance used in its place. Although this is not so efficient as the double winding it reduces size, simplifies construction, and is quite good enough for normal use. It is obviously impossible to give instructions for making up aerials for every type of receiver, but the following rules may be kept in mind. Firstly, the frame should, if possible, be square; that is, with all sides of the same length. The medium-wave section should be wound with Litz wire, the type known as 27/42's being most convenient to obtain. The long-wave section, when adopted, may be wound from ordinary D.C.C. wire, a gauge of 26 or 28 being quite suitable. If the frame has to be wound to include a re-

# OUTDOOR

## A Seasonal Discussion on the Set Extension Points and Related Subjects

action winding this should be placed between the long and medium-wave sections which should be separated for the purpose. For most purposes a length of

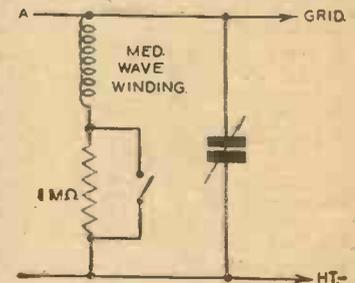


Fig. 2.—The diagram above shows the theoretical arrangement for dispensing with the long-wave frame winding, and on the left is the pictorial diagram of the arrangement.

75ft. of the Litz wire will be needed for the medium waves, 30ft. of the 26 or 28 D.C.C. for reaction, and 125ft. of the same wire for the long-wave winding.

**Spaced Turns**

The quantity of wire mentioned should be measured off and wound round the

# GLASGOW EMP

IN addition to the various radio and television exhibits at the Empire Exhibition some interesting new ideas are being incorporated in the United Kingdom Government Pavilions. Here the novel sound-track film produced by the British Ozaphane company is being used to produce various items as set out below. This film, it will be remembered, is non-flam and is used in the radio-grams and similar domestic products of the company mentioned.

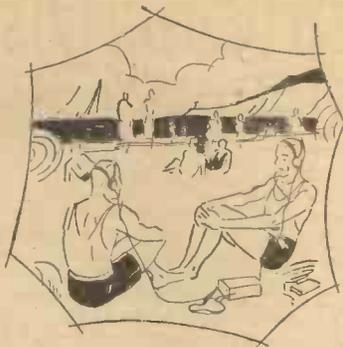
**The Invisible Lecturer**

The talks will cover the Industries of Iron and Steel, Coal and Shipbuilding, and at each of the sixteen stands the exhibit will literally speak for itself. As people stand before the exhibit they will hear everything clearly explained in a perfectly modulated conversational tone, so that without referring to any printed matter they will be able to follow the story of the Manufacture of Iron and Steel, the Mining of Coal, its uses and by-products, and the story of Shipbuilding.

The talks will come from loudspeakers situated in the ceiling of each stand or bay. These will be "fed" from a centrally situated installation of a new invention especially designed for the Exhibition by British Ozaphane, Ltd. In this new machine each film is joined to make an

# RADIO

Project of Portable Design, Outdoor  
 Sets - - - - By W. J. DELANEY



So much for the portable features, the types of circuit to adopt being left to the requirements of each listener. At home the fine weather induces the listener to get out into the garden and it is possible to listen to the programme without taking the set out of doors, merely running an extension lead into the garden. For this purpose, the best plan is to run a single lead only, which means that an output filter circuit must be fitted to the receiver.

frame, reducing the amount to provide an equal number of turns. Space the Litz wire by a space equivalent approximately to the thickness of the wire between successive turns, but wind the reaction and long-wave windings with turns touching. The reaction winding should be placed about  $\frac{1}{2}$  in. from the medium-wave section, and a space of  $\frac{3}{4}$  in. or so should be left between reaction and long-wave winding so that one winding will have maximum effects on both wave bands. Obviously these are only the bare outlines and a little experiment may be necessary to find the best spacing and number of turns for any particular receiver. A .0005 mfd. tuning condenser and .0003 mfd. reaction condenser is assumed

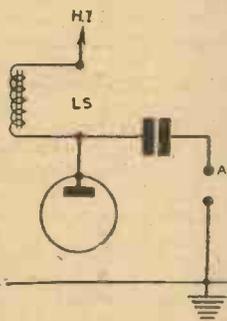
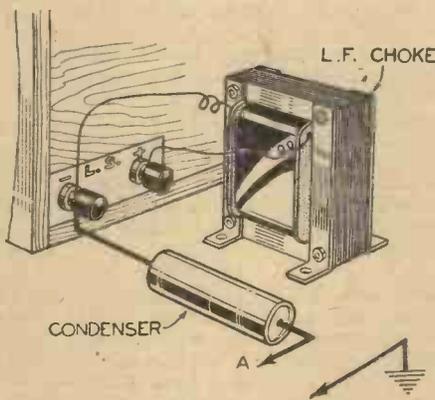


Fig. 3.—The above is the theoretical diagram of an output filter circuit, and on the right is the pictorial diagram showing how it may be added to an existing set.

in all cases. Where the long-wave section is to be omitted a resistance of 1 megohm may be used and wired in series. The theoretical and practical arrangements of all these schemes are shown in Figs. 1 and 2. It should be remembered that a receiver with a self-contained frame aerial may be used with an outdoor aerial although, naturally, the directional effects will be lost and selectivity may suffer. The aerial may be attached to the "top" of the



For the benefit of new readers this is shown in Fig. 3, and it will be seen that an iron-core choke and fixed condenser of 2 or 4 mfd. are the only requirements. The lead to the garden should preferably be of the lead-covered type or at least of a waterproof variety to enable it to be left *in situ*. The heavy-gauge wire sold for lead-in purposes will be found quite suitable, and it may be tacked along a fence, or even left lying on the ground. It should be attached to the point marked A in Fig. 3 and at the listening point it is attached to one terminal on the loudspeaker, the other terminal of which is earthed. This is very easily carried out by attaching a short length of bare wire to the terminal and sticking the other end in the ground. It is important to remember that annoyance should not be caused to neighbours by operating the set at too high a volume and therefore a volume control on the speaker is really desirable in order that the level may be adjusted whilst in the garden, without running back to the house to turn down the control. The best method of arranging for this is to place a low resistance of the variable type (an old filament rheostat will do) across the speech coil winding. A value of 5 to 10 ohms is suitable.

Where a summer-house or other building is available in the garden a permanent installation may be provided, making use of the remote control equipment such as the W.B. "Long-arm" and this will enable the receiver to be switched on and off as desired for various items without returning to the house each time.

## RE EXHIBITION

endless band and six films are all working at once in synchrony, one machine supplying all the lectures for each hall. As a point of interest the following details are provided:

Each roller will revolve 60,750,000 times. Each lecture will be given 28,000 times. In other words, each film will run through the sound gate 28,000 times, each film will travel 1,022 miles, and all the films together will travel a total of 16,352 miles during the six months the Exhibition is open. A different type of machine, known as the "Duo-Trac" Cellophone, supplies the voice of the Mechanical Man in the Hall of Health and Education. The sound reel will enable him to talk in the most natural way imaginable for ten minutes on the subject "How the Body Works," with intervals of five minutes' silence.

It is a matter of congratulation that the Department of Scientific and Industrial Research and the Ministry of Health should have been the first to realise the immense possibilities of Ozaphane for sound reproduction in the commercial world.

In London the domestic models can be seen in the showroom of British Ozaphane, Ltd., at 46, Albemarle Street, London, W.1, where a sound reel of a complete symphony lasting forty-four minutes may be heard.

frame aerial tuning condenser or, where selectivity is desired, the following scheme may be adopted. Two or three turns of wire should be wound round the outside of the cabinet, making certain that the turns are in the same direction as those of the frame aerial. The outside aerial may then be attached to one end of these additional turns and the earth terminal to the other end. (Fig. 4.)

### Extension Points

For wave-change purposes in the type of aeriels mentioned a simple on/off switch is all that is needed, short-circuiting the long-wave winding or the loading resistance in each case, and if a tuning coil without self-contained switch is employed in the detector stage a two-pole switch may be used to change wavelengths at one operation on both frame and coil, but care must be taken not to provide interaction due to long leads running parallel to both the H.F. and detector stage: With any type of portable aerial the use of an earth connection will give increased volume and a short length of wire attached to the L.T. negative terminal and stuck into the ground will give the necessary earthing connection. If possible, a moist position should be found, and if a stream or river is handy, the wire may simply be thrown into the water. Remember, also, that a wire fence makes a splendid aerial, and a short length of wire attached to the aerial terminal and twisted round one of the wires of the fence will give the necessary connection.

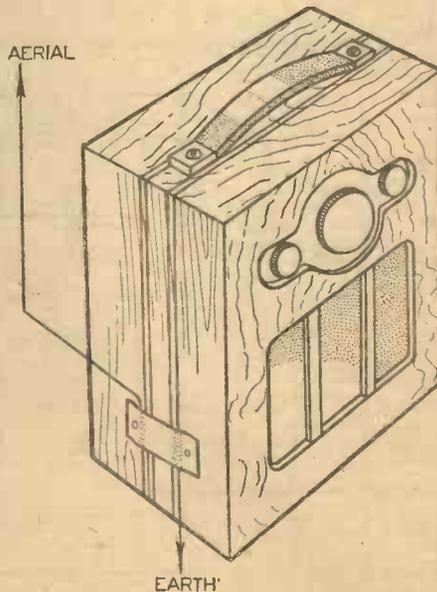


Fig. 4.—An external aerial may be coupled to a self-contained receiver as shown above.

# The B.L.D.L.C. British Long-Distance Listeners' Club

## Headphone Receivers

THE ideal dual purpose receiver for headphone and loudspeaker reception under average reception conditions on the short waves is the tuned H.F., Detector and one L.F. combination, or T.R.F.

For loudspeaker reception a four-valve untuned H.F., Detector, L.F. and pentode output is a useful arrangement, a similar arrangement with a tuned H.F. stage being, of course, better owing to increased H.F. gain and selectivity, and by the introduction of regeneration in the H.F. stage sensitivity and selectivity can be further increased.

When receivers designed on the foregoing lines are contemplated it should be remembered that the maximum of amplification is governed by the permissible noise level, and that as we amplify the signal, so also is noise level increased. It is better therefore to amplify at high frequency, rather than at low frequency, in multi-stage regenerative combinations.

For world-wide short-wave loudspeaker reception, the superheterodyne, with its high sensitivity, selectivity, and output, is without a peer, and the prospective listener has a wide choice from which to select one most suitable to his requirements.

## Reflex Circuits

During the past few months a revival of interest in the reflex circuits appears to have taken place, and several queries have been received regarding this type of receiver. It must be pointed out that where quality is desired the reflex principle should not be employed. Years ago, when valves cost over £1 each, it was very useful to make use of a reflex circuit in order to obtain results with a minimum number of valves and some ingenious circuits were

developed. As an indication of what may be done, we give below a circuit of a three-valve set in which the H.F. valve performs the dual function of H.F. amplifier (aperiodic) and first L.F. stage. The receiver is thus equal in theory to a four-valver, but it must be emphasised that it will not give the same results as a straight circuit built on similar lines. It will be seen that the signal passes from the anode of the H.F. valve to the H.F. transformer feeding the detector stage, and on its way it passes through the primary of an L.F. transformer. The .0003 mfd. fixed condenser across the latter bypasses the H.F. From the anode of the detector the standard reaction circuit is fed and the signal goes to a second L.F. transformer which carries the L.F. impulses back to the first valve. The transformer in the anode circuit of this feeds the signal, now stepped up in voltage, to the output stage and thus it has passed in effect through four separate stages. Although values are given for the main components, some experimental work will have to be carried out to find a suitable and stable layout, and it will undoubtedly prove worth while to experiment by using a separate H.T. feed for each valve, with decoupling components arranged in the usual way.

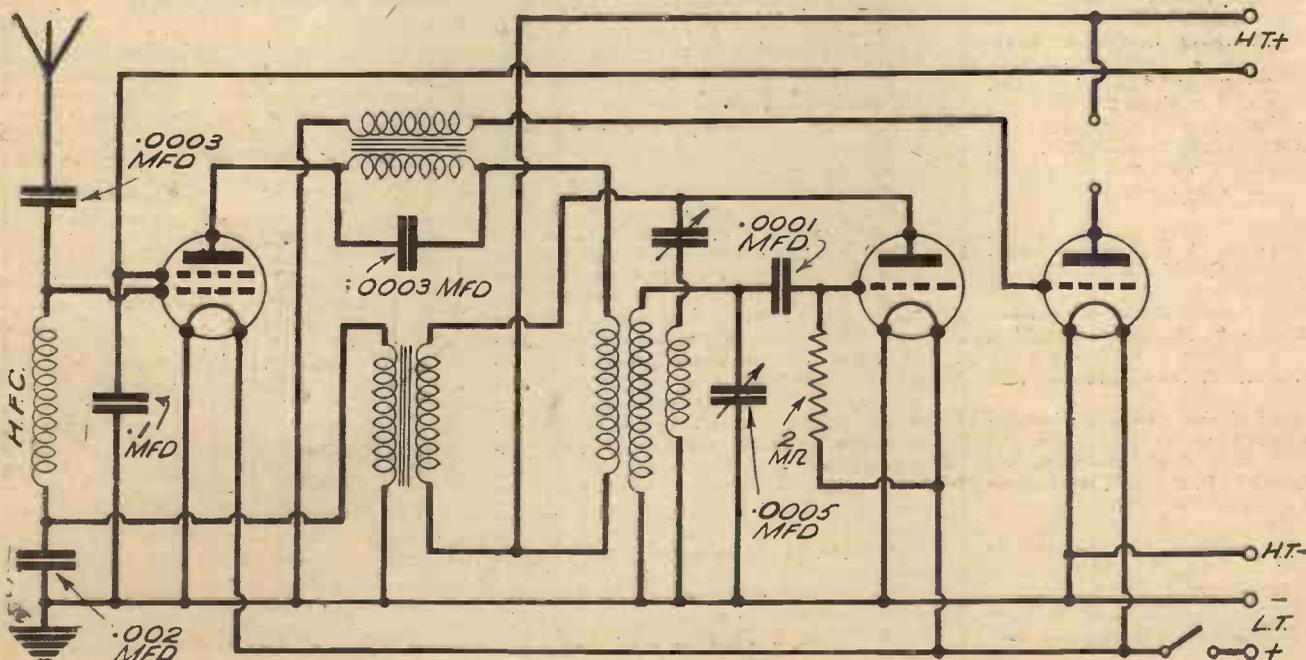
## Quality Couplings

In the search for quality many experimenters come against the economy problem. The resistance-capacity coupling is very low in price and is capable of giving better quality than a low-priced transformer stage, but it suffers from the lack of amplification. In most cases this means that an additional stage of amplification is needed and this may easily lead to distortion or troubles which will offset the gain given by the R.C. coupling. It should be remembered, how-

ever, that special valves are now available which will provide adequate amplification when fed from a single R.C. stage, and in the case of the battery user especially, this is of the greatest importance. For instance, in the G.E.C. range a new tetrode has been developed which is capable of giving really good quality, when fed from a normal detector through a resistance-capacity network, or the order of 725 milliwatts. If two of these valves are used in a normal Class A push-pull circuit an output of 1.3 watts is available. It must be remembered, however, that the volume alone is not the main consideration when building a battery receiver and the H.T. consumption is an important point. The tetrode mentioned (type KT.21) will require an anode supply of 10 mA. at 150 volts to give the 725 mW. output mentioned for a single stage, whilst for the push-pull stage the total anode current will be 20 mA.

## Canadian Broadcasting

We have received a communication from the Rogers Radio Broadcasting Company of Canada regarding the reports which they have received from members of the B.L.D.L.C. on the reception of their long-wave station CFRB and the short-wave station CFRX. They state that they are anxious to receive reception reports upon receipt of which they will gladly forward suitable veris. For the benefit of those members who wish to pick up these stations it may be mentioned that CFRB operates on 690 kc/s (434.5 metres) and CFRX relays programmes of CFRB on 6,070 kc/s (49 metres). Both stations are on the air continuously from 7.30 a.m. E.S.T. until 12 midnight, except Sunday, when they operate from 10.30 a.m. to 12 midnight. CFRB is an independent station owned and operated by the Rogers Radio Corporation and is not associated with the Canadian Broadcasting Corporation, the Government owned network of stations. CFRB is the Toronto outlet in Canada for the Columbia Broadcasting System of New York and there it carries a number of their presentations—sponsored or otherwise. The address of the Rogers Corporation is 37, Bloor Street West, Toronto, Ontario, Canada.



An experimental 3-4 valve reflex circuit as referred to in these notes.

# MOST POPULAR VAUDEVILLE PROGRAMME

THE B.B.C announces that seventeen of every twenty women variety "fans" listen to Saturday night broadcasts of "Music-Hall" and "Palace of Varieties."

That, at any rate, is one of the conclusions indicated by the analysis of the "Listening Logs" of two thousand listeners who, as recently mentioned in these pages, for twelve weeks during the winter, formed the B.B.C.'s Variety Listening Barometer.

Other results, outlined in an interim report by the Listener Research Section, show that twelve women in every twenty listened to evening Variety outside broadcasts, eight in every twenty to afternoon Variety gramophone records, and five in every twenty to Variety records broadcast during the morning.

The average audience for each type of evening vaudeville programme was as follows:—

1. "Music-Hall" and "Palace of Varieties" . . . . . 83 per cent.
2. "Monday at Seven" . . . . . 72 per cent.
3. Carroll Lewis and his Discoveries . . . . . 68 per cent.
4. Outside broadcasts of Variety (between 8.0 and 8.45 p.m.) . . . . . 61 per cent.
5. Studio vaudeville shows . . . . . 60 per cent.
6. Outside broadcasts of Variety (between 9.0 and 10.0 p.m.) . . . . . 58 per cent.

All these types of programme draw big audiences from men and women of all ages. Ninety-four per cent. of log-keepers listened to the broadcast of the Royal Command Performance; though the figure is not actually 100 per cent. it may reasonably be considered to have secured the maximum possible audience; there must always be some listeners who are prevented by one reason or another from hearing even a favourite programme.

An analysis of the figures for "Music-Hall" and "Palace of Varieties" shows that no single programme fell below an 80 per cent. appeal.

Quite a substantial number of men listened to daytime vaudeville—one in ten to the morning gramophone records of Variety, one in five of them to the afternoon programmes.

# EST. PETO-SCOTT 1919

## YOUR RADIO SHOPPING GUIDE

There's something new you need . . . Note these wonderful offers . . . quality apparatus to meet every requirement. For full specification see previous announcements, or send now for full details. Buy NOW before prices rise.

### POST ORDERS

Prompt attention on receipt of remittance, deposit, or C.O.D. instructions. All orders over 10/- Carriage and C.O.D. charges paid. Overseas orders please send full cash plus approximate postage or half value and we will collect balance C.O.D.

### CALLERS

All items offered available from our London branches daily: 9 a.m. to 7 p.m.; Saturdays: 9 a.m. to 1.30 p.m. Call in and let us help you in your choice of apparatus.

### CHASSIS

FOR EVERY REQUIREMENT. LOWEST PRICES. REPLACE THAT OLD SET NOW. Supplied complete with knobs and escutcheon.

**BRAND NEW 1938 6v. ALL-WAVE A.C. SUPERHET CHASSIS**

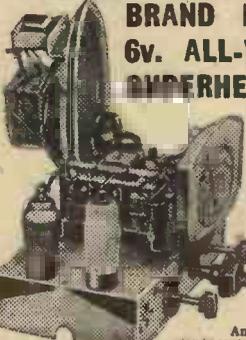
LIST VALUE £14 : 3 : 6

**BARGAIN 8 1/2 GN S.**

YOURS FOR 10/- Balance in 18 monthly payments of 12/3.

An exceptional opportunity to replace that old chassis with a brand new, up-to-the-minute, all-wave superb chassis at 1/4 off list price.

Guaranteed



Peto-Scott Battery ALL-WAVE S.G.3 CHASSIS. 4 wavetands, 14-2,000 metres. Acroplane type station-name dial. Low H.T. consumption. Complete with S.G. Det. and Pentode valves. Guaranteed. Fully Tested, 79/6 or 5/- down and 11 monthly payments of 7/6.

6-VALVE A.C. ALL-WAVE SUPERHET. Excellent Radio or Radiogram Chassis 18-2,000 metres. Station-name dial. Automatic Volume Control. 6 tuned stages. Provision for Pick-up. Complete with specially matched Rola mains speaker and 5 Valves. Guaranteed, fully tested. 26/8/- cash or 7/6 down and 15 monthly payments of 8/9. Chassis only, with valves, but less speaker, 24/17/6 or 7/6 down and 15 monthly payments of 7/11. For A.C. Mains only.

9-VALVE A.C. ALL-WAVE SUPERHET CHASSIS. Amazingly efficient, new circuit arrangement, 10-2,000 metres, new Epicycle Tuning. Plate class station-name Dial. Automatic Volume Control. Provision for Pick-up. World-wide reception guaranteed. 7 watts output. Complete with all valves, less speaker. Fully guaranteed. £11/19/6 cash or 17/- down and 15 monthly payments of 17/-.

A.C. BANDPASS S.G. FOUR CHASSIS. Excellent opportunity. 3-watts output. Provision for Pick-up. Engraved dial. 200-2,000 metres. Complete with 4 valves. Fully tested, 59/6 cash or 5/- down and 12 monthly payments of 6/-. With specially matched mains speaker, 23/19/6 cash or 5/- down and 11 monthly payments of 8/3.

A.C. ALL-WAVE BANDPASS S.G.4 CHASSIS. 18-2,000 metres. 3 watts output. Efficient H.F. and Pentode output circuit. Provision for Pick-up. Circular station-name dial for short, medium and long waves. Guaranteed, fully tested. £4/10/0 cash or 4/- down and 14 monthly payments of 7/-. Specially matched mains speaker 21/- extra or add 1/- to deposit and 3/6 to each payment.

### ONLY OBTAINABLE FROM PETO-SCOTT

#### DECCA 1938 ALL-WAVE BATTERY MODEL 33.

—An amazing 3-valve 3-tuned-circuit receiver, 19-2,000 metres. Station-name dial. Hi-flux moving-coil speaker. Provision for Ext. Speaker and Pick-up. Tasteful Walnut Cabinet. Brand New. Covered by Maker's Guarantee. Sealed carton. Present List Price £7 17s. 6d. OUR PRICE £5 19s. 6d. CASH or 5/- down and 18 monthly payments of 7/4.

#### BRUNSWICK 1938 ALL-WAVE MODEL BPU/1.

A wonderful 6-Valve receiver, 19-2,000 metres. For all electric supplies 100-250 volts. (A.C. 40/60 c/s). Automatic volume control. Large, easy-to-read station-name dial. Transportable, but provision for external aerial for distant stations. Brand New in sealed carton. Maker's Guarantee. Present List Price, £13 2s. 6d. OUR PRICE £8 8s. 0d. or 8/6 down and 18 monthly payments of 10/10.

#### HOME BROADCASTERS.

These excellent microphones can be employed with Peto-Scott Amplifiers offered or can be instantly attached to your present radio when a complete broadcasting station is at your disposal for crooning and commentating, etc. Table Model complete with transformer, 25/- cash or 2/6 down and 10 monthly payments of 2/6. Telescopic Floor-stand Model—real professional type. Chromium-plated. List 88/-, Special less-than-half price—2 gns. cash or 2/6 down and 11 monthly payments of 4/-.

PICK-UPS, 7/6 each. Wonderful offer of Cosmoquad type. Highly sensitive and actually listed originally at 17/6. Order early.

#### ERECT AN EFFICIENT AERIAL NOW.

ALL-WAVE AERIAL. Absolutely essential for present-day good listening. Complete outfit for instant erection with all aerial and lead-in wire, transformer, insulators, and instructions. List value 37/6. Special Price 17/6 cash or 2/6 down and 7 monthly payments of 2/6.

#### KITS—SHORT-WAVE. Fully described with 7 other receivers in the Peto-Scott Short-Wave Experimenter Book sent free on request.

4 VALVE S.W. RECEIVER. 6-97 metres. Amazingly efficient S.G. Pentode output circuit. Latest design. Complete Kit with 4 coils. List value £3/12/0. Special price less valves £2/15/0 or 5/- down and 11 monthly payments of 5/-.

8-IN-ONE S.W. KIT. The most comprehensive Kit ever offered. Comprising all parts to build alternatively 8 Short-Wave Battery Receivers, 1-4 valve circuits all different. Complete with 6 coils, 4 Valves, instructions and 8 Blueprints. List value £7/8/6. Special price £5/9/0 or 7/6 down and 14 monthly payments of 8/-. Steel cabinet and panel 14/6 extra or add 1/- to deposit and payments.

### ALL-WAVE KITS

1 Valve All-Wave Kit. 18-2,000 metres. Employing efficient All-Wave Tuner, requiring 6 connections only. Provides world-wide headpiece reception. Complete kit with valve and drawings. List value 33/3. Special Price 29/6 or 2/6 down and 11 monthly payments of 3/-.

### "TROPHY" SHORT-WAVE SETS.

The most efficient self-contained Short-wave sets ever offered. WELL WORTH DOUBLE THE PRICE. Complete in steel cabinet with moving coil speaker fitted and provision for headphones. Wavetrange 12-52 metres, but tuners available for 6-500 metres. Battery Model £5 15s. 0d. or 9/6 down and 13 monthly payments of 9/11. A.C. Model, 8 gns. cash or 10/- down and 13 monthly payments of 10/9. Headphones with Plug fitted 7/6 extra. Complete specifications on request.

AMPLIFIERS. 6-7 Watt Model for A.C. Mains. Effective sound-range 500 feet. Ideal for home, club, and sports meetings and all P.A. work. Assembled and fully tested, ready for immediate attachment to Microphone or Gramophone Pick-up, complete with 4 valves. List value 25 10s. 0d. Special Price £3 10s. 0d. or 5/- down and 11 monthly payments of 6/9.

### WORLD WIDE RECEPTION ON THIS MODERN SHORT-WAVE ADAPTOR - CONVERTER

13-74 METRES



MODEL 80

Convert your existing Battery or A.C. set for operation on the short waves with this up-to-the-minute unit. No alterations to your set whatsoever.

- No coil changing.
- Ready drilled enamelled steel chassis.
- Ready drilled black crystalline finish steel panel.

**KIT "A"** with diagram, assembly and operating instructions. List Value 42/- Cash or C.O.D. 29/6 Carriage Paid, or 2/6 down and 10 monthly payments of 3/-.

**2/6 DOWN**

## PETO-SCOTT CO., Ltd. 77 (Pr. W. 37), City Road, London, E.C.1. 62 (Pr. W. 37), High Holborn, London, W.C.1. 3249

Please send me..... Cash/C.O.D. or H.P..

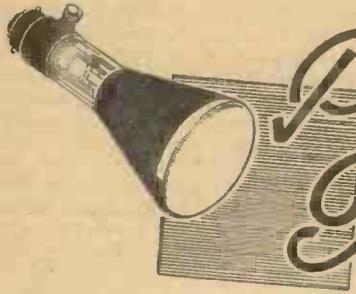
for which I enclose £.....

Please send me details of.....

Name.....

Address.....

**POST THIS COUPON NOW**



# Practical Television

May 14th, 1938. Vol. 3. No. 100.

## A Joint Committee

THE film question, in so far as it relates to the B.B.C., is still the subject of considerable deliberation by the film industry, and in an effort to meet the case many points have been brought forward by committees representing the film industry interests in general. It is felt that if the present news reels radiated daily by the B.B.C. are withdrawn, then the B.B.C. will quite naturally take steps to develop its own, and this may even prove more suitable for televising. The film industry would, under these circumstances, gain no advantage, and it is now felt that it would be mutually beneficial if some form of joint committee was formed to settle on an amicable basis the interests of all concerned. On this would be represented the cinematograph exhibitors, the newsreel companies, the B.B.C. and those manufacturers of television receiving equipment which lends itself more readily to use in public houses, hotels, clubs, etc. Ordinary home reception is not complained about, but it is felt that the showing of pictures in public places is a form of competition to cinemas which might, as time goes on, prove a slight menace. This proposal is certainly more in keeping with a good conciliatory spirit, and is to be preferred to the threats of embargo which some time ago were used rather freely. That wiser councils have prevailed is a matter for congratulation to all concerned, and is more conducive to a settlement.

## A Curious Effect

AT the Institution of Electrical Engineers recently a detailed technical description of the equipment and performance of the Alexandra Palace station was given by members of the B.B.C. engineering staff. Many interesting points came out during the course of the subsequent discussion, and one of these concerned the extreme importance of the reduction of artificial forms of electrical interference. Apart from electro-medical apparatus it is known that certain forms of neon signs can cause considerable trouble in the receivers. Associated with this is the value of the intermediate frequency used in the superhet vision chassis. It was also mentioned that in the case of motor-cars the ignition systems seem to cause a peak form of interference in the neighbourhood of 125 cycles per second. This was attributed to the predominance of six-cylinder cars on the road coupled with the maximum speed of 30 miles per hour imposed in built-up areas. It is known that this interference can be suppressed very readily in the car itself, but there still seems to be a divergence of opinion as to whether engine performance is upset or not by incorporating the requisite electrical equipment. Until this is known the widespread use of suppressors is not likely to be forthcoming. The B.B.C. are still very conservative in their estimates of service range, it being pointed out that so much depends on the degree

of local interference experienced in the proposed area of reception. Efforts are also being made to increase the degree of mobility associated with the outside broadcast equipment. It is recognised that one of the most useful functions that the B.B.C. television service can fulfil is linked up with open air sporting and topical events, and steps are therefore being taken to reduce the time necessary for setting up the requisite apparatus on site.

## On the Fringe

THOSE viewers who look-in regularly realise only too well that television, in so far as it is represented by the B.B.C. service, is only on the fringe of many

Olympia, and hundreds of people were marshalled through the televiewers parade in a steadily moving throng to catch glimpses of the play on the thirty sets operating in that section. Many of the northern enthusiasts who came to London on that day saw parts of the match, and then re-formed in the queue to see more, for the results were excellent. During the four weeks that this exhibition has been open, thousands of people have witnessed pictures; some for the first time, so that they marvelled at what they saw, while others, more television conscious, came with the intention of comparing results on the different makes of sets with a view to purchase. Of course it is generally appreciated that seeing sets working under normal viewing room technique is not the best method to effect sales.

## Signal Distribution

REALISING the extreme importance of television signal distribution over cables, a large number of experiments are being carried out to find the method or methods which give results of a satisfactory character without considerable capital expenditure. Looked at in the broadest sense there are three types of circuits which seem to furnish the best schemes. First of all we have the balanced twin low



Some of the 2,000 cast in the historical Ice Festival, which opened at the Empress Hall recently, were televised in the "Picture Page" programme at the Alexandra Palace, London. The illustration shows Mr. Brough Andsell as Samuel Pepys facing the television camera.

important developments and programme expansions. The recent outside broadcasts which have been undertaken so successfully, coupled with those scheduled for the coming summer months, give a fair indication of the improvements which have been effected, but Mr. Gerald Cock himself has stated quite openly that whereas in the past much of the work was undertaken on a hit and miss principle, the experiments can now be directed in a more definite and scientific manner. As an indication of the enthusiasm associated with items of national interest, mention has only to be made of the Cup Final at Wembley, where with the aid of three cameras viewers had a wonderful view of the match, and its last minute thrill. This took place on the last day of the Ideal Home Exhibition at

capacitance cables which have been designed expressly for television, and which is represented by the network linking up numerous points of interest over a wide London area and having appropriate tapping points. The generated vision signals are fed to a repeater station at Broadcasting House where phase correction, equalisation and amplification is provided prior to re-transmission to Alexandra Palace where the process is repeated before the signals modulate the ultra-short-wave vision transmitter. The next category is embraced by the unbalanced coaxial cables now being installed by the Post Office through the centre of Britain for multi-channel telephony and/or television. Until all the repeater stations have been installed the final results will not be known.



## NOTES FROM THE TRADE

### Tempovox Radio Clock

THE accompanying illustration shows one of the new Grandmother style radio clocks supplied by British Tempovox Ltd., of Tempovox Works, Holly Road, Hampton Hill, Middlesex. This model, which costs 15 gns., is available for either A.C. or A.C./D.C. mains use and incorporates a five valve (including rectifier) superhet circuit. This is of the type having a triode-hexode frequency-changing stage followed by a pentode I.F. stage feeding a double-diode triode. A.V.C. is employed and the output is a tetrode. The A.C. model, number R.3.G., includes a synchronous electric clock, whilst the A.C./D.C.



The new Vidor Portable.

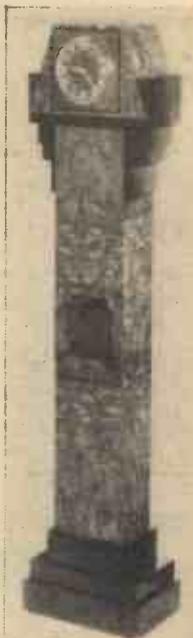
model, type R.3.G.U., incorporates an eight-day movement. Further details, including hire-purchase terms, may be obtained from the makers at the above address.

### New Ferranti Electrolytic Condenser

A NEW type of high-surge electrolytic condenser is now available from Messrs. Ferranti. This particular component is designed to withstand repeated surges of 720 volts and will remain cool if left on 650 volts D.C. We have submitted an 8-mfd. unit to severe tests and found that it fully justifies the makers' claims. In spite of repeated overloads the condenser has been found to function quite satisfactorily, and no internal short-circuits have developed. The condenser is in a carton provided with flexible coloured leads and may also be obtained in square or cylindrical metal cans. The carton type costs only 4d. more than the standard 500-volt-peak type of similar capacity. It is interesting to note that the makers point out that the reliability is obtained by a single unit and not by using two units in series as is common in some American type condensers of a similar rating. A booklet describing the various types may be obtained on application.

### Vidor, Portable

A NEW Portable by Vidor is seen on the left and this is of the battery-operated superhet type. The circuit includes an octode frequency changer, pentode I.F. stage, double-diode-triode providing second detection A.V.C. and L.F., and a pentode output stage. The H.T. battery provided includes the necessary grid biasing section. The wavelength range is from 200 to 550 and from 900 to 2,000 metres and the receiver is of the single-knob control type. The weight is 20lbs., the height 11½ ins., the width 11 ins., and the depth from front to back is 7 ins.



This is the Tempovox Grandmother radio clock

### McMichael's First 1938 Release

THE illustration at the foot of this column shows the novel lines of the first of the 1938 McMichael models. This is an all-wave battery superhet with 3-band tuning having 4 valves incorporating 6 stages. The tuning dial, it will be seen, is divided into three sections, the left-hand scale showing the medium-wave band, the right-hand scale showing the long-wave band and the centre scale the wavelengths on all three bands. The main tuning control is of the two-speed type and a white indicating pointer moves simultaneously over the three scales. The remaining controls are the volume combined with on/off switch and the wave-change switch, each provided with an indicator which shows through a window on the panel. A tone control is mounted in a recess on the side of the cabinet. The price of the receiver (less batteries) is 8½ gns.



The first of the 1938 McMichael receivers.

## PROGRAMME NOTES

### Glasgow Exhibition Visit

LISTENERS will on May 11th hear the first of a series of visits which the microphone will make to the Empire Exhibition, Glasgow, in the course of the summer. Those with any experience of exhibitions know that repeated visits must be made if one is to get a comprehensive view of what is to be seen and to enjoy fully the entertainment that every exhibition sets out to provide. From time to time, therefore, the microphone will be set up at fresh places of interest in Bellahouston Park, so that gradually intending visitors will have a fair idea of what to expect and what they will want to make a point of seeing.

### Cabaret from Bournemouth

DANCE Cabaret from the Royal Bath Hotel Ballroom, Bournemouth, on May 18th (Regional), will include Robert Ashley, "The Popular Singer," with Reginald Morgan, the well-known composer pianist; Max Wall, "Irresponsible"; and dancing to Billy Thorburn and his Music.

### "Send for Paul Temple"

THE last episode but one of the Midland detective serial entitled "Send for Paul Temple," will be heard on May 20th and will be repeated in the Regional programme on May 21st. The author is Francis Durbridge and the producer Martyn C. Webster. The eighth and last episode will be broadcast on May 27th. Francis Durbridge has followed his Paul Temple play with a novel on the same theme—the detection of a series of gang robberies with violence in the Midlands.

### Dance Music and Variety

ON May 18th another "Dancing Here and There" programme will be broadcast for Northern listeners, when three semi-professional bands will be featured: George Sutton and his Arabians, Jack Lancaster and his Music, and Eddie McGarry and his Band. A broadcast from the Palace, Blackpool, in the "Northern Music Hall" series will also be heard on the same evening.

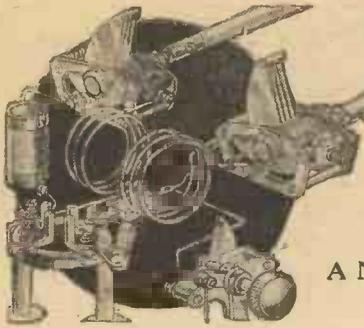
### "Bird Song"

A SECOND broadcast of wild bird life has been arranged by the B.B.C.'s Outside Broadcast Department for May 15th. By then more migrants should have arrived in this country and the nesting season will have progressed, so that it is hoped to broadcast the song of a greater variety of birds than that previously heard by listeners.

A quiet copse in Suffolk, with a stream running alongside, has again been chosen. This affords heathland, marsh, and the reeds of the stream—an excellent spot for the different kinds of birds to be found in the English countryside at this time of the year. The seclusion of the place chosen should ensure freedom for the microphones to pick up the song of the birds without the intrusion of too many mechanical noises which spoil a nature broadcast of this type.

### THE CYCLIST.

The leading weekly for every Cyclist, Clubman, Utility Cyclist, or Tourist. Join "The Cyclist" Road Club and also take advantage of the FREE Insurance offered. 2d.—Every Wednesday.



# Short Wave Section

## MAKING COIL FORMERS

A Novel and Inexpensive Method of Making Small Formers for S.W. Coils.

**R**EQUIRING some low loss coil formers for short-wave working, I set about making them in the following manner.

Procuring some inch-wide gummed paper tape, such as is used for securing parcels, I cut off twelve inches, and after thoroughly damping it, wound it carefully around an ordinary lead pencil, gummed side out, first having rubbed the pencil with a candle.

in the exact centre of each of the flat sides, finishing the former as previously described.

It was now found that the corners of the triangular pencil were too rounded, and those of the tube more so. The remedy was obvious: just sharpen them.

I then shaped a length of half-inch dowelling with knife edged corners, leaving sufficient for a hand hold.

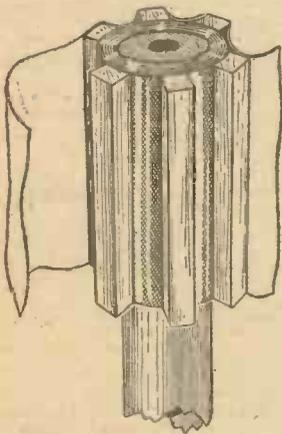


FIG. 1

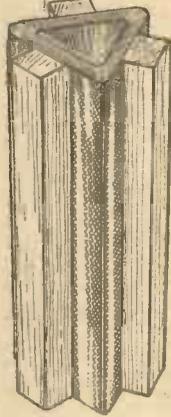


FIG. 2

Figs. 1 and 2 Show the methods of building up the short-wave coil formers.

Having made several tubes in this manner, and setting them aside to dry, I cut a number of match sticks each one inch long. By this time the tubes, which had been placed on the hob, were dry, on the outside at least, so placing one back on to the pencil, I lightly smeared Seccotine all over it, and then placed match sticks at equal distances on the tube to form ribs. Four of these were found not to give enough clearance, but five and six did so admirably, the result being as in Fig. 1.

### Securing the Ribs

To make certain that the match stick ribs should remain fast, a couple of inches of the gummed tape, was, after being rendered thoroughly limp by moistening, rubbed into intimate contact with the contour of the former, just once round, the surplus being cut off.

After thoroughly drying the former was dipped bodily into thick shellac varnish and after draining was set aside to harden, the result being a damp-proof, efficient, and cheap, job.

Now this rib business is not so easy as it sounds if it is desired to have them at mathematically even distances apart, and perfectly parallel, so having obtained a three-sided pencil I made a tube by wrapping the same length of gummed tape around it.

Ribbing now was easy with three of them already formed: all that now remained to be done was to stick another rib

## SHORT-WAVE AERIALS

**A**ERIALS for short-wave use generally require much more care in their selection and installation than standard aerials, and especially does this apply when going down to the ultra-short wavebands. For television purposes a vertical aerial must now be used, and where a reflector is also employed to increase the signal/noise ratio a good mast becomes essential. In this connection the wooden lattice mast should be adopted, and the accompanying illustrations give some idea of the lines upon which it should be built up, using standard scantlings for the assembly with good galvanised bolts to hold the various sections together. The aerial will, of course, have to be attached to the top of the mast before it is erected, but this will prove quite a simple matter, as the wooden structure will not provide any screening or other ill effects. The mast should be assembled on the ground and pulled up into a vertical position by good tackle, and it will be found that

two people can manage this quite easily. When in position, guy ropes should be used and if galvanised wire is adopted for this purpose insulators must be inserted in the guys at distances of about 5 or 6ft. so that no screening or absorption effects will be produced in the guys. The type of mast illustrated and referred to will only cost about 30s. for a total height of approximately 35ft.

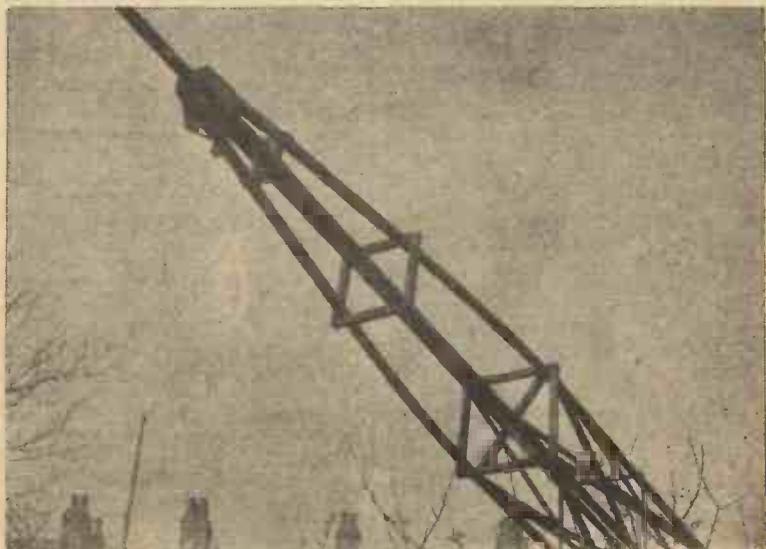
Oregon pine is obtainable from most timber depots and will withstand climatic conditions in this country fairly

well. The mast may be treated with creosote or carriage varnish if a more pleasing appearance is desired. To provide a firm base the dimensions at the lower end should be at least 2ft. 6in. square and additional rigidity will be obtained if a square of concrete that size is first laid down where the mast is to stand.



A lattice mast in position.

Thoroughly impregnating this contraption with molten paraffin candle, repeating the operations as previously mentioned and the perfect former was achieved. Fig. 2 gives a general view of the triangular coil former in its finished condition, and in Fig. 1 the round coil former is seen with the finishing strip being placed in position.—A. W. B.



Raising the mast into position.

# ELECTRADIX

**A BARGAIN IN DYNAMOS.** Type "V." Our latest for Bungalow, Yacht, or Cell Charging. 140 watt. Enclosed Dynamo, 12-20 v. 12 amps. Ball Bearings, Vee Pulley, Switchboard with Ammeter, maximum and minimum Auto Cutout Mains Switch and Fuse, Field Regulator, 65/- the set.

**KITS.**—For Short-wave Battery valve Receivers, polished oak, 13 1/2 in. x 7 in. x 6 1/2 in. oval front, crackle black panel fitted geared .0005-mfd., sunk dial, 3-way coil switch and a single plate vernier condenser, and 10 terminal strip, new stock, 15/-.

**S.W. COMPONENTS.**—Coils 1/9. Formers 1/-, Chokes 9d. Ceramic Valveholders 1/4. Crossfeeder aerial blocks 6d. Beehive Insulators 6d. Glass insulators 6d. Frequentite 6 in. rods 8d. Screened flex 4d. yd. Twin 6d. yd. **SLOPE FRONT TEAK CABINETS.** New, make fine instrument panel, 10 in. x 7 in. x 11 in., 3/- each.

**NEW PANELS.** Polished aluminium, 18 and 16 gauge, bright or enamelled, 12 in. x 12 in., 3/-. 18 in. x 18 in., 5/6. Ebonite 1 in. panels 2d. in. x 2 1/2 in. for 6/6.

**SMALL A.C. MAINS MOTORS.**—Enclosed self-start. A.C. 1/50 h.p. with pulley. Type 40, 1,500 revs., 18/6. Type 36, Ditto, 1,250 h.p. O.E.C., 3,500 revs., 27/6. Induction. 1/10 h.p., 2,500 revs., 35/-. 1/4 h.p. self-starting, 1,495 revs., 45/-.

**SMALL D.C. MAINS MOTORS.**—1/40 h.p., Type 60, 220 v., K.B. series, 1,750 revs., 15/-. Ditto, 1/40 h.p., G.E.C., 230 v. series, 2,000 revs., 16/-. Ditto, 1/12 h.p., Croydon 110 and 230 v. shunt, 1,700 revs., 30/-. M.G. for A.C., 220 v. to 100 v., 1 amp. D.C., 60/-, 100 v. 15/-. All fully guaranteed.

**ROTARY CONVERTERS** for A.C. sets on D.C. mains. 7-watt P.M. model, 35/-; 15-watt 220 D.C./220 A.C., ball bearings, lam. field, silent running, enclosed, 65/-; Larger sizes 50 watts, 100 watts and 200 watts to 3 k.w. M.G. D.C. 220 v. to 6 v. 5 amps., 65/-; **DOUBLE CURRENT GENERATORS,** D.C., 600 watts 100 m/a., and 6 volts, 3 amps., 25/-.

**D.C. D.C. PORTABLE MOTOR GENS.** for P.A. or Transmitters, 6 v. to 150 v. 25 m.a., 55/-; 6 v. Input, 500 v. 25/30 m.a. output, 57/8. 6 v. 100 v. 75 m.a., 62/6. 12 v. to 1,000 v. 75 m.a., 65/-; 25 v. to 1,400 v. to 1 amp., 45/10/-; Special Bargain: Eight M.L. D.C./D.C., 40 watts, 210/230 v. to 400 v. 100 m.a., to clear at 50/- each. All as new. Smaller size, 220 v. to 100 v. 30 m.a., 27/8; unused.

**WIND GENERATORS.** Slow-speed, enclosed, 6 to 12 volt 10 amp. ball-bearing generators for windmills, 35/-.

**GRAMO-MOTORS.** Garrard Universal A.C./D.C. with turntable and auto switch, 43/10/-; B.T.H. Universal Model Y.M. turntable and autostop, 45/-; Gramo-motors and turntables, H.M.V. 110 volts, 25/-; 230 volts, 37/6.

**MOVING-COIL MICRO AMMETERS** for Panels, 1 m/amp per div., 0 to 50 microamps, full scale, 50 m.v. moving coil, 1,000 ohms, flush panel, 2 1/2 in. dial, 40/-; 2,000 Meters. All sizes in stock. **METERS.** Weston Central zero 1 to 15 amps., flush panel, 2 1/2 in. dial, nickel or black. Sale price 5/6. Hoyt CZ mov. coil milliammeters, 25-0.27 m.a., 10/-; Weston 5, 20 and 50 m.a., 0-100 m.a. mov. coil milliammeters, 17/6. 0-3 m.a., 25/-; Switchboard Meters, all sizes in stock.

**LESDEX ELECTRIC PUMPS** for A.C. or D.C. mains. Centrifugal, all-bronze pump, 3 ft. lift, 120 gallons per hour. For 6 ft. fountain, etc. Price 67/6. Supplied in strong case for 5/- extra. Larger pumps quoted for.

**LESDEX AIR COMPRESSORS** for paint, set cleaning, inflation, etc. Foot-operated, 45/-; Electric, No. 1 size, 55 15/-; No. 2, twin-cylinder, 27/10/-; A few S.H. plants, in good order, cheap.

**FIXED CONDENSERS** for odd smoothing jobs, 5,000 Mansbridge 1 mfd. Condensers to clear at 2/- doz., 20/- gross. Large range of H.T. Condensers up to 8,000 volts.

**PARCELS** of experimental odd coils, magnets, wire, chokes, switches, terminals, etc., 10 lbs., 7/-; 7 lbs., 5/-.

Our May Sale List of 15 Foolscap pages has over 100 illustrations of Electrical and Radio Bargains not obtainable elsewhere. Free for stamped envelope.

**ELECTRADIX RADIOS**

218, Upper Thames Street, London, E.C.4

Telephone: Central 4611

When writing to Advertisers please mention "Practical and Amateur Wireless"

## EVERYTHING RADIO SUPPLIED FOR CASH OR ON EASY TERMS

Item	Cash Price			De-posit	Monthly Payment
	£	s	d		
S.T.900 Complete Kit	5	15	3	10/-	11 of 10/7
W.B. Stentorian Senior 388	2	2	0	2/6	11 of 4/-
Garrard A.C.6 Radiogram Unit	3	15	0	5/6	11 of 7/-
Garrard A.C.6 Motor only	2	8	6	4/-	10 of 4/3
Rothermel Piezo - Electric Pick-up	2	2	0	4/-	10 of 4/3
Avonminor Test Meter	2	6	0	5/-	10 of 4/8
Goodman's L.S. Twin-Cone Unit	3	10	0	0/6	11 of 6/5

**CASH or C.O.D.** ORDERS DELIVERED BY VEHICLE OR BY POST. We can guarantee such prompt delivery only because we carry large stocks and, being placed so favourably, we are able to secure anything Radio or Electrical immediately.

Write us your requirements - we will quote best terms by return.

5 MINUTES FROM STRAIP

**LONDON RADIO SUPPLY COMPANY** 1925

11, OAT LANE, NOBLE ST. LONDON, E.C.2.

Phone: NATIONAL 6828-9

# Radio Clubs and Societies

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

## RADIO, PHYSICAL AND TELEVISION SOCIETY

At a meeting of the above society, held on Friday, April 20th, Mr. E. K. Corbett, of Messrs. Thomson, Alston & Co., Ltd., delivered a most interesting lecture entitled "The Organisation of the Rubber Plantation Industry."

Mr. Corbett began by describing briefly the history of rubber from the time when early travellers in the Amazon Valley first observed natives playing with rubber balls, until the present day when rubber is produced in most tropical countries except Brazil, the home of the rubber tree, where for some time past the quantities produced have been of little importance.

The lecturer gave a description of the rubber tree from the botanist's point of view and went on to explain methods of planting, tapping and smoking. Modern methods of increasing the yield of a plantation such as bud-grafting and hand-pollination were also dealt with. Mention was made of the International Rubber Restriction Scheme. Bearing in mind the fact that the total capital of all the rubber companies exceeds £120,000,000, exclusive of the Dutch companies, whose capital must be just as large, and remembering that there are thousands of small plantations of half to three-quarters of an acre entirely in native hands, the fact that any restriction scheme at all is possible is something to be marvelled at.

Hon. Sec., C. W. Edmans, 72a, North End Road, West Kensington.

## DOLLIS HILL RADIO COMMUNICATION SOCIETY

On April 26th an exceptionally interesting talk was given by Mr. C. C. Bradley on Amateur Radio, in which he described his early experiences and the growth of G8KZ. A 15-valve all-wave receiver was on view, together with a 5-metre crystal-controlled transmitter, and Mr. Bradley explained in detail the operation of both these exhibits.

This society caters for all those interested in radio of any description, and the members are now planning the building of a laboratory containing test equipment of all types for the use of members. The next meeting will be held on May 17th at 8.15 p.m. at Brainercroft Schools, Warren Road, London, N.W.2, and thence fortnightly. On this date Mr. S. C. Ash will give a talk "From Microphone to Loudspeaker."

Full details of the society will be sent on application to the Hon. Sec., Mr. E. Eldridge, 79, Oxgate Gardens, Criklewood N., W.2.

## LONDON TRANSMITTING SOCIETY

In a recent lecture entitled "The Design of Antennae for Radio Transmitters," our secretary explained that all aerials were derivatives of three main types, the Marconi, Hertz, and the Terminated Aerial.

The society has applied to G.P.O. for transmitting licence. We would like to receive Q.S.L. Card when membership is applied for. Membership is free to transmitting licence holders and badges are 2s. each. We have applied to R.S.G.B. for affiliation, and have also offered our services to the A.R.P. officer. Kindly enclose stamp when applying for membership. We meet every Thursday at 8 p.m. Hon. Sec., G. Yale, 40, Raeburn Road, Edgware.

## SOUTHEAST AND DISTRICT RADIO AND SCIENTIFIC SOCIETY

At the termination of a very successful winter session, the annual dinner and dance of the society was recently held at the London Hotel. During his speech, Mr. J. W. Burrows, J.P., congratulated the society upon their achievement in providing and maintaining for many years a comprehensive radio installation in the Southeast General Hospital, and in his reply the chairman, Mr. J. B. Petch, emphasised that this, the 18th consecutive year of the society's existence, had been one of steadily increased activity.

Four open-air summer meetings, comprising direction-finding tests both on 1.7 mc/s and 50 mc/s have already been arranged, the first two take place on May 15th and June 20th, when visiting parties from other clubs will be welcomed. A silver cup for the best performance in these tests was won last year by Mr. L. G. Pugh, and was presented to him at the annual dinner. Hon. Secretary, J. M. S. Watson, 23, Eastwood Boulevard, Westcliff-on-Sea, Essex.

## EASTBOURNE AND DISTRICT RADIO SOCIETY

A meeting of the above society was held in the Science Room, Cavendish Senior School, on April 25th, when it was decided that the construction of the 5-metre transmitter should be entrusted to Mr. E. Wingfield (G3CX).

By general consent, meetings will now be held at fortnightly intervals, the post of secretary being occupied by Mr. T. G. Dowsett, of 43, Grove Road, Eastbourne.

The next two meetings of the society are as follows:

May 30th—"Short-wave Radio Reception" by a representative of Messrs. Belling-Lee.  
June 13th—Tuning up of the 5-metre set by the members.

## THE EXETER AND DISTRICT WIRELESS SOCIETY

At the last meeting of this society held on Monday, April 25th, the society's new amplifier was under test. This particular evening proved most instructive as several minor faults came to light in the amplifier, and the members thoroughly enjoyed themselves in having these faults put right by some of the more technical-minded persons present. It was shown that the reproduction which could be expected when the amplifier was complete, is of a very high order.

Meetings are held each Monday, at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivel Place, Heavitree, Exeter.

## THE BOOTLE AND DISTRICT AMATEUR TRANSMITTING CLUB

This club offers unique advantages to any persons in the district interested in the following subjects:

1. Amateur transmitting.
2. Short-wave radio reception.
3. Quality and/or high power amplifiers.
4. General radio engineering.

A radio course for beginners will soon be started, and every help given to persons wishing to start on short-wave radio.

You are invited to write to the Hon. Secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20, for application forms and any particulars, relating to the activities of the club.

## THE EAST DORSET AND WEST HANTS RADIO CLUB

The following are the arrangements for the next meetings of the above club:

Wednesday, May 18th: Demonstration by Lissen, Ltd.; Wednesday, June 1st: Discussion on DX Contest; Wednesday, June 15th: A visit to Dorchester Beamstation.—David M. Williams, Org. Sec., Amberley Cornwall Road, Poole, Dorset.

## WORTHING AND DISTRICT SHORT-WAVE CLUB

On Sunday, April 24th, the above club held its first out of doors listening test on the Downs near Worthing, and although this could not be called completely successful, several useful lessons were learnt and it is hoped that another test will be held in the near future. Although this club was started as a "Junior" club, it has now been decided, owing to several applications from prospective members over the age limit of 21, to drop completely this age bar, and now short-wave enthusiasts of any age are welcome.

The fact that our Morse instructor has had to leave Worthing has put the club in rather a quandary as the Morse classes have had to be suspended until a new Morse instructor can be found.

Club meetings are held every Wednesday, and during the summer will commence at 8 p.m., instead of 7 p.m.

Any enthusiast wishing to join should apply to the Hon. Sec., G. Lambourne (2DQI), 16, Angola Road, Worthing.

## NEWCASTLE RADIO SOCIETY

At the April meeting of the above club the hon. sec., Mr. G. C. Castle, demonstrated his recently built mains-unit, and several sets which had been previously battery supplied were tested and found satisfactory. Mr. Castle also showed how the tester published in PRACTICAL AND AMATEUR WIRELESS (Readers Wrinkles page), of November 6th, 1937, was capable of testing various components including large capacity fixed condensers. It was found that good condensers placed across the test sockets allowed the oscillations to discharge through the condenser, followed by silence in the 'phones, whereas those having internal short-circuits allowed the current to flow, thereby completing the circuit. It was agreed that the tester was useful in lieu of more complicated apparatus. Since the opening out of Stagshaw, with increased power and finer quality, several members have not been satisfied with their receivers and are now changing over to diode detection. The next meeting will be held on Sunday, May 15th, from 6 p.m. to 9.30 p.m. when a demonstration of diodes and A.V.C. action will be given. Readers of PRACTICAL AND AMATEUR WIRELESS are cordially invited to attend, and there is no charge.

Hon. Sec., Geo. C. Castle, 23, Sandringham Road, South Gosforth, Newcastle-on-Tyne, 3.

## THE WEST SUSSEX SHORT-WAVE AND TELEVISION CLUB

Owing to our chairman, Mr. L. Willard, having resigned, and the club's secretary, Mr. J. Williams, being drafted for service in Egypt, certain

(Continued on opposite page)



# LETTERS FROM READERS

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).

## A High-quality Amplifier

SIR,—I have made up the direct coupled amplifier described by Mr. Bonavia-Hunt, using the negative feed-back detector shown in Fig. 3 of his article. My valve sequence is AC/P for V1, V2, V3, and the output valve is a PX25.

After having tried every type of quality circuit, I can truthfully state that this one is easily the best. It is amusing to read the opinions of those who from mathematical calculations have convinced themselves that there must be a big drop well below 10,000 cycles. If this is so, how do they explain my having to filter out a heterodyne whistle at 9 kc/s, and also how it is that an engineer in one of our leading firms, having taken a response curve of this amplifier, finds that it is flat up to 10,000 cycles? It seems high time for our theorists to revise their views about the working characteristics of amplifying valves, as the entertainment value of this particular amplifier is undoubted, and its quality result far in advance of anything I have heard elsewhere.—J. CLARKE (Worcester).

## Station W10XAB

SIR,—Many readers may be interested to learn that excellent signals were received here from North-West Greenland between 06.45 and 07.45 B.S.T. on April 28th. Jerry Sayre, of the MacGregor Expedition, was then operating W10XAB on 14,380 kc/s and contacting amateurs on the west coast of North America.

W10XAB is located at Reindeer Point, some 600 miles from the North Pole, and its signals averaged R7 here on the loud-speaker of a six-valve superhet. Contacts were made with W6EJC, W7CVO, W6SV and W6MPS, and I was able to hear the two former replying, W7CVO actually peaking at R8. W10XAB gave the temperature as around zero, and said that the sun was shining outside—for twenty-four hours each day.

On May 1st, at 07.30, W2IXY was instrumental in getting a hook-up between W10XAB and VR6AY, and I heard Granville Lindley on Pitcairn Island sending greetings to Commander Swashback in Greenland. These two gentlemen, I learned, were once in closer company, when they were members of the Admiral Byrd Expedition in the Antarctic. VR6AY was received here at R5-6, but W10XAB was not audible on this occasion, though his phone signals were intelligible in Pitcairn, apparently.—REGINALD H. GREENLAND, B.Sc. (Barnsley, Yorks).

## Special Broadcast from TI4NRH

SIR,—Please note that station TI4NRH (Costa Rica), on 9,670 mc/s, is dedicating a special broadcast to me on the evening of May 17th. Should any reader hear this broadcast, I shall be glad if they will write

to me, and I shall be happy to acknowledge such reports.—W. A. DEAN, 55, Elm Street, Hartford, Connecticut, U.S.A.

## A Log from Northumberland: Correspondent Wanted

SIR,—In enclosing my log, may I mention that there are still some short-wave enthusiasts in this part of England.

On an 0-v-1 receiver of my own design, with an aerial of 50 ft. pointing directly westward, I have received at good strength the following 'phone stations:

On 10 metres:

CN8AV, 8JD, HI7G, SAICA, SU1CH, YR5AA, and many others.

On 20 metres:

CN8AL, 8AV, 8BA, 8MV, CT1QH, IQG, EA3SI, 3J, ES5D, I11Y, LA1G, LY1HB, ON4SS, 4VK, 4AR, OZ5BW, PAOWF, OMV, OMZ, OLR, RKI, SP1MR, 1FD, SA3HC, SM5YS. Also thirteen VE's, including VE1ID, 1EL, 3KL, and VO6J, 6L, V1BR, VLIX, YR5AA, 5CF, YT5MT, YV5AK.

I am 16 years of age, and would like to correspond with another enthusiast of the

CUT THIS OUT EACH WEEK.

# Do you know

—THAT coupling condensers used in band-pass circuits must be of the non-inductive type to preserve the band-pass characteristics.

—THAT to be fully effective, H.F. by-pass or decoupling condensers should also be of the non-inductive type.

—THAT in some cases an anti-microphonic valveholder may be found to increase troubles due to microphony.

—THAT where large screens are needed economy may be effected by using small mesh wire netting. The same material may be used to screen an entire room from outside interference.

—THAT a special H.F. screen between primary and secondary windings on an aerial transformer will reduce static and similar electrical interference.

—THAT the field surrounding an air-core coil is more extensive than that round an iron-core component.

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

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

Copyright in all drawings, photographs and articles published in PRACTICAL AND AMATEUR WIRELESS is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden.

same age. Every bit of my wireless knowledge was gained from your paper.—J. A. ALAN SHORT, Starling House, Choppington, Northumberland.

## RADIO CLUBS AND SOCIETIES

(Continued from previous page)

changes have been made in the personnel of the club's officers. Mr. C. J. Rockall (G2ZV), has been elected hon. sec.; the vice-chairman, Mr. E. C. Cosh, now occupies the chair. On Wednesday, April 13th, Messrs. Lissen, Ltd., gave the club a very interesting lecture and demonstration of their HI-Q components, etc. On Wednesday, April 27th, a further interesting address and demonstration of "AVO" instruments was given by The Automatic Coll Winder and Equipment Co., Ltd.

A further address and demonstration will be given by Messrs. Weston early this month, and members will be notified of the date, time, and place.

Particulars of membership for this club are obtainable from Mr. C. J. Rockall (G2ZV), "Aubretia," Seafield Road, Rustington, Sussex.

## SLOUGH AND DISTRICT, SHORT-WAVE CLUB

At the meeting held on April 26th we were pleased to note that the attendance had risen somewhat, but still not enough to be satisfactory.

The chief item of the agenda was the discussion on the future and policy of the club. The chairman, and others, mentioned instances of other clubs in a similar position to our own, and it was finally decided that all we could do was to continue as before and attempt to make the meetings as attractive as possible. Mr. Sly followed with a lecture on A.F. couplings, and 2DDG, with the assistance of G6PR, demonstrated a T.P.T.G. oscillator link-coupled to an artificial aerial. Special attention was drawn to the optimum coupling of the A.A.

Interested readers of PRACTICAL AND AMATEUR WIRELESS are invited to come to our next meeting. The secretary will also be pleased to welcome any radio fan at the address given.—J. H. White (2DAJ), 20, Chalvey Road, Slough.

## WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB

THE above club is to produce its own monthly bulletin, which will be circulated to members free of charge. Transmitting and other members are asked to supply interesting articles, and among those who have already promised to do so is Mr. W. E. Corbett, A.M.I.W.T., A.M.I.R.E. At the last meeting of the club, Mr. R. Cumberland (G3CK) delivered an interesting talk on "Antennas," giving many useful formulae. Secretary: J. R. Williamson, 13, Harrow Grove, Bromborough.

## TELEVISION IN FRANCE

ACCORDING to the latest reports, the tests now being undertaken in connection with the recently inaugurated French television service are proving that the equipment installed in Paris is satisfactory. The radio transmitter itself was made of a sufficiently flexible nature to accommodate itself to any type of scanning and definition within quite widely separated limits, but it is understood that the method of picture modulation is positive, as in this country. That is to say, an increase in signal modulation corresponds to an increase in picture brightness while D.C. lighting is incorporated in the radiated picture signal. It will be interesting to see what extension in service range is secured when the full peak power output of 30 kilowatts is used in lieu of the present 15 kilowatts. The two television studios equipped with modern electron camera apparatus are situated 1½ and 3 miles from the transmitter itself, and coaxial cables provide the necessary links for this purpose. Since the picture signal has a modulation frequency of zero to 2.5 megacycles it is transmitted by means of an impressed high-frequency carrier on the line, the total transmitted band being from 3 to 8 megacycles, since the carrier is 5.5 megacycles. In installing the feeder cable which connects the radio transmitter at the base of the Eiffel Tower with the aerial positioned at the summit—over 1,000 feet high—great care had to be exercised to prevent any fault occurring from expansion and contraction of the tower itself, and also from any measure of sway that occurs with high winds. Only time will tell how successful has been this engineering feat.

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		No. of	Universal £5 Superhet (Three-		
CRYSTAL SETS		Blueprint	valve)		
Date of Issue.			F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW44
Blueprint, 6d.			F. J. Camm's Universal £4 Super-		PW50
1937 Crystal Receiver	9.1.37	PW71	bet 4		PW60
<b>STRAIGHT SETS. Battery Operated.</b>					
One-valve : Blueprints, 1s. each.					
All-wave Unipen (Pentode)		PW31A	"Qualitone" Universal Four	16.1.37	PW73
Beginner's One-valver	19.2.38	PW85	<b>SHORT-WAVE SETS.</b>		
Two-valve : Blueprints, 1s. each.					
Four-range Super Mag Two (D, Pen)		PW36B	One-valve : Blueprint, 1s.		PW88
The Signet Two (D & LF)	20.8.36	PW76	Simple S.W. One-valver	9.4.38	PW88
Three-valve : Blueprints, 1s. each.					
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2	Midget Short-wave Two (D, Pen)		PW38A
Selectone Battery Three (D, 2 LF (Trans))		PW10	Three-valve : Blueprints, 1s. each.		PW30A
Sixty Shilling Three (D, 2 LF (RC & Trans))		PW34A	Experimenter's Short-wave Three (SG, D, Pow)		PW30A
Leader Three (SG, D, Pow)	22.5.37	PW35	The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
Summit Three (HF Pen, D, Pen)		PW37	The Band-Spread S.W. Three (HF Pen, D (Pen) Pen)	20.8.36	PW68
All Pentode Three (HF Pen, D (Pen), Pen)	20.5.37	PW39	<b>PORTABLES.</b>		
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41	Three-valve : Blueprints, 1s. each.		PW65
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48	F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)		PW77
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49	Parvo Flyweight Midget Portable (SG, D, Pen)	10.6.37	PW77
Genet Midget (D, 2 LF (Trans))	June '35	PW1	Four-valve : Blueprints, 1s. each.		PW12
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51	Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)		PW53	"Imp" Portable 4 (D, LF, LF, Pen)	10.3.38	PW86
Battery All-Wave Three (D, 2 LF (RC))		PW55	<b>MISCELLANEOUS.</b>		
The Monitor (HF Pen, D, Pen)		PW61	S.W. Converter-Adapter (1 valve)		PW48A
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62	<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
The Centaur Three (SG, D, P)	14.8.37	PW64	<b>CRYSTAL SETS.</b>		
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	20.8.36	PW66	Blueprints, 6d. each.		
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69	Four-station Crystal Set	12.12.36	AW427
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72	1934 Crystal Set		AW444
The "Rapid" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82	150-mile Crystal Set		AW150
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78	<b>STRAIGHT SETS. Battery Operated.</b>		
1938 "Tri-band" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84	One-valve : Blueprints, 1s. each.		
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87	B.B.C. Special One-valver		AW387
Four-valve : Blueprints, 1s. each.			Twenty-station Loudspeaker One-valver (Class B)		AW449
Sonotone Four (SG, D, LF, P)	1.5.37	PW46	Two-valve : Blueprints, 1s. each.		
Fury Four (SG2, D, Pen)	8.5.37	PW11	Melody Ranger Two (D, Trans)		AW388
Delta Universal Four (SG, D, LF, Cl. B)		PW17	Full-volume Two (SG det., Pen)		AW392
Nucleon Class B Four (SG, D, (SG), LF, Cl. B)	6.1.34	PW34B	B.B.C. National Two with Lucerne Coil (D, Trans)		AW377A
Fury Four Super (SG, SG, D, Pen)		PW34C	Big-power Melody Two with Lucerne Coil (SG, Trans)		AW338A
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull)		PW40	Lucerne Minor (D, Pen)		AW426
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67	A Modern Two-valver		WM409
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79	Three-valve : Blueprints, 1s. each.		
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83	Class B Three (D, Trans, Class B)		AW386
<b>Mains Operated.</b>					
Two-valve : Blueprints, 1s. each.			New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
A.C. Twin (D (Pen), Pen)		PW18	Home-built Coil Three (SG, D, Trans)		AW404
A.C.-D.C. Two (SG, Pow)		PW31	Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
Selectone A.C. Radiogram Two (D, Pow)		PW10	£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
Three-valve : Blueprints, 1s. each.					
Double-Diode-Triode Three (HF Pen, DDT, Pen)		PW23	1934 Ether Searcher; Baseboard Model (SG, D, Pen)		AW417
D.C. Ace (SG, D, Pen)		PW25	1934 Ether Searcher : Chassis Model (SG, D, Pen)		AW419
A.C. Three (SG, D, Pen)		PW29	Lucerne Ranger (SG, D, Trans)		AW422
A.C. Leader (HF Pen, D, Pow)		PW35C	Cosor Melody Maker with Lucerne Coils		AW423
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B	Mullard Master Three with Lucerne Coils		AW424
Ubique (HF Pen, D, (Pen), Pen)	23.7.34	PW36A	£5 5s. Three : De Luxo Version (SG, D, Trans)	19.5.34	AW435
Armada Mains Three (HF Pen, D, Pen)		PW33	Lucerne Straight Three (D, RC, Trans)		AW437
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50	All-Britain Three (HF Pen, D, Pen) "Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
"All-Wave" A.C. Three (D, 2 LF (RC))		PW54	Transportable Three (SG, D, Pen)		WM271
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)		PW56	£6 6s. Radiogram (D, RC, Trans)		WM318
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70	Simple-tune Three (SG, D, Pen)	June '33	WM327
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80	Economy-Pentode Three (SG, D, Pen)	Oct. '33	WM337
Four-valve : Blueprints, 1s. each.			"W.M." 1934 Standard Three (SG, D, Pen)		WM351
A.C. Fury Four (SG, SG, D, Pen)		PW20	£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
A.C. Fury Four Super (SG, SG, D, Pen)		PW34D	Iron-core Band-pass Three (SG, D, QP21)		WM362
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45	1935 £6 6s. Battery Three (SG, D, Pen)		WM371
Universal Hall-Mark (HF Pen, D, Push-Pull)	0.2.35	PW47	PTP Three (Pen, D, Pen)	June '35	WM389
A.C. All-Wave Corona Four	6.11.37	PW81	Certainty Three (SG, D, Pen)		WM393
<b>SUPERHETS.</b>					
Battery Sets : Blueprints, 1s. each.			Minutube Three (SG, D, Trans)	Oct. '35	WM396
£5 Superhet (Three-valve)	5.6.37	PW40	All-Wave Winning Three (SG, D, Pen)	Dec. '35	WM400
P. J. Camm's 2-valve Superhet	13.7.35	PW52	Four-valve : Blueprints, 1s. 6d. each.		
F. J. Camm's £4 Superhet		PW53	65s. Four (SG, D, RC, Trans)		AW370
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75	"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
Mains Sets : Blueprints, 1s. each.			2HF Four (2 SG, D, Pen)		AW421
A.C. £5 Superhet (Three-valve)		PW43	Crusader's A.V.C.4 (2HF, D, QP21) (Pentode and Class B Outputs for above : Blueprints, 6d. each)	18.8.34	AW445
D.C. £5 Superhet (Three-valve)	1.12.34	PW42	Self-contained Four (SG, D, LF, Class B)	25.8.35	AW445A

These Blueprints are drawn full size. Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the Blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless ... 4d. Post Paid  
 Amateur Wireless ... 4d. ..  
 Practical Mechanics ... 7d. ..  
 Wireless Magazine ... 13. ..

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

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

New Class B Five (2 SG, D, LF, Class B)	Nov. '33	WM340
<b>Mains Operated.</b>		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.		AW403
Economy A.C. Two (D, Trans) A.C.		WM286
Unicorn A.C.-D.C. Two (D, Pen)		WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.		AW333
S.G. Three (SG, D, Pen) A.C.		AW390
A.C. Triodyne (SG, D, Pen), A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)		WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386
<b>SUPERHETS.</b>		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior		WM375
Varsity Four	Oct. '35	WM395
The Request All-Waver	June '36	WM407
1935 Super Five Battery (Superhet)		WM370
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.		AW425
Heptode Super Three A.C.	May '34	WM350
"W.M." Radiogram Super A.C.		WM366
1935 A.C. Stenode	Apr. '35	WM385
<b>PORTABLES.</b>		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW330
Holiday Portable (SG, D, LF, Class B)		AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)		WM367
<b>SHORT-WAVE SETS—Battery Operated</b>		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)		AW320
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver		AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)		AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)		AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen)	Jan. 10, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)		AW436
Empire Short-Waver (SG, D, RC, Trans)		WM313
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	Nov. '35	WM397
<b>Mains Operated.</b>		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.		AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.		WM368
"W.M." Long-wave Converter		WM380
Three-valve : Blueprints, 1s.		
Emigrator (SG, D, Pen) A.C.		WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short waver (SG, D, RC, Trans)	Aug. '35	WM391
<b>MISCELLANEOUS.</b>		
Enthusiast's Power Amplifier (1/6)	June '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)		WM392
Radio Unit (2v) for WM392	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New Style Short-Wave Adapter (1/-)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter (1/-)		AW456
Superhet Converter (1/-)		AW457
B.L.D.L.C. Short-wave Converter (1/-)	May '36	WM405
Wilson Tone Master (1/-)	June '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)		WM408



# QUERIES and ENQUIRIES

## H.F. Transformers

"In reference to Circuit 11 in your Fifty Tested Circuits, could I use plug-in coils, or could you give me any directions how to make an H.F. transformer? I have had a job to get one in our district, and I have been told they are getting out of date."  
—T. W. (Gillingham).

ALTHOUGH plug-in coils could be used (adopting the layout shown on page 151 in our issue dated April 23rd last), any modern coil may be used in the circuit in question. The majority of standard coils now on sale have primary and secondary windings, with the addition of a reaction winding and these are known as H.F. transformers with reaction. You will find suitable components in the Varley, Wearite, or Bulgin ranges. You have been wrongly informed that these coils are getting out of date.

## Accumulator Maintenance

"Recently I had an accumulator given to me which my local radio dealer assures me is in good condition. I had it cleaned and new acid put in. About three weeks ago I noticed that the negative terminal was very stiff to turn. Since then the sulphate has accumulated, despite my efforts to keep it clear. There is no trace of it on the plates. Is there any chemical with which I could treat the terminal and dissolve the sulphate? Or is there any other remedy?"—A. D. B. (Coventry).

THE terminal should be unscrewed and all metallic parts well cleaned by means of a rag dipped in ordinary ammonia. This will remove all traces of the corrosion, and when perfectly clean the terminal should be replaced after smearing all exposed parts with ordinary vaseline. If the corrosion has extended to the threads of the terminal, an old toothbrush should be used to get the ammonia into contact with the deposit. When the battery lead is attached to the terminal, screw it up tight and then smear again with vaseline so that all exposed metal is protected from the fumes and spray from the cell.

## H.T. Drop

"I was examining a circuit in one of your back numbers recently, and was puzzled by the fact that the detector anode circuit contained a 100,000-ohm resistance. I fail to see how such a circuit could work efficiently in view of the huge voltage loss which must occur through such a resistance. Perhaps you could give your explanation of the use of such an unusual component?"  
—G. E. F. (Rickmansworth).

THERE are two points to consider when choosing the anode load resistance. We presume, of course, that the resistance in question was a load and used for a detector which was R.C. coupled to the following valve. Presumably also the valve was an S.G. or H.F. pentode type.

To enable a valve of this type to give satisfactory amplification a high anode load is desirable, and when reduced below a certain value the amplification falls

off rapidly. Therefore, in order to obtain best results we must employ a high resistance. Unfortunately, as the value of the resistance is increased the H.T. falls off and there is thus a limit imposed as to the value which we can use. In the case in question the anode current will be less than 1 mA and the voltage drop through 100,000 ohms will be, therefore, less than 100 volts. By using a 150-volt H.T. battery we can still obtain a useful H.T. voltage consistent with a fair degree of amplification. A reduction in the value of the resistance will enable more H.T. to be applied to the valve, but the amplification will be less and thus there will be nothing gained.

## Flexible Drives

"I have built the Acme receiver and am extremely pleased with the results. I now wish to use this as a radiogram, and am trying to fit it in a 'surplus' gramophone cabinet which I have purchased. This has a receiver panel which is removable,

### RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender. Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

mounted at the side of the turntable, and I do not find room to mount the receiver on its side here. Is there any way in which I can drive the dial with the receiver down in a normal position, but with controls on the panel which is provided?"—G. E. (Barnet).

WE presume that you do not wish to cut the front of the cabinet, and if you wish to operate all six controls by remote methods it will be expensive. If possible, we would recommend that you mount the set in a normal position above the speaker fret, and put five of the controls on the cabinet front, leaving out the tuning control and dial. This may then be mounted on the panel referred to, and you could drive the condenser from that point through almost any angle by means of the new Eddystone flexible coupler. This is supplied in a 5½ in. length, but, no doubt, a longer cable could be supplied to order if you need it. The price is 3s. 6d. complete with coupling bush and one-hole fixing drive of standard dimensions.

## Cutting Top Notes

"I have just replaced my output valve by an economy pentode, but am very dis-

appointed with the reproduction. Admittedly, the volume is better, but the tone is too high-pitched and screechy. I have not altered anything else, and wonder if the loudspeaker is not now matched correctly. Perhaps you could explain the point and tell me the best way to improve the set."—T. E. (Cardiff).

ALTHOUGH the speaker may not be matched the trouble is no doubt due to the fact that the pentode reproduces the high notes better than the older valve. Many listeners dislike the tone of the pentode valve and you must fit a tone control circuit in order to reduce the high-note amplification. The best way to do this is to fit a fixed condenser and a resistance across the speaker, the most suitable values being .01 mfd. and 10,000 ohms. The resistance should be of the variable type and one side should be joined to the H.T. positive line whilst the other should be attached to the fixed condenser, the other side of which should be joined to the other side of the speaker. You can then adjust the resistance to give the required degree of high-note cut-off.

## M.W. Breakthrough

"I have just obtained a commercial set which was going cheap, but find that on the long waves I can still hear some of the medium-wave stations. On the medium waves performance is good. The set is H.F., Detector and L.F., and the coils are in a unit and screened. What is the best anti-breakthrough choke to make up to prevent the trouble?"—G. A. (Bodmin).

AT your address we think it unlikely that medium-wave breakthrough is responsible for the trouble. This is usually only experienced in close proximity to a powerful station, and it is more than likely that your trouble is due to faulty wave-change switching. The switch usually employed for wave-change purposes short-circuits a section of a coil on medium waves and should be quite open on long waves. If the switch only opens on one coil it is possible to obtain long waves on that coil and still get medium waves on the other, and this, naturally, gives the same effect as breakthrough. We suggest that you check the resistance across the tuning condenser in each stage with the switch in both positions when you will, no doubt, be able to check whether the switch is functioning correctly.



## Replies in Brief

The following replies to queries are given in abbreviated form either because of non-compliance

with our rules, or because the point raised is not of general interest.

J. J. G. (Glasgow). We have no set specially designed for your purpose, but you could use the set referred to. The Kit A costs 42s., and the set is for loudspeaker use.

R. T. (Ripponden). We regret the loss—only one condenser is needed, of course. You must keep the volume control down or selectivity is bound to be poor. You should remember that the set is an "all-round" design and naturally something has to be sacrificed in order to provide the short-wave ranges.

T. W. H. (Goole). The circuit is exactly similar, the tuned grid circuit taking the place of the secondary of the I.F. transformer.

J. P. (Leeds, 8). The condensers may be used in the set as suggested by you.

G. W. (Loughton). We cannot supply a circuit using the valves you mention and can only guarantee our sets when you use parts and valves as specified by us. We suggest you consider the Prefect S.W. Three, omitting the last stage if you only require two valves.

The coupon on Cover iii must be attached to every query.

## Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

# RADIOMART

## SPECIAL BARGAIN OFFERS

**W.B. 8" Permanent Magnet Speakers at One-third Cost.**

Extension Type (no transformer) 7/6 Standard Type (with transformer) 12/6

**GARRARD SENIOR AUTOMATIC RECORD CHANGER**  
Standard 12 guinea model, but fitted with high fidelity Piezo Crystal Pick-up. Only a few left. £4.12.6

### SHORT-WAVE CATALOGUE

New Edition with dozens of new lines. 1/6d. post free.

### GENIE'S 66-PAGE MANUAL

The greatest value and most comprehensive Manual ever published in this country. 7/6d. post free.

# RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

**CONVERSION UNITS** for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components.

**WARD**, 46, Farringdon Street, London, E.C.4.  
Telephone: Holborn 0703.

**25 ONLY FOR SALE.**—3-valve kits with valves and diagram, 12/6; 3-valve 8/6 kits with valves and diagram, 20/-. Orders executed in rotation.—Universal Radio Co., 221, City Road, London, E.C.1.

**1938 RADIO** at 50 per cent. Discount. Components, Speakers, Receivers, etc. 1/6d. stamp.—**COULPHONE, ORMSKIRK.**

**ALL** goods previously advertised are standard lines, still available. Post card for list free.  
**VAUXHALL UTILITIES**, 163A, Strand, W.C.2  
Over Denny's the Booksellers. (Temple Bar 9338.)

**LATEST** Philco Brand-new all-wave Radio; 6v. A.C. mains. AG37 tube, 13 gns.; sacrifice, £6/15/0. P.337. Walnut Cabinet, battery 3v. list £8/15/0; sacrifice, £3/15/0, in maker's sealed cartons, fully guaranteed; money returned if not as represented. Few left, cash with order or C.O.D. Get list of other bargains.—Aston Radio Direct Supply Co., 261/3, Lichfield Road, Aston, Birmingham.

**BANKRUPT BARGAINS.** List free. All new goods—Philco battery 3-v all-wave 1938, £4. Brunswick 6-v 1938 battery all-wave superhets, £6 10s. Philco 5-v all-wave 1938 A.C. superhets, 95/-. Decca 5-v A.C./D.C. 1938 all-wave transportables, £5. Brunswick 1938 6-v all-wave 4-band A.C. superhets, 7 gns. Plessey 4-v battery superhet chassis, valves and speakers, 57/6. Many others.—Butlin, 6, Stanford Avenue, Brighton.

## LOUDSPEAKER REPAIRS

**LOUDSPEAKER** repairs, British, American, any make. 24-hour service, moderate prices.—Sinclair Speakers, Alma Grove, Copenhagen Street, London, N.1.

**REPAIRS** in Moving Coil Speakers, Cones and Coils fitted and Rewound. Fields altered. Prices Quoted including Eliminators, Loudspeakers repaired, 4/-; L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service, Estimates Free.—J.S. Repair Service, 5, Bailham Grove, London, S.W.12. Battsrae: 1321.

# PREMIER SUPPLY STORES

## POST ORDERS

Jubilee Works,  
167, Lower  
Clapton Rd.,  
London, E.5.  
Amherst 4723.

## CALLERS

165 & 165a,  
Fleet Street, E.C.4  
Central 2833.  
50, High Street,  
Clapham, S.W.4.  
Macaulay 2381.

Premier 90 Page Giant Illustrated Catalogue, Handbook and Valve Manual Now Ready, Price 6d.

## SPECIAL OFFER ROLA SPEAKERS.

8" P.M.'s, 15/-; 10" P.M.'s, 19/11; G.12 12" High Fidelity P.M., 79/6; G.12, Mains Energised, 57/6.

**U.S.A. GEN. E. MOTORS STEP-UP**, 12 volts to 285 volts at 06 amps. D.C. output. Complete in Metal Case 6in. x 5in. x 3in. 25/- each.

**BATTERY VALVES**, 2 volt, H.F., L.F., 2/3. Power, Super-Power, 2/9. Var-mu-S.G., 4- or 5-pin Pentodes, H.F. Pens, V-mu-H.F. Pens, 5/- Class B, 5/- Freq. Changers, 7/6.

**EUROPA MAINS VALVES**, 4v. A.C. Types, A.C./H.L., A.C./L., A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P., and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens, I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. Changers, 8/6; Double Diode Triodes, 7/6; Triode Hex. Freq. Ch., 8/6; Tri. Grid. Pen., 10/6; 3½ watt, D.H. Triodes, 7/6.

**UNIVERSAL TYPES**, 20v. 18a, S.G., Var-mu, S.G., Power, H.F. Pen., Var-mu, H.F. Pen., 4/6 each. 13v. 2a. Gen. Purpose Triodes, 5/6; H.F. Pens and Var-mu, H.F. Pens. Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

**AMERICAN VALVES.** We are sole British Distributors for TRIAD High-grade American Valves. All Types in stock. Standard types, 5/6 each. All the new Octal base Tubes at 6/6 each. 210 and 250, 8/6 each; 81 and 2A3, 8/- each.

**PREMIER COMPONENTS** for Economy "One-Valver" in April 30th issue. Complete Kit of Premier Parts with 2-volt valve and 4 coils, 23/6. Post Free.

**PREMIER TRANSFORMERS**, wire-end type with screened primaries, tapped 200-250 v. Filaments. Guaranteed one year. H.T. 8 & 9 or H.T.10 with 4 v. 4 a. C.T. and 4 v. 1 a., C.T., 10/- 250-250 v. 60 m.a., or 300-300 v., 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., 10/- 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., 13/- With engraved panel and N.F. terminals, 1/6 extra. 500-500 v. 150 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 21/- 500-500 v. 200 m.a., 5 v. 3 a., 4 v. 2 a., 4 v. 2 a., 4 v. 3.5 a., all C.T. 25/-

**FILAMENT TRANSFORMERS**, Tapped Primaries, 200-250 v. All secondaries C.T. 4 v. 3 a., 8/6; 4 v. 5 a., 9/6; 7.5 v. 3 a., 8/6; 6 v. 3 a., 8/6; 2.5 v. 8 a., 8/6; 6.3 v. 3 a., 8/6; 5 v. 3 a., 8/6.

**NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT**, 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVES GIVEN FREE!**

**DE LUXE MODEL**, 14 to 170 metres, complete Kit with Classis, 4 Coils and all parts, 17/6.

**S.W. SUPERHET CONVERTER KIT**, for A.C. Mains Receivers, 22/6. A.C. Valve given FREE!

**NEW 2-VALVE S.W. KIT**, 13 to 86 metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE.**

**DE LUXE MODEL**, 14 to 150 metres, complete Kit and Circuit, 4 Coils and all parts, 25/- **VALVES GIVEN FREE.**

**NEW 1938 S.W. S.G.3 KIT.** Pentode H.F., Detector and Pentode. 14 to 170 metres. Complete Kit of Parts with 3 Tested Valves, 59/6. Metal Cabinet, 7/6 extra. Ideal for Amateur Reception.

**CENTRALAB POTENTIOMETERS**, all values, 2/- With Switch, 2/6.

**MOVING IRON METERS.** Any range between 10 and 500 m/a. Also 1.5 or 5 amps. Read A.C. or D.C. Flush Bakelite case, 2 3/16 in. diam. B.E.S.A. standard specification 80, 5/9 each.

**MOVING COIL METERS.** 1 ma. Scale. 100 ohms resistance. Diameter 3 1/16 in., 22/6. Flush mounting. Bakelite case, B.E.S.A. first-grade accuracy. Multipliers for above, 1/- each. 50 m.a., 27/6.

**PREMIER "TROLITUL" Short-Wave CONDENSERS.** Certified superior to Ceramic. All-brass Construction, 15 mmid., 1/6, 40 mmid., 1/9, 100 mmid., 2/-, 160 mmid., 2/3, 250 mmid., 2/6; Double Spaced 15 mmid., 2/9; 40 mmid., 3/6; S.W.H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion .00015 Tuning, 4/3; .00015 Reaction, 3/9. **UTILITY 4" MICRO-CURSOR DIALS.** Direct and 100:1 ratio, 3/9 each.

**SHORT-WAVE COILS**, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 10-43, 38-86 metres. Suitable any type circuit, 2/6.

**COIL FORMERS**, 4- or 6-pin low-loss, 1/- each.

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

## RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1. Holborn 4631.

This is your last opportunity to obtain a first-class All-wave A.C. Chassis or Receiver. Stocks have been practically cleared, and early application is advisable to avoid disappointment.

**SPECIAL! SPECIAL!** We score again by a keen purchase of the entire Radio Stocks of Messrs. Gambrell, enabling us to offer same at a fraction of the original cost. Stock includes Chassis and complete Table and Console Receivers. The demand is sure to be heavy, **ORDER EARLY TO AVOID DISAPPOINTMENT.**

**GAMBRELL 7-valve All-Wave, All-stage Chassis.** Constructed throughout of heavy Cadmium plated steel. This Chassis represents a real engineering job. Fitted with all the latest refinements, including Six Harries All-stage Valves, one Valve for All Positions, plus standard Hi-vac UU/120/350 Rectifier. Wave Band Ranges: Long Wave 800 to 2,000 metres, Indicator Light Red; Medium Wave 200 to 550 metres, Indicator Light Yellow; Short-wave Band 2, 30 to 75 metres, Indicator Light Green; Short-wave Band 1, 12.5 to 30 metres, Indicator Light Blue. Provision for Pick-up and External Speaker. Fitted 2-speed Drive, Built-in Visual Tuning, Wave-change Switch, Combined Volume Control, Push-pull Tone Control and Mains On-Off. The Dial is a really magnificent affair, size 9ins. long and 5ins. wide, Tuning Indicator being built in the Dial. The Chassis throughout is heavily screened, thus providing stability on all bands, with the finest all-round performance. Valve Screens spun from one piece. Transformer and Choke are of massive construction. In fact, the Chassis throughout is constructed in such a way that overloads, etc., are provided for without strain. Size of Chassis, 14ins. long, 10ins. wide and 3 1/2 ins. deep. Pre-H.F. stage operates on all bands. Reports from satisfied customers more than confirm our contention that this chassis represents the finest value we have ever offered to the Public. Supplied complete with Six of the latest Harries All-stage Valves, plus Rectifier, £4 9s. 6d. each.

As above, but with Celestion 10in. Moving Coil Speaker, £4 19s. 6d. each.

As above but fitted in Handsome Table Piano Finish Walnut Cabinet, complete with Valves and Speaker, £5 10s. each. Cost of Packing and Carr. 2s.

As above, but fitted in handsome Piano Finish Walnut Console Cabinet, complete with Valves and Speaker, £6 6s. each. Cost of Carriage and Crating, etc., 5s. Hunt's 1,000 mfd. Cardboard Electrolytics, Wire Ends, Peak Voltage, 12 volts, 2/- each. Special offer in 1/2 gross lots only, T.C.C. 0.1 Wire End, Tubulars, 15/- per half gross.

Polar N.S.F. Resistances, Our Selection, 1, 1/2, 1 and 2 watt, 4/- gross.

Tubular Condensers, Our selection, 1/- dozen. Dubilier 1/2 meg. Volume Controls, with Switch, standard model, very compact, 1/6 each.

H.T.8 Type Rectifiers (skeleton type). A really splendid job, 4/6 each.

6 Bank 4 Position Vaxley Type Switches, beautifully finished. Each Bank 5 Contact Type, plus Common. 5/- each.

Visual Tuning Indicator, m/a type, complete with mounting Bracket, 1/3 each.

3-gang .0005 Straight Condensers. A precision instrument with Ceramic Insulation, suitable for all Circuits, including All-wave, 3/- each.

Dials for above, 2-Speed type, 9" Long, 5" Wide. Station Marked for 4 Wave Bands, Two Short, Medium and Long, 4/6 each.

465 I.F.s, Iron Core, with Trimmers, 2/6 each.

Plessey Can Type Condensers (Electrolytics), complete with Fixing Clamp, 8 plus 16 Mfd. 8 Mfd., working voltage 450, 16 Mfd., working voltage 350. 2/- each. Plessey 16 Mfd., 150 volt working, 1/3 each.

Special offer Mains Transformers, 350-0-350, 120 m.a. 15 volts C/T at 4 amp., 4 volts C/T at 2.5 amp. Mains Input Adjustable 200-250 volts. Heavily Shrouded, 4/6 each. Postage 1/-.

20 Hy, 100 m.a., 500 ohms Choke, Unshrouded, 5/11 each.

350/120 Indirectly Heated Rectifier, Octal Base type, well-known make, complete with Octal Base Valveholder, 4/6 each.

All orders 5/- or over, post free: orders under 5/- must be accompanied by a reasonable amount for postage: C.O.D. orders under 5/- cannot be accepted. Hours of business 9 a.m. to 7 p.m. weekdays; 9 a.m. to 1 p.m. Saturdays. All enquiries must be accompanied by 1/6d. stamp if reply expected.

**RADIO CLEARANCE**, 63, High Holborn, W.C.1. Holborn 4631.

## SITUATIONS VACANT

**WANTED**—ambitious young men to prepare for well-paid posts in TELEVISION, the great career of the future. Apply for free booklet from **BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY**, 18P, Stratford Place, W.1.

# The HOME MECHANIC SERIES

Each 1/- net Illustrated

These Inexpensive Books will help you . . .

**THE HOME WOODWORKER.** The various examples of woodwork described in this handbook have been designed by practical craftsmen. They are modern in style, and their construction is well within the powers of the average home-worker who follows the instructions given.

**THE HANDYMAN'S ENQUIRE WITHIN.** Hundreds of practical ideas and hints—many not hitherto published. Classified according to the subjects dealt with, an index being provided to facilitate speedy reference.

**POWER-DRIVEN MODEL AIR-CRAFT.** All about petrol, compressed-air and steam engines, wheels, carburettors, ignition systems, rotary engines, etc., with special constructor's chapters, ranging from compressed-air models for beginners to advanced petrol-engined planes. With 130 sketches, diagrams, and photographs.

**MODEL AIRSHIPS AND AERO-PLANES.** This handbook is intended as a guide to the beginner in model aerodynamics. It presents in clear language the first principles of aviation and incorporates these in various forms of simple flying models. Profusely illustrated.

**ACCUMULATORS.** An accumulator (whether for wireless or the car), if properly used and cared for, is an extremely reliable piece of apparatus. Proper care and proper use can only follow a possession of the knowledge which study of this book will impart.

**SIMPLE ELECTRICAL APPARATUS.** Interesting and useful apparatus, easily constructed, with which the student is enabled to test for himself the theory and practice of electricity as laid down in the text-books. 138 illustrations.

All fully illustrated.

1/2 each post free, from the Publishers:

**GEORGE NEWNES, LIMITED,**  
Tower House, Southampton St.,  
Strand, London, W.C.2

George Newnes, Ltd.

## NEW RECEIVERS AND CHASSIS

ARMSTRONG Company pioneer firm supplying all British Radio receivers in chassis form, announce several new models as under:

ARMSTRONG Model 3NBP/T, 7v. (including Cathode Ray), all-wave radiogram chassis, complete with moving coil speaker, £7/18/6.

ARMSTRONG Model RF73/T; this 8-valve chassis has been designed in answer to many requests for a luxury chassis with smaller output.

ARMSTRONG Model RF94/T 10-valve Radiogram Chassis, with 10 watts push-pull output; £13/13.

ARMSTRONG Latest Catalogue Contains Illustrated Technical Data of Model 3NBP/T; also many new models.

ARMSTRONG Chassis Carry Generous Guarantee, no charges for material, labour, or carriage for 12 months.

ARMSTRONG Chassis Sent on 7 Days' Trial, packing and carriage free.

ARMSTRONG Co., 100, King's Road, Camden Town, N.W.1. Gulliver 3105.

## TUITION

"R.T.I."—established 1920.—still lead. Get free particulars latest Radio and Television courses; postal and private.—Radio Training Institute, 40a, Earl's Court Road, London.

## SITUATIONS VACANT

**D RAUGHTSMEN.**—Numerous vacancies in Engineering, Building, G.P.O., etc., for men age 17-40. Exp. unnecessary if willing to learn. Details of openings, salaries, etc., FREE on application to N.I.E. (Dept. 37J), Staple Inn Bldgs., W.C.1.

## MISCELLANEOUS

**THOUSANDS** American Magazines, Books; Technical, Radio, everything. Samples and Catalogue, 2s. 6d.—G. A. Final, 15, Nashleigh Hill, Cheshire.

**NEWNES TOURIST ATLAS** of Great Britain and Route Guide." Edited by John Bartholomew & Son, Ltd., 120 pages of fully-coloured contour maps for the whole of England, Scotland, Ireland and Channel Islands, with Index to the principal Motoring and Cycling centres and distances, 2s. 6d. from all Booksellers.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

**"THE OUTLINE OF WIRELESS,"** by Ralph Stranger. Fifth Edition, 8s. 6d. net.—This book, which covers the subject from A to Z, is to be recommended to all who desire to master the theory of Modern Wireless. At all Booksellers and Newsagents.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

**A DICTIONARY OF WIRELESS TERMS,** by Ralph Stranger. A Wireless Work of Reference that should be on the bookshelf of every keen amateur. Compiled by a master of lucidity, it gives the meanings of all Technical terms in general use. Price 2s. 6d. from all Booksellers and Newsagents.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

## ADVERTISEMENT INDEX

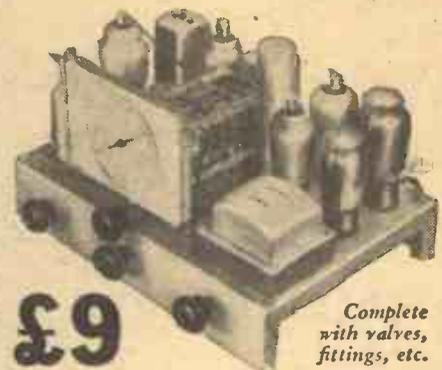
	Page
Automatic Coil Winder and Electrical Equipment Co., Ltd. . . . .	Cover ii
British Institute of Engineering Technology . . . . .	Cover iii
Electradix Radios . . . . .	228
"Exit" . . . . .	Cover iii
London Radio Supply Co. . . . .	228
M.P.R. Electrical Co. . . . .	Cover iii
McCarthy Radio, Ltd. . . . .	Cover iii
New Times Sales Co. . . . .	225
Peto-Scott Co., Ltd. . . . .	223
Player's Navy Cut Cigarettes . . . . .	Cover ii
Premier Supply Stores . . . . .	232

## FREE ADVICE BUREAU COUPON

This coupon is available until May 21st, 1938, and must accompany all Queries and Wrinkles.

PRACTICAL AND AMATEUR WIRELESS, 14/5/38.

## ALL MAINS ALL-WAVE SIX (With R.F. Stage)



£9

Complete with valves, fittings, etc.

A De-Luxe 6-valve receiver—performance equal to many receivers employing at least 8 valves. High performance on all three wavebands even under most difficult reception conditions. Enthusiastic reports from foreign and colonial users.

Special features: Stout cadmium-plated 16-gauge steel chassis. Iron-cored I.F. coils, Litz-wound tuning coils. 3 wave-ranges cover 16.5-2,000 metres. Illuminated "Airplane" dial with principal station names. Variable tone control and volume control both operative on radio and gramophone.

Circuit in brief: Pre-selector, radio frequency amplifier (operative on all wavebands), triode-hexode frequency-changer, I.F. amplifier, double diode detector (applying A.V.C. to preceding valves), and L.F. amplifier, 3-watt pentode output.

Deferred terms on application. Demonstrations Daily.

Cash with order on 7 days' approval. Complete illustrated catalogue, with technical data and circuit diagrams, on receipt of 3d. in stamps, or abridged list of McCarthy chassis types free of charge.

## MCCARTHY RADIO LTD.

44a, Westbourne Grove, London, W.2.

Telephone: Baywater 3201/2.

## ENGINEERING OPPORTUNITIES



This unique Handbook shows the easy way to secure A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T., A.M.I.R.E., and similar qualifications. **WE GUARANTEE—NO PASS—NO FEE.** Details are given of over 150 Diploma Courses in all branches of Civil, Mech., Elec., Motor, Aero, Radio and Television Engineering, Building, Government Employment, etc. Write for this enlightening Handbook to-day FREE and post free.

British Institute of Engineering Technology, 409, Shakespeare House, 17, 18, 19, Stratford Pl., W.1

## EARN EXTRA MONEY

by hiring out the M.P.R. 12 Watt. A.C. Amplifier: Dances, Socials, etc. Complete with Five Valves, 10in. P.M. Speaker, and Volume Control. Will reproduce Gramophone recordings at full band strength. Ready for connecting to pick-up or Microphone. Price £7/7/0 or 13/- monthly. Other models from 45/-. Full particulars from M.P.R. Electrical Co., 252, Victoria Road, Romford, Essex.



**"EXIT" STATION SEPARATOR**  
AMAZING RADIO GADGET CUTS OUT UNWANTED STATIONS. No more "three programmes at once." No loss of signal strength. No tiresome adjustments. Does away with aerial if required. **SPECIAL TRIAL OFFER 1/6 EACH POST FREE** "EXIT" 11, New Station Street, Leeds, 1.

**New Authoritative  
Technical Practical**

# AERO ENGINEERING

Indispensable to everybody engaged in the aircraft industry. Written by men with unsurpassed experience in their respective branches.

**T**HIS work provides in a convenient form a comprehensive and reliable source of reference to Aircraft Construction, Production, Maintenance and Overhaul. The wide adoption of metal construction has rendered a work of this kind necessary even for those men who have been for many years associated with the aircraft industry.

Never before has the whole aspect of Aircraft Production and Maintenance, from the original specification to the forty hours' inspection schedule, been covered within the confines of a single work. The operative in the production shop, whether engaged upon aeroplane construction, or upon the machining, fitting, assembly or testing of aeroplanes, will find the Information ideally adapted to his needs.

We have had the courteous and cordial co-operation of many of the larger manufacturers, and through their assistance we have been able to deal thoroughly, and in a practical manner, with some of the leading types of British aircraft, both from the production side and the point of view of the ground engineer.

## VERY BRIEF OUTLINE OF "AERO ENGINEERING"

ESSENTIAL REQUIREMENTS OF MODERN AEROPLANES. PRINCIPLES OF FLIGHT. SURVEY OF MODERN AIRCRAFT PRODUCTION. WORKSHOP PROCESSES USED IN AIRCRAFT PRODUCTION. MACHINE TOOLS. SHEET AND PLATE METAL WORK. COMPONENT JIGS. AIR FRAME JIGS. MATERIALS USED IN AIRCRAFT CONSTRUCTION. HEAT TREATMENT. THE ANODIC PROCESS. METAL CUTTING. WELDING. SOLDERING AND BRAZING. RIVETING. INSPECTION STANDARDS AND METHODS. AIR FRAME ASSEMBLY. ENGINE INSTALLATION. FITTING THE ELECTRICAL EQUIPMENT. RIGGING. AEROPLANE MAINTENANCE. THE INSPECTION SCHEDULE. GROUND EQUIPMENT, ETC., ETC.

All the Chief Makes of Aero Engines and all representative types of civil and military aircraft are covered

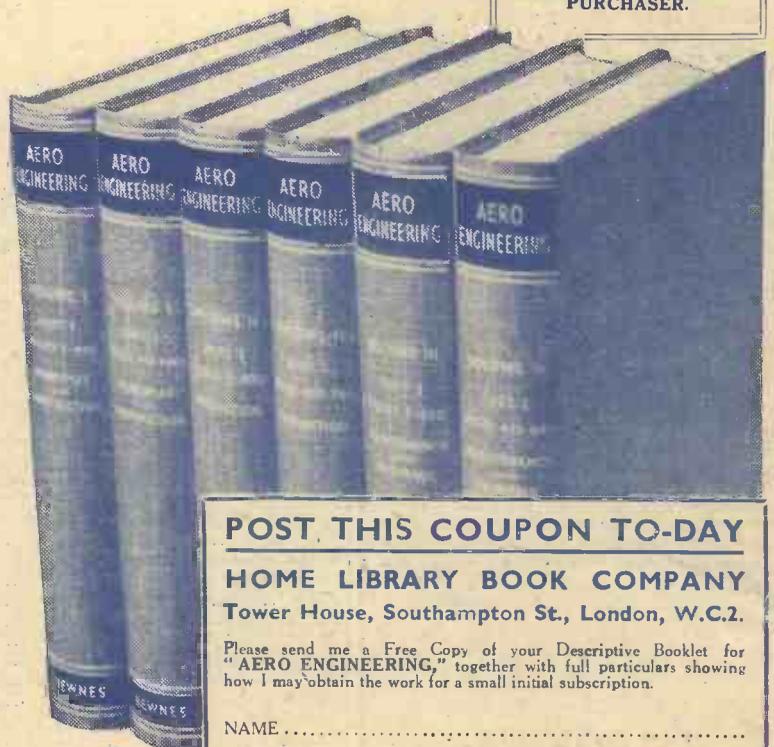
### 50 FREE DATA SHEETS

Prepared with the assistance of the Air Ministry and leading British Aircraft Manufacturers, these contain details of the most popular types of civil and military aircraft—performance, pay load, fuel consumption, maximum speed, cruising speed, landing speed, etc.

§ § § §

**FREE:** Handsomely Bound Case for filing your Data Sheets.

Bound in Durable Cloth Binding with Tinted Title Lettering.



### POST THIS COUPON TO-DAY

#### HOME LIBRARY BOOK COMPANY

Tower House, Southampton St., London, W.C.2.

Please send me a Free Copy of your Descriptive Booklet for "AERO ENGINEERING," together with full particulars showing how I may obtain the work for a small initial subscription.

NAME .....

ADDRESS .....

Occupation ..... P.W.14538

If you do not wish to cut your copy, send a postcard mentioning "Practical Wireless" to above address.

George Newnes, Ltd.

**OPERATING YOUR FIRST SHORT-WAVER—** See page 241

# Practical and Amateur Wireless

**3<sup>d</sup>**  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 12. No. 298.  
May 21st, 1938.

**AND PRACTICAL TELEVISION**

*Choosing Your*  
**TECHNICAL  
LIBRARY**

## EVERYMAN'S WIRELESS BOOK

By F. J. CAMM (Editor "Practical and Amateur Wireless," etc.)

A Radio Consultant for the Listener, Expert and Amateur Constructor, explaining the Operation, Upkeep and Overhaul of all Types of Wireless Receivers, with Special Chapters on the Principles of Radio Telephony, Installation, and Systematic Fault-finding, And 200 Illustrations. From all Booksellers only 3/6 net, or 4/- post free from

GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, LONDON, W.C.2.

# The Motoring Bargain of 1938

## THIS MAP CASE and 30 NEWEST ROAD MAPS

Handsome Weather-proof Case, Non-flam Mica Front.

All Maps Latest Issue in 4 colours.

Very Practical Scale—8 miles to 1 in.

The Case will Last for Years.

In the handy size of 11½" x 8½".

A CASE of maps is just what every motorist wants—the map containing your route is placed behind the transparent mica, and you can follow it with ease. There are no pages to be continually turned over as with a book of maps!

England, Scotland and Wales are covered in this very latest issue of Maps, and they show with the utmost clarity every main highway and the main secondary roads. Included is a double map of the Central London area.



## Also GREAT FREE MOTORISTS' INSURANCE

Covers PRIVATE MOTORISTS and COMMERCIAL TRAVELLERS; etc., for

**£3 A WEEK**

Total Disablement Benefit (Starting-handle risks included). And Bus Drivers, Commercial Vehicle Drivers, Taxi Drivers, Motor-Coach Drivers, etc., for £1 a WEEK. There are many other valuable benefits.

# Get To-day's

Don't miss this **ALMOST-A-GIFT OFFER**

# Practical Motorist 3<sup>D.</sup>

THE HELPFUL MOTORING WEEKLY THAT SAVES YOU POUNDS

Of all Newsagents and Bookstalls, or by post 4d. from the Publisher, George Newnes, Ltd., Tower House, Southampton St., Strand, London, W.O.2.

# SERVICING WITH THE C.-R. TUBE —See page 238



## Practical

## and Amateur

## Wireless



*Edited by* **F. J. CAMM**

Technical Staff:  
 W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,  
 B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 296. May 21st, 1938.

## ROUND *the* WORLD of WIRELESS

### Improving Performance

IT is not always worth while to attempt to improve on a set which is giving good results. On the other hand, it is often possible with a little care and experiment, to gain an improvement by making slight changes in a circuit, and in this issue we give a short article dealing with the problem of "hotting-up" a simple receiver. It should be remembered that changes in coils and valves generally result in the necessity for slight adjustments, but it is often possible to substitute certain components such as condensers and resistors in order to obtain an improvement. Many constructors seem still to be under the impression also that a cheap small H.T. battery is quite good enough, overlooking the fact that as soon as the ordinary type of H.T. battery is put into use the voltage falls rapidly to a certain value where it remains more or less constant for a long period. Therefore, the best results are not obtained for the main period of use of the battery and in many cases the use of a larger H.T. battery more than justifies the slight additional cost of the larger unit. Similarly, it is always worth while to calculate the total H.T. current consumption and to choose a battery which is designed to give that current, rather than to select a battery merely because it is low in price.

### Radiolympia

AMONG the details concerning the forthcoming Radio Exhibition at Olympia the most interesting is the fact that vision will be permitted on all stands. This means that firms showing television apparatus will be able to show the results on an actual transmission (during the appropriate hours). The transmission will take place from studios at Olympia. In addition two radio frequency inputs will be permitted on each stand so that receivers may be demonstrated on actual transmissions and not, as in previous years, an audio input from a central recording studio.

### Valve Conference

THE International Standardisation Conference, held by the International Electro-technical Commission, will be held from June 22nd to July 1st at Torquay. About a day and a half of the total time will be devoted to discussions on valve

standardisation and Mr. T. E. Goldup, A.M.I.E.E., head of the Mullard Technical Service Department, has been appointed as the British Delegate.

### No Irish Exhibition

WE understand that the Irish Radio Traders' Association has decided not to hold a Radio Exhibition in Dublin this year. It is rumoured, however, that the retail trade may organise a show on its own account and details, when released, will be given in these pages.

### Television from Paris

IT is reported that a Brighton amateur has successfully received pictures from the experimental television transmitter at the Eiffel Tower. This is, so far, the longest reported successful reception of television on the ultra-short wavelengths and seriously upsets all previous calculations regarding the distance over which such transmissions may be received.

### Pipeless Organ

THE first studio broadcast of the latest pipeless organ will be given on May 28th when Robin Richmond will present the organ in a Palace of Varieties broadcast produced by Ernest Longstaffe. The instrument occupies only a few square feet of floor space and is worked entirely by electricity. The console itself creates no sound, but electrical waveforms which are converted into music in a small power cabinet.

### Variety from Plymouth

ROY FOX and his band, who are appearing at the Palace Theatre, Plymouth, in the week commencing May 23rd, will broadcast from the stage in a West of England programme on May 26th.

### London Music Festival

THE B.B.C. announces that exceptional arrangements have been made for parts of the coming series of concerts to be conducted by Toscanini at the Queen's Hall to be transmitted from the Alexandra Palace on the sound wave of the television service. This will enable music lovers to hear the items at their best as the ultra-short waves permit of a much better frequency band than is possible on the standard medium waves. The items to be given are tabulated on page 247.

### Torquay Dance Concert

DANCE Cabaret from the Grand Hotel, Torquay, on May 28th, will include: Joan Millar, "In American Character Comedy"; Marriott Edgar, "In Lancashire Monologues"; Greta Gaye, "The Glamour Girl"; and dancing to Harry Evans and his Band.

ON OTHER PAGES	
	Page
Hotting up the Simple Set	235
Transmitting Topics ..	237
Servicing with the C.-R. Tube	238
On Your Wavelength ..	239
Short-wave Section ..	241
Readers' Wrinkles ..	243
Starting Your Technical Library ..	244
Practical Television ..	246
Latest Patent News ..	248
British Long - distance Listeners' Club ..	251
Readers' Letters ..	253
Queries and Enquiries ..	255

### PCJ Reports

SINCE the inauguration of the new transmitter in Holland, Messrs. Philips are anxious to collect as much material regarding reception as possible, and welcome reports from all parts of the world concerning the results obtained on the new transmitter. They will be interested especially in listeners who are prepared to listen over extended periods so that complete data may be obtained, as distinct from odd periods of listening which might include "freak" conditions.

# ROUND the WORLD of WIRELESS (Continued)

## Madrid's Super Summer Time

IN order to effect economies in electric lighting and power, the Spanish Government has advanced all clocks in Republican Spain a further hour. As the change to British Summer Time was already carried out on April 2nd last, all Madrid clocks are now TWO hours ahead of ours.

## I Was There

FROM time to time talks under this heading, which was that of a very popular series, will appear again in the programmes. One of the most interesting of the original talks was by Frank Gerald, who described his experiences during the Coolgardie Gold Rush. The same speaker will be heard on May 24th in the National programme dealing with a thoroughly topical subject, the visit to England of the first cricket team from Australia.

## Wire-fence Radio

IT is reported that farmers in some of the drought-stricken areas of the Canadian provinces have evolved an ingenious method of communication. They are making use of wire fences to talk to each other and to broadcast wireless programmes. Making use of headphones, loudspeakers and batteries to electrify the circuit, they have



Perhaps you've guessed who it is? Yes, it's Mr. Richard Goulden ("Mr. Penny" of B.B.C. fame) seen with three black cats. Naturally his thoughts must be turned to how lucky he'll be with such an armful.

established efficient links of communication with their neighbours, and families who cannot afford wireless sets of their own are finding it possible to hear, over these improvised lines, programmes relayed by their more fortunate friends.

## Schools Radio in South Africa

A PLAN to enable a much wider use to be made of educational broadcasting has recently been launched in South Africa. Hitherto the use of radio in schools has been mainly confined to Cape Colony, but under the new scheme, every school in the Union will be able to avail itself of the school broadcasts.

The new arrangement stipulates that each province of the Union shall contribute to a general fund in proportion to the number

## INTERESTING and TOPICAL NEWS and NOTES

of schools in the province. This fund will be used to finance educational broadcasts and to grant subsidies to the schools for the

their normal capacity in order to cope with the demand from the trade for training in fitting and servicing car radio.

The makers of Philips MotoRadio maintain a permanent and completely equipped school for the motor and radio trade, at which the classes usually consist of about six people at a time. Recently, however, they have had to be enlarged up to a



Broadcasting Commentator Tom Woodroffe ate his hat before the television cameras during "Picture Page," the television broadcast from Alexandra Palace, recently. He made this public penance in response to widespread public demand following his broadcast of the Football Cup Final, during the closing stages of which he said: "If they score now I'll eat my hat." He was referring to Preston, who did score just afterwards, and thus won the cup. Our illustration shows Mr. Tom Woodroffe eating his hat, an old straw, before the television cameras.

purchase of radio equipment. To a limited extent assistance will also be given for the purchase of film projection apparatus.

## P.A. Equipment at Glasgow Empire Exhibition

IT is interesting to note that the P.A. installation in the exhibition grounds will comprise 130 loudspeakers connected up on five circuits. Any one of these circuits may be singled out for a given transmission; any combination of circuits may be used, or the whole of them can be brought into action so that not a single part of the 170 acres of ground is omitted. The main control panel is housed in a building at the base of a 300ft. tower on the crest of a hill in the centre of the grounds.

In addition to broadcasting announcements of a general nature and putting through emergency calls, music and speeches will be relayed from radio broadcasts and gramophone records, from either of the two bandstands or from the concert hall. Any of these transmissions can, of course, be relayed on any one circuit or on all circuits.

Microphone pre-amplifiers remotely controlled from the control tower, will be installed in the concert hall and two bandstands, to boost the microphone input for line transmission.

## Increased Facilities for Car Radio

IN view of the obvious growth in the popularity of car radio, it is not surprising to learn that one firm's instruction classes are now operating at three times

maximum of 20, so that there shall be no lack of trained men all over the country to carry out MotoRadio installations.

## SOLVE THIS!

### PROBLEM No. 296

Richmond had a simple three-valve battery set with triode output valve. He decided that a pentode would give better volume, and to save expense he obtained a 4-pin pentode which he plugged in in place of the existing triode. He removed the original lead from the anode to speaker terminal and joined this to 100 volts on the H.T. battery and connected the side terminal of the valve to the speaker terminal. He was surprised to find, however, that results were no better than with the original valve. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Envelopes must be marked Problem No. 296 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 23rd, 1938.

### Solution to Problem No. 295

To obtain maximum results with a Class B stage the secondary winding of the transformer must have a low resistance and the arrangement which Harbutt tried would not permit the Class B valve to function. The following three readers successfully solved Problem No. 294, and books have accordingly been forwarded to them—J. A. Hawes, 34, Gale Street, Dagenham, Essex; H. E. Evans, 12, Mount Pleasant, Chatham Hill, Chatham; W. R. Fisher, 1, Waghorn Road, Kenmore Park, Harrow, Middx.

# Hotting Up Your Receiver

Some Simple but Effective Devices for Obtaining Improved Performance from Simple Sets - - By W. J. DELANEY

WHEN a receiver has been installed, many amateurs are content to leave things as they are provided that they get some sort of result. It must be remembered, however, that published designs are generally worked out on what may be termed average characteristics.

set does not reach out, and that the careful use of the reaction control often enables long-distance stations to be brought in sufficiently well to provide entertainment value. Obviously, reaction should not be pushed too far, but in most sets it will be found that as this control is turned up signal-strength builds up until, with a "plop," the set falls into oscillation. Turning the control back, the set does not go out of oscillation until it has travelled some distance past the point where it went into oscillation, with the result that the signal is then very weak again, and the control has once more to be advanced. This has to be done with care to prevent the oscillation, and consequently it generally resolves itself into a juggle to get the best position. This, then, is the first point where our hotting-up process can start.

important. Thus these are the two first points at which our improvement may commence. Replace the fixed anode by pass condenser by a pre-set, having

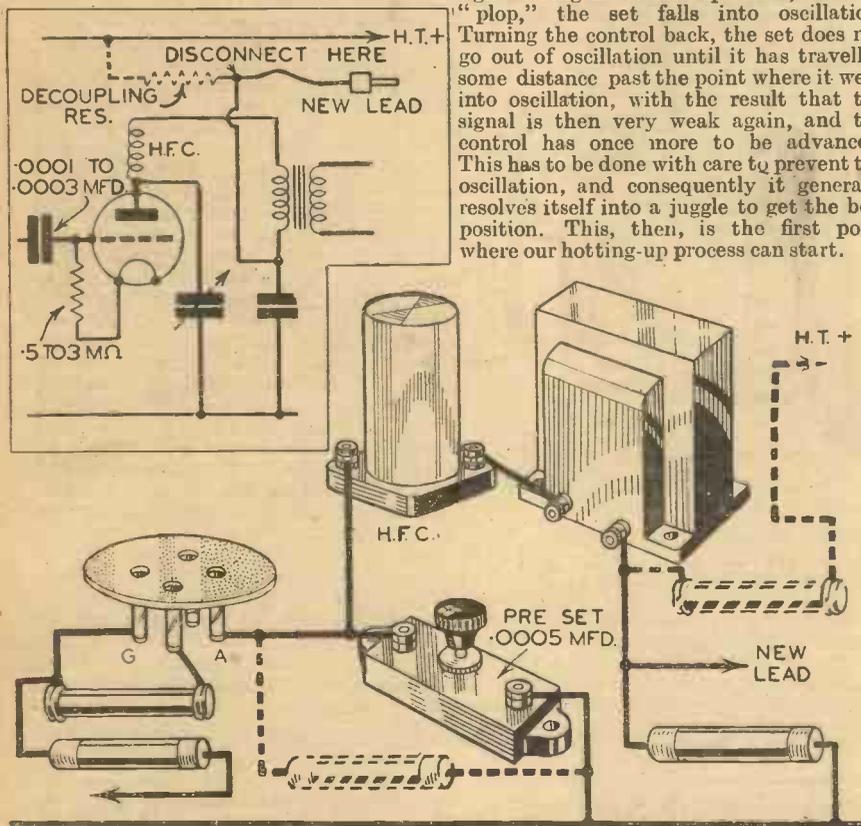


Fig. 1.—Changes in the detector voltage may be tried as shown in this diagram.

Valves, for instance, whilst they are very well standardised will be found to possess differences in one class which often will prevent maximum results from being obtained with circuits or values which are published. As our readers know, we do not give instructions for modifying our published designs, but the following details should be carefully noted as it may be found that the results on your set may be improved, just as the performance of a standard car may often be improved by the process generally referred to as "hotting up." Only the simpler types of receiver will be dealt with, as it will be assumed that the powerful types of set, including the superhet, already give results which satisfy the ordinary listener, and only experienced amateurs should undertake modifications to circuits of that type.

## The Detector Stage

The majority of simple sets, including those with H.F. stages, rely in the main for good long-distance results on the use of reaction. Every user of this type of receiver knows how without reaction the

The H.T. voltage on the detector is important, and the value of the by-pass condenser in the detector stage is also very

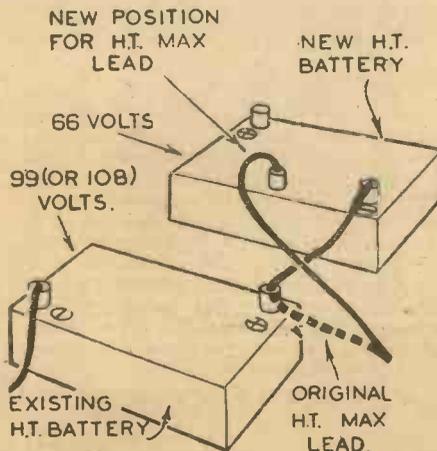


Fig. 2.—Extra H.T. voltage is obtained by connecting another battery in series as shown here.

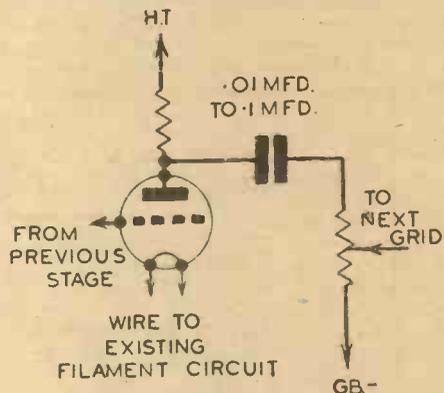


Fig. 3.—Parts needed for an additional L.F. stage are wired as shown here.

maximum capacity of .0005 mfd., and experiment with this with a view to smoothing out the reaction effects. If the circuit is wired with a common H.T. tapping, or with the detector anode circuit connected through decoupling components to the H.T. positive line, remove these components and use a separate H.T. lead to the anode load component and experiment with this in the H.T. battery so as to find a voltage which gives the desired results. In the majority of cases it will not be necessary to change the grid leak and condenser values, although in some sets it might be worth while using a lower value of leak and condenser. Generally, these should be standardised with any value between .5 and 2 megohms and .0001 and .0003 mfd. Fig. 1 shows the suggested changes in the detector stage.

## Output Stage

Many listeners, on the grounds of economy or because they follow old ideas, use 99 or 108-volt H.T. batteries. It will be seen from a modern valve catalogue that standard 2-volt valves are to-day designed for a maximum H.T. voltage of 150. If the output valve is at present working with only 100 or so volts, an increase up to the maximum recommended will not only give an increase in volume, but will give a vast improvement in quality. You cannot expect to get good bass response and volume by using small valves and small H.T. values. The grid bias will also have to be increased at the same time, of course, and if you wish to experiment first to see whether it is worth while using the extra voltage, all that is necessary is to buy another small H.T. battery and connect it in series with the existing battery. Fig. 2 shows how the new battery should be connected, the negative socket of the new battery being joined to the positive socket of the existing battery, and the H.T. maximum lead then being plugged into the new battery at a socket which gives about 130 to 150 volts. The H.T. voltage is

(Continued on next page)

(Continued from previous page)

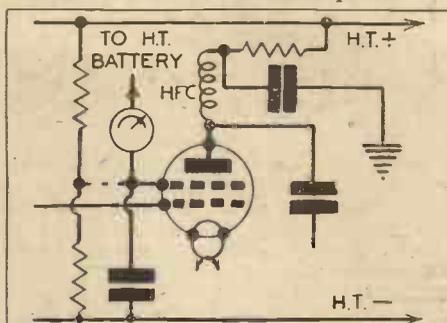
reckoned from the original H.T. negative end, and so, if you now use a 99-volt H.T. battery you would get a new 66-volt battery, and when joined in series the total voltage would be 165. To obtain 150 volts the H.T. lead should therefore be plugged into the 48-volt socket on the new battery (the sockets will not permit exactly 150 volts to be obtained, and therefore care should be taken to choose a battery with tappings at fairly close intervals—not every 15 volts or so).

If a common H.T. positive lead is employed you may have to disconnect the leads to earlier valves and plug these in separately or change the value of decoupling resistances to get stable working in those stages, but in most published designs this will not

be necessary. Do not forget to change the grid bias at the same time, and at this point it may be mentioned that when replacing the H.T. battery, test the G.B. battery and make certain that this does not need replacing at the same time. Many listeners leave this battery in the set for months on end without considering whether it is drying up, and this is often

### L.F. Stages

In most cases it will not be possible to



overcome by fitting a volume control between the new stage and the existing stage. The coupling should therefore be of the resistance-capacity type, with the grid leak in the form of a potentiometer, using the circuit shown in Fig. 3. Remember to get a really good control for this purpose to avoid noises when it is adjusted. If one L.F. stage is already included between the detector and output stage, the additional stage should be placed between the detector and first L.F. stage, whilst when the detector feeds the output stage it may be desirable to place the new stage after the present output circuit, and to obtain a new super-power valve to give a general all-round improvement.

### H.F. Stages

In the H.F. stages the only really satisfactory hotting-up which can be done concerns the voltages applied to anodes and screens. Where a potentiometer control is used for the screen voltage, it may be found worth while to disconnect this and use a flexible lead connected direct to the H.T. battery and to experiment to find the most useful voltage. If a good milliammeter is then included in the lead the current may be ascertained and the choice of new resistance values may then easily be made by subtracting the new voltage from the total of the batteries and dividing the answer by the current (Fig. 4). The same thing may, of course, be carried out in a mains receiver, although generally these may be considered to work satisfactorily due to the higher efficiency of the valves. If, however, any experimental voltage is needed, remember that a good potentiometer may be joined across the H.T. supply and the appropriate voltage ascertained in the same way—but a really good milliammeter is essential in order to obtain a true reading. As a general rule it may be stated that no changes in layout or wiring should be considered, but if valve types are changed, or even when a new valve of the same type is used as a replacement, the above details should be followed so that the best results may be obtained from the valve in case its characteristics are not exactly similar to the original valve.

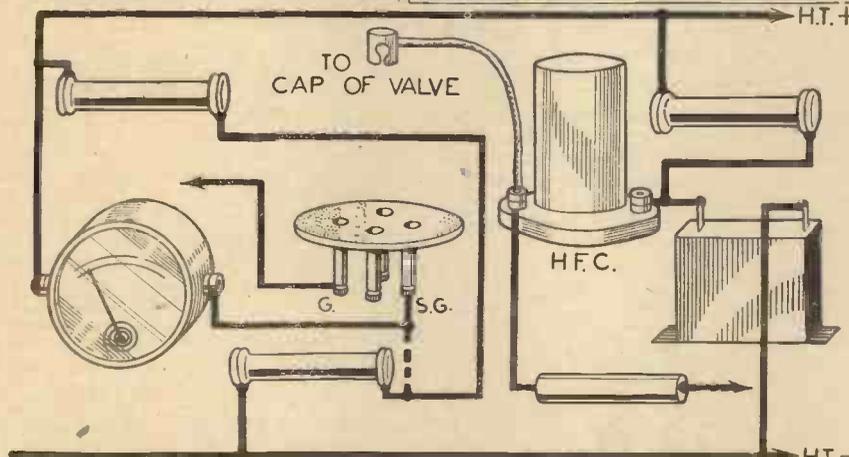


Fig. 4.—To test the screen potential, attach a lead direct as shown here, disconnecting the potentiometer but leaving the condenser in circuit.

add a further L.F. stage to obtain increased L.F. amplification as the output valve would not handle this additional signal without overloading on many stations. If, however, certain long-distance stations are received at sufficient volume to justify putting them on the speaker with an additional stage, the difficulty of overloading on more powerful stations may be

be necessary. Do not forget to change the grid bias at the same time, and at this point it may be mentioned that when replacing the H.T. battery, test the G.B. battery and make certain that this does not need replacing at the same time. Many listeners leave this battery in the set for months on end without considering whether it is drying up, and this is often

It is interesting to note that the voices of men who work under London, and of others with a lifetime of experience in news gathering, will be heard at the microphone in two new series of talks to be broadcast during the next few months.

The two series, "Under London" and "My Best News Story," are part of the B.B.C.'s new schedule of talks just prepared. In the first group of talks tube workers, sewer men, gas men, strong-room keepers, and others will come fortnightly to the microphone to describe their jobs. In the second series, the newspaper correspondents will describe the most interesting situations and incidents which they have covered during their careers.

### "Off Duty"

Further innovations will be a group of light entertaining afternoon talks entitled "Off Duty": a series of broadcasts under the title, "Forgotten Anniversaries," each of which will be given within a week of the anniversary of some picturesque but generally forgotten event: and a new law series, called "Round the Courts." The two broadcasters who conducted the recent feature, "Is that the Law?" will co-operate again, this time explaining legal points of practical interest which have occurred in the Courts during the previous fortnight. Scheduled for Sundays, the broad-

## NEW BROADCAST TALKS

casts will alternate with Sunday Cinema Talks, which will be continued by Mr. Andrew Rice.

### Talks for Housewives

Morning talks for housewives will continue to be broadcast. "At Home To-day" will go on as usual, and, in addition to these, there are "The Health of the School Child," a series of talks by doctors on the well-being of youngsters, and "How to Get Your Money's Worth." This is a repeat of a Midland Region series of last year, in which a housewife interviews trade buyers and other experts on matters of domestic economy.

Fortnightly talks and discussions on theatrical matters are also projected. These will alternate with "From the London Theatre," the series of play extracts now broadcast in alternate weeks. Producers, actors, managers, promoters, critics, and others connected with the theatre will come singly or in groups to the microphone. The series has been arranged by the B.B.C.

Talks Department in conjunction with the Features and Drama Department.

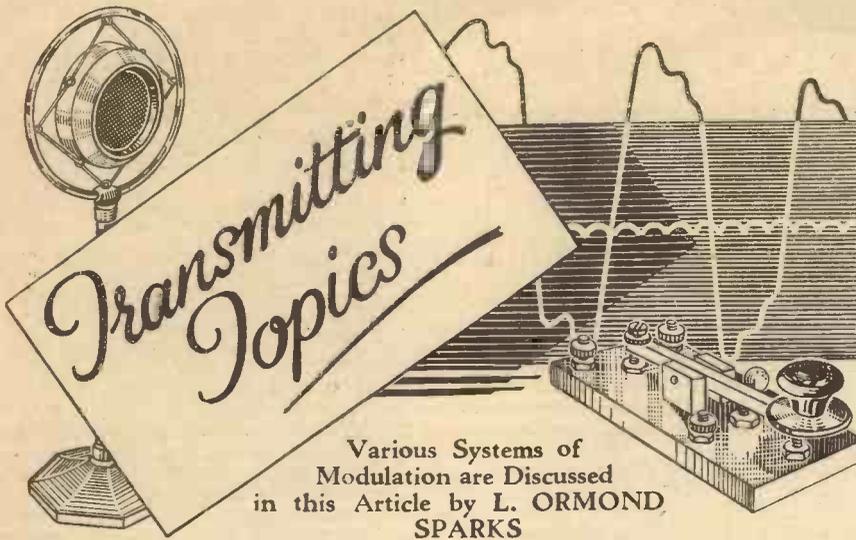
Talks for Discussion Groups will be broadcast under the headings, "Natural History," "The Poet and his Public," and "Transport."

### Saturday Afternoon Talks

Now that V. C. Clinton-Baddeley has concluded his readings from "A Tale of Two Cities," a fresh selection will be offered to listeners every Saturday afternoon when the same broadcaster will give weekly readings from the Barchester novels of Anthony Trollope, from the West Region. A group of some eight talks dealing with the British Empire, in which speakers familiar with its respective parts will describe the conditions and life of these parts, will be broadcast on Saturday evenings.

### Regular Features

Amongst the regular features which will be maintained are "In Your Garden," "Tea-Time Talks," "Music and the Ordinary Listener," "Farming To-day," "The World Goes By," Book Talks, Talks on Sport, "World Affairs," "America Speaks," short stories, readings from abroad, "I Knew a Man," "I Was There," and "The Week in Westminster." This last will be promoted from Saturday morning to Friday evening, where it will, in consequence, reach a wider audience.



Various Systems of Modulation are Discussed in this Article by L. ORMOND SPARKS

TO produce the modulation of the train of continuous waves which are known as the "carrier," it is necessary to provide some arrangements whereby the low-frequency currents from the modulator amplifier can be superimposed on the high-frequency oscillations.

We are here dealing with "amplitude" modulation, and as it is absolutely essential to avoid any form of distortion, modulation cannot be applied before the desired carrier frequency has been produced, or, in other words, the modulated signal cannot be passed through frequency-multipliers in the same way as the oscillator output.

So far as the average amateur is concerned, the modulating component must be applied to the final stage of the transmitter to allow the complete signal, i.e., the modulated carrier, to be transferred straight into the aerial circuit.

In the diagrams a single triode valve is shown as the modulator. This is done purely for explanatory purposes as the modulator section or amplifier can employ one or more valves according to the circuit requirements.

The most simple arrangement is, of course, a single triode valve operated as a Class A amplifier, which means that the operating conditions must be such that the grid is never allowed to be driven through the curved portion of the valve's characteristic curve, or into a positive condition. The only snag with this arrangement is that its anode efficiency is on the low side, but this can be overcome, if necessary, by using two triodes in Class A push-pull.

**Choke System of Modulation**

This method is one of the simplest and, to give it its correct title, is known as the "Heising" or "constant current" method. The circuit is shown in Fig. 1. The triode V2 represents the modulator, its grid being connected to the secondary of an L.F. input or microphone transformer. The power amplifier or oscillator is V1, and it will be noted that the H.T. supply is common to both valves. The L.F. choke Ch must be of a reliable make, while its characteristics must be such that it presents a high impedance to all the modulation frequencies, thus preventing their passage through the H.T. supply.

When an input is applied to V2, voltage variations are set up in its anode circuit, and these are applied directly to the anode of V1; therefore, the L.F. output of the

modulator is fed into the P.A. or oscillator as the case may be. Without going into minute details, it is essential when 100 per cent. modulation is required, to swing the anode volts of V1 from its

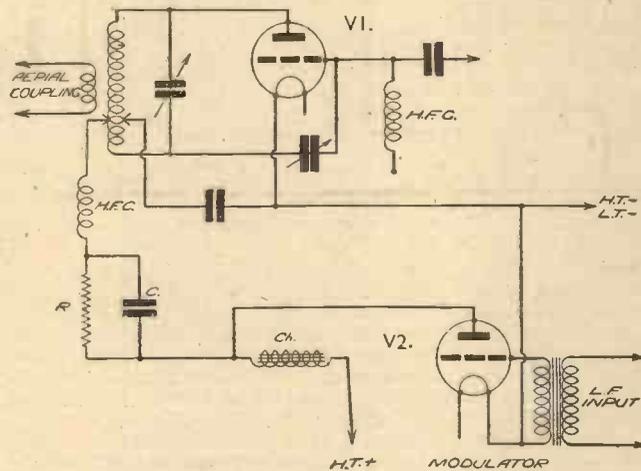


Fig. 1.—This is the choke, Heising, or constant plate-current modulation circuit.

normal value to twice that amount, and back to zero, without distortion taking place. Now bearing in mind that the maximum anode swing obtainable from a Class A amplifier is bound to be less than its applied voltage—no distortion being permissible—it becomes essential that V2

In the interests of distortion-free output of V2 it is necessary that its anode load must be according to its specification; therefore, V1 must be operated under such conditions that its anode voltage divided by its anode current will give the optimum load of the valve used for the position V2.

Reverting to the requirements for a 100 per cent. modulation, it will be appreciated that the output of V2 must be sufficient to produce a swing of twice the normal anode volts of V1; therefore, it is possible to determine the anode voltage required by V2. The value of R can now be fixed by subtracting the anode voltage of V1 from the anode voltage of V2, and dividing the result by the anode current of V1.

**Suppressor-grid Modulation**

Owing to the popular use of pentodes as power amplifiers and oscillators, this method is greatly in favour as it is simple, effective, and requires quite a low modulation power. A standard arrangement is shown in Fig. 2. As in the previous case, the grid circuit of V2 follows normal L.F. practice, but unlike the choke method a transformer is inserted in the anode circuit, the primary being connected to the anode and H.T. supply, the value of which will depend on the requirements of V2.

When a pentode is used under the conditions mentioned above, it will be found that a slight variation of the suppressor-grid potential produces quite a large change in the power output, the grid input and anode voltage being constant; therefore, only a small L.F. output is required from the modulator stage to modulate quite a large radio-frequency output.

The suppressor-grid receives its necessary positive voltage via the secondary of the transformer T, which also introduces the

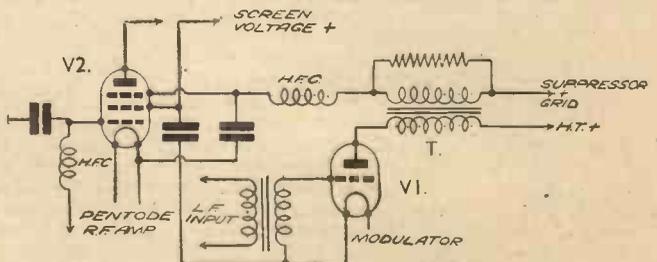
modulating voltages across the resistance R.

The H.F. choke and condenser are embodied to form a radio- or high-frequency filter.

For the beginner, this method of modulating is most satisfactory, as it is not diffi-

**Suppressor-grid Modulation**

Fig. 2 (right).—In this arrangement the system known as suppressor-grid modulation is employed.



has a higher anode voltage than V1. This state of affairs is secured by inserting the resistance R in the anode supply of V1, but as we must not allow the resistance to affect the modulation frequencies, a by-pass condenser C is connected across it thus providing an easy path for the L.F. currents. The maximum anode swing of V2 can be determined, and when the figure is known the voltage of V1 can be reduced to, say, one half of this figure by R.

cult to adjust and it avoids the cost of an elaborate modulator amplifier. The transformer T can be of the Class B input type.

**Grid-bias Modulation**

This system is shown in Fig. 3, and while it is used in many instances, it is not a system I would advise the newcomer to transmitting to employ. Particular attention has to be paid to the P.A. as the overall

(Continued on page 250)

# RADIO SERVICING WITH THE CATHODE RAY

An Article Dealing with the Practical Utility of the Cathode-ray Oscillograph

**R**ADIO servicing has been, and is still, going through a process of evolution, and this has particularly been apparent in connection with service testing equipment. For service bench testing the cathode-ray oscillograph is rapidly coming into its own. Many service establishments have cathode-ray apparatus, but there are still many which have yet to take up cathode-ray testing technique. It can be prophesied, however, that in the natural course of the evolution which is going on it will only be a matter of time before the cathode-ray oscillograph becomes as commonplace as any other of the testing instruments which are now regarded as essential for speedy and efficient servicing.

Of all the indicating instruments that human ingenuity has devised the cathode-ray oscillograph is probably the most versatile, although many of its applications necessitate the use of apparatus additional to the oscillograph itself. In some cases elaborate set-ups are required.

There must be many of our readers who are interested in the radio servicing possibilities of the oscillograph when used, at the most, with an oscillator of suitable type, and this article has been written for their especial benefit.

## Electron Beam Deflection

Various types of CR tubes are employed in servicing oscillographs; some are of the gas-focused type, others of the high-vacuum, electron lens focused type. There are differences of screen sizes, differences in the visual and photographic properties of the screen traces, etc., but a feature that they have in common is the provision

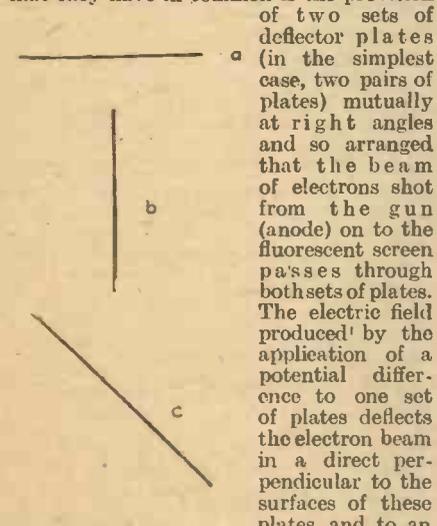


Fig. 2.—Showing the effect of applying periodic deflecting voltages, without time base:—

- (a) Trace obtained when the voltage is applied to the X plates only.
- (b) Trace obtained when the voltage is applied to the Y plates only.
- (c) Trace obtained when the voltage is applied to both X and Y plates simultaneously.

beam by the magnetic field set up by currents in the coils.

It is normally arranged that the deflecting force of one set of plates tends to move the light spot horizontally across the screen, and these particular plates are invariably referred to as the X plates. The other set of plates tend to move the light spot

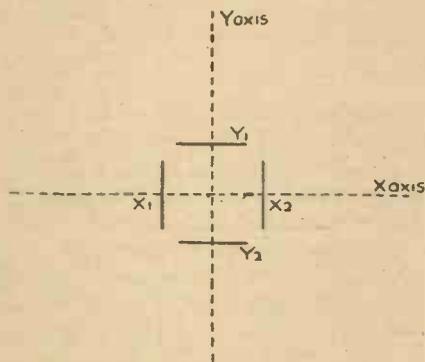


Fig. 1.—Plan view of the deflector plate arrangement to give horizontal, vertical, or resultant-deflection.

vertically, and are called the Y plates. (See Fig. 1.)

If deflecting voltages are applied to both sets of plates simultaneously the light spot will be moved in a direction somewhere between the horizontal and vertical, dependent upon the vector resultant of the two deflecting forces.

If constant deflection voltages are applied the light spot will take up a position dependent upon the deflection resultant but will thereafter remain steady as long as the plate potentials keep constant. If there is any variation of voltage at the deflecting plates the light spot will move in sympathy and a very slow variation of voltage will be shown by a slowly moving spot (definitely visible as a spot). Fast voltage variations, however, will, owing to the persistence of vision, cause the movement of the light spot to show up as a line trace.

## X Deflection as a Function of Time

In radio we are particularly interested in voltage waveforms. This is another way of saying that we are particularly interested in the exact manner in which the voltage varies with respect to time. If we wish a "picture" of a voltage waveform to be visible on the screen it will be of no use applying the voltage either to the X plates alone, or to the Y plates alone, or to both together, for that matter. Suppose we did apply an alternating voltage to the X plates. The light spot will certainly move in strict accordance with the voltage variations, but as it will run backwards and forwards along a straight line the trace of this line will be the only visible result. (See Fig. 2.)

What is required is that the X deflection shall cause movement of the light spot

across the screen independently of any variation of the voltage under test; preferably the movement of the spot with reference to the X axis should be at uniform speed, in which case the position of the spot with reference to the X axis will be a function of time. Then, if the voltage under test is applied to the Y plates, the position of the spot with reference to the Y axis will be a function of this voltage. In brief, horizontal movement represents TIME, vertical movement represents voltage variation, and the excursion of the spot over the screen will actually "graph" the waveform of the voltage. As to how many cycles will show up will depend upon the ratio of the voltage frequency to the X sweep frequency, but we will return to this point presently.

In radio service testing we are not normally concerned with transient waveforms and, therefore, do not want the X deflection to give just a single sweep across the screen. What is desirable is that a horizontal traverse shall occur at a uniform speed (usually from left to right), that the spot shall then fly back rapidly to the starting point, and immediately start another left to right traverse at the same speed as before, and so on.

Remembering that X deflection depends upon the voltage applied to the X plates we can now see what kind of deflecting voltage is required. For the left to right traverse a voltage increasing in a linear manner will be necessary, and for the rapid right to left fly back a sudden drop of this voltage to the starting value will be required. In other words, we want an

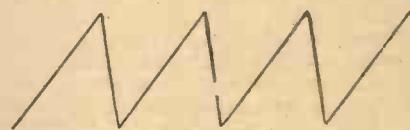


Fig. 3.—Saw-tooth waveform of voltage for X deflection as a function of time.

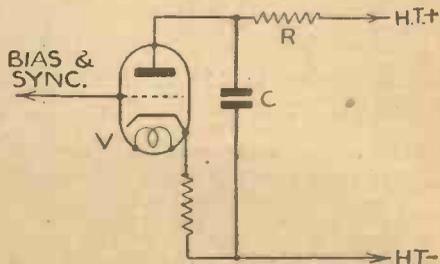


Fig. 4.—Simple circuit illustrating the principle of the time base.

X deflecting voltage of saw tooth waveform, as shown graphically in Fig. 3, and a "time base" circuit to produce such a voltage will be an essential part of the oscillograph.

(To be continued)

# ON YOUR WAVELENGTH



By *Thermion*

## Plans for Radiolympia

**R**ADIOLYMPIA this year will be held from August 24th to September 3rd, and the Radio Manufacturers Association inform me that this year there will not be a theatre as previously. This, I know, has been a sore point with many manufacturers, who, in my opinion, have quite rightly formed the conclusion that whilst such a theatre may be good box office, it does not help to sell wireless sets, because people go to Radiolympia merely to see the Show. Thus, the theatre attracts the wrong type of public. It attracts those who have not the least interest in visiting the Exhibition, or have any intention of buying a wireless set. Of course, they have to pay to enter the Exhibition and pay again before they can enter the theatre, but it is my view that they clutter up Radiolympia, and interfere with the comfort of those who have genuinely gone there to inspect the wireless sets with a view to making a purchase. I, therefore, am glad that there is not to be a theatre at Radiolympia this year.

In place of the theatre I understand there will be a full-size and completely equipped television studio, so arranged that demonstrations of television and sound receivers can be given on the main stands in the wells of two of the halls. The Gallery, which is the usual home of gadgets, will this year be reserved for offices. In place of the exhibitors' club there will be a piano and music section, whilst the exhibitors' club will be transferred to the Princes Rooms. Thus, the ground floor of the Grand Hall will have open stands in the wells with wall stands beneath the Gallery. The trade section will be at the west end. The television studio and some other wireless stands will be in the National Hall, Ground Floor, with the instrument and suppliers section at the east end. The piano and music section will be in the Grand Hall. I am also informed that the television studio at Radiolympia will have glass sides, which will enable the visitors to study the methods employed in television broadcasting, both in rehearsal and in performance. It is at present suggested that the programmes will be

originated in the studio at Radiolympia and transmitted from Alexandra Palace, and thus form part of its regular television programme. The programme will also be seen on the screen of the televisions on the exhibitors' stands.

It is thought that the studio performance will be continuous, and not to set times as last year. Thus, it does not matter when you enter Radiolympia you may see television at your leisure. It is not intended to provide seating arrangements, as the audience will be permitted to move about the glass walled studio. Admission to the studio will be sixpence, and arrangements are being made for television receivers to be shown and demonstrated on the stands of exhibitors.

Ordinary broadcast receivers may also be demonstrated this year. Each stand will be supplied with an R.F. feeder or input, consisting of two forms of the same programme. Although neither of these programmes will be actually radiated by the B.B.C., I understand they will closely simulate these transmissions.

It is the aim of the Exhibition committee to dispel the thought that television requires of necessity a darkened room.

## Limitation of Agency

**A** MOVE is afoot to prevent one dealer acting as agent for any number of makes. You are probably aware that in the cycle and motor trades most agents are not permitted to handle every agency they care to take up. Now, no one dealer can expect to give the very best service when he handles every make of wireless set, and I hope this move succeeds. There should be not more than two agents for a particular make of wireless set in any one district.

## Joke

**A**CCORDING to D. N. W., of Birmingham, two er—ladies were discussing the B.B.C. programmes. One said: "I am fed up with the programmes lately. It's all sympathy and philarny." If this isn't boloney it is most amuseful! This reader also tells me of an experience he had which comes under the heading of freak reception.

"I had an experience a week or two ago which may be of interest to you, and I would be extremely pleased if you can explain the reason for it. I have been a keen constructor for fourteen years, but this is the first time anything like it has happened. I have converted the cellar into a workshop, and I was down there one Sunday morning testing a seven-valve universal set which I had built. At the same time my father-in-law, who is an old army drummer, was upstairs in the bedroom giving some boy scouts a few wrinkles in drumming. About 12.15 I was tuning round to see how the Regionals were situated on the dial. The station mush was there, although the programmes had not commenced. When I got to the North Regional, I had a shock, for quite loudly through the speaker came a roll of drums. I listened for a few seconds, and it was repeated. I swung round to the West and London Regionals, but there was nothing doing, so back I went to the North, and sure enough, there it was again. So I arranged for my father-in-law to roll the drums while I listened and each time he did so it was reproduced quite distinctly down below. It has puzzled me ever since, and I hope you can enlighten me as to the cause."

## The Boy Scouts' Questionnaire

**I** HAVE received a suggestion that I should publish the correct answers to the questionnaire set for Boy Scouts wishing to obtain a wireless badge. If there are many of my readers who are Boy Scouts perhaps they will drop me a note. I should have thought that such a request would be out of order, for the test is intended to find out how much the Scout really knows. It would not be fair for him to obtain a badge as a result of learning off in parrot fashion standard replies.

### S O S Broadcasts

I WAS interested to hear that, of the 341 S O S messages broadcast during the first quarter of the year, 168, or 49.27 per cent., were successful. During the corresponding period last year, 285 messages were broadcast and the percentage of successes was 56.49.

There was a slightly better response this year to messages asking for witnesses of accidents. Forty per cent. have been successful, compared with 36.36 per cent. last year.

Twenty people failed to reply to cards on which they were asked to let the B.B.C. know the results of messages, and it is not, therefore, known how many of them were successful.

Altogether a total of 226 "Illness" S O S calls were broadcast; 95 messages appealed for witnesses of accidents; there were five messages in the "Crime" category, of which two were successful; while of fifteen "special" messages, five were successful.

Though it is not possible to accede to them, many requests still reach the B.B.C. to broadcast messages for lost property and missing animals, while within the last three months two curious requests have reached Broadcasting House. One came from a girl who asked to be put in touch with a man—she didn't know his name—whom she had met on Hampstead Heath, and the other from a woman who wanted a broadcast to be arranged for "the betterment of cats." She wished the speed limit on the roads to be reduced to twenty miles per hour so that fewer cats would be run over!

### Which is Right?

DURING discussions in connection with the development of this country's television service it seems to be accepted quite generally that television and ordinary sound broadcasting must ultimately merge into one service only. Which side of this dual branch will then assume the greatest importance? In reaching this point will manufacturers and designers regard the receiver as a wireless sound set with television added, or will the television set constitute the main item with a sound broadcasting chassis incorporated as an additional point in favour of the complete product? There is no doubt that the consensus of opinion regards the latter point of view as being the correct one. Bearing in mind the stringent requirements of vision plus the equipment essential for scanning and supplying the required high voltages to the tube itself, it seems futile

## Notes from the Test Bench

### Corona Four

IT may again be emphasised that when building the Corona Four, or any other receiver in which the same two coils are used, the slightest mis-alignment of the coils will result in the switch-gear failing to function. The coil nearest the panel should first be firmly attached to the chassis and the remaining coil should only be left in position—without holding-down screws. The set should then be tested and when the switching is found to function the screw holes should be marked and the coil attached whilst the set is working. If it is found that the signal disappears as the screws are driven home, the screws will have to be moved until the coil is firmly attached without losing the signal. The locating plate must also be firmly locked whilst a signal is tuned in to ensure that it acts correctly in relation to the internal switch mechanism. Another important point is to remember not to press on the trimmers when adjusting them as the internal coil assembly is "floating," and the component may be damaged by such pressure.

### Plug and Socket Connections

THE old form of plug and jack connection had many points in its favour, although it now seems to have dropped out of use. The modern small plugs and sockets may, however, be put to similar use and often enable quick substitutions of components to be made for experimental purposes. The correct type of plug and socket must, however, be used, and it will be found that there are solid plugs and split plugs and sockets, and poor fitting will be provided if incorrect pairs are chosen. Where split plugs are used the ends may be opened out by means of a penknife, so that a really reliable contact may be obtained with repeated use.

### Marking Accumulators

SOME listeners still find difficulty in identifying their accumulator after visits to the charging station. It may be remembered that a label carrying your name (and address or other mark) may be attached to the accumulator case and protected by covering with a thin sheet of celluloid. This should be attached to the case by using ordinary amyl acetate, in which has been dissolved a quantity of clean celluloid cut into strips. Special acid-proof labels are also obtainable from some dealers and service stations, although this does not prevent the exchange of cells of a similar type and outward appearance.

to regard this as an addition to a radio set. The two things appear to bear the same relationship as a good garage to a modern suburban home; the garage being the equivalent of the sound broadcasting chassis. On this score alone, therefore, it is difficult to see how elaborate relay systems are going to provide an economical solution to any distribution scheme designed for the purpose of providing a vision and sound service to a potential viewing community situated over a wide area. In flats and hotels where cables can be kept to relatively short lengths a satisfactory and economic cable distribution can be installed, and this is being done in most modern blocks of flats now being erected. Apart from this, relay reception in the home does not at the moment appear to provide a satisfactory solution. A direct aerial feed to the set itself enables problems of interference to be settled on site, does away with the necessity for elaborate filters which may be essential for relay distribution, and gives the set user complete independence for choice of programme.

### Enthusiasm

THE amateur is often accused of devoting his time to transmitting and other subjects merely for personal enjoyment, it often being overlooked that he does in many instances carry out really useful work in the field of research. I am reminded of this in a note in a short-wave magazine issued by the Cardiff Radio Society where the writer recalls some of his earlier experiences. I am sure the following will emphasise the unselfish work which has been carried out by amateurs from time to time.

In the earlier days of the Blackwood Radio Club, it was decided to hold something in the nature of a Field Day, with a small portable receiver to provide the radio fare; the date of the event corresponded with the Radio Society of Great Britain National Field Day of that year, and accordingly the members, plus receiver, were installed in a field some little distance away and a very interesting and enjoyable day was anticipated by all. Unfortunately, none present could read Morse and the bands were found to be full of it. Later rain fell and the writer can still picture the Chairman doing his very best to cover all with his umbrella. At the end of the day, the total log of stations received was one—G2JL—and he was using 'phone. The writer is not at all sure about the "endless joy" on that occasion, but it certainly did provide material for serious study.



### SHORT-WAVE SECTION

(Continued from previous page)

set to the point at which the "breathing" is first heard, and then eased off very slightly. In these conditions the valve will be just short of the oscillation point and telephony signals will be heard as speech or music, probably rather distorted. A further slight slacking off will remove the distortion. Powerful signals will often cause the valve to oscillate so that the

reaction and tuning knobs simultaneously. Generally, the reaction control requires to be turned through only a small arc while the tuning pointer moves from end to end of the scale, and one has to learn to turn the two knobs by the correct proportional amounts. The whole object is to "hold" the faint background noise and maintain it at constant strength.

#### Listening Times

The beginner to short waves should not despair if his initial efforts meet with little success, for with a little perseverance he will soon master the operations involved. Incidentally, it should be pointed out

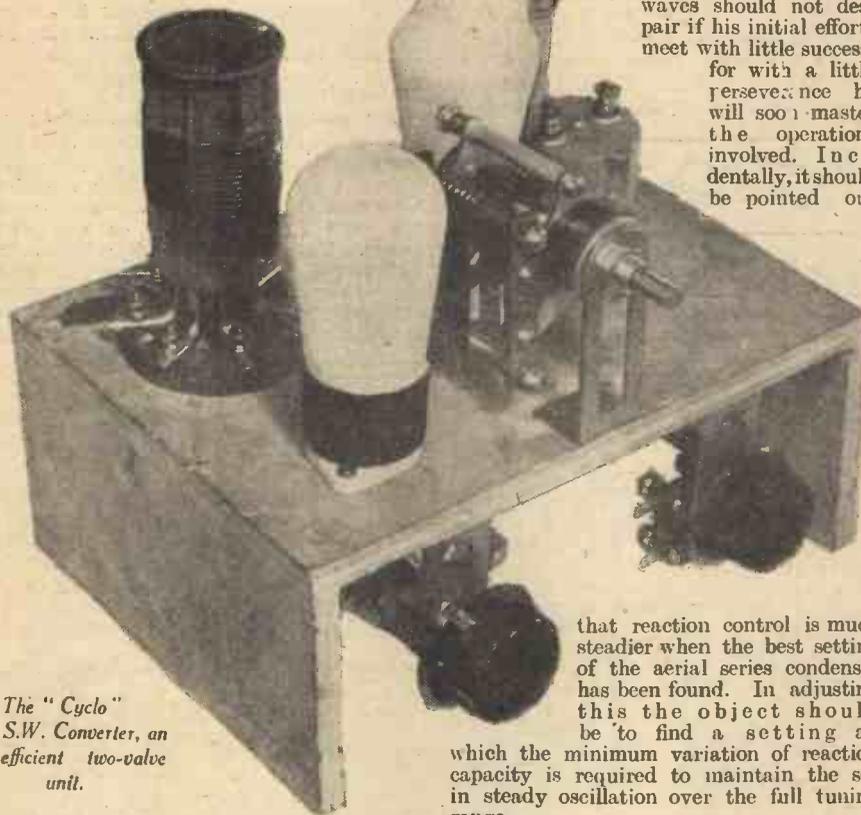
If the set is being tested during the early evening the 19-metre band will probably yield a few good signals; later in the evening the 31-metre and 47-metre bands are better for reception of American stations. Continental transmitters such as Rome, Zeesen and Huizen can be heard at most times of the day on the 19, 25 or 31-metre bands, and one of the Daventry Empire transmitters can generally be picked up. Surprisingly enough, however, these transmissions are not well received at distances of less than 100 miles, due to "skip-distance" effects.

When testing during the day, especially when in search of long-distance stations it will be found that the shorter waves down to about 13 metres are received better in the morning, and that the optimum wavelength range increases as darkness approaches. This is not an invariable rule, for one of the most interesting features of short waves is their variation. Signal strength also varies from day to day—even hour to hour—so if initial tests are not very successful, wait an hour or two and try again before concluding that the receiver is defective. Once you have "got the hang" of tuning you will find that there is always something to be heard on short waves unless conditions are unusually bad.

#### A Common Slip

There does not appear to be any good reason for it, but it is frequently found that one particular connection is omitted when wiring the receiver; that is the one between the L.T. circuit and the lower end of the grid winding and earth. We must confess that we have a bad habit of making this slip ourselves, and it has often caused us to look for obscure faults. Our correspondence shows that many readers make the same mistake, which is usually indicated when signals from the nearest broadcasting station are heard as "break-through" over the major portion of the tuning range. The same trouble is sometimes caused by the aerial being too long and near to another which is being used for broadcast reception. In some cases it has been found that the absence of the same wire makes it possible to hear, usually faintly, telephone conversations. Here again, of course, tuning has little effect.

A final word of advice; pay great attention to the earth lead. It is usually more important than the aerial. If it is necessarily long, insulate it as carefully as the aerial is insulated, and use heavy stranded wire.



The "Cyclo"  
S.W. Converter, an  
efficient two-valve  
unit.

whistle or carrier wave is heard instead of the actual telephony. In that case, reaction will have to be reduced to a greater extent.

The method outlined appears simple enough, but in practice it is not simple until experience has been gained. The difficulty is in keeping the correct reaction setting as tuning is varied, because reaction is automatically altered with the tuning. That is why the skilled operator turns both

that reaction control is much steadier when the best setting of the aerial series condenser has been found. In adjusting this the object should be to find a setting at

which the minimum variation of reaction capacity is required to maintain the set in steady oscillation over the full tuning range.

One of the best times for trying out a short-wave set is on Sunday mornings, when there are literally thousands of amateur transmitters at work on the 20-metre and 40-metre bands. They are also to be found on 10 and 5 metres, but there are not usually as many signals on these bands, whilst tuning is somewhat more difficult until the experimenter has fully mastered the operation of the set.

#### Spring Schedule of Motala

LISTENERS on short waves desiring to hear the Stockholm programme should tune in to SBP, Motala, on 25.63 m. (11.7 mc/s), which comes on the ether daily (except Saturday) from B.S.T. 13.30-19.00, and on Sundays from B.S.T. 15.00. From 19.30, SBO, on 49.96 m. (6.06 mc/s), takes over and transmits the programme until 23.00. Experimental broadcasts are still being carried out by SM5SX.

#### Test Matches on Empire Wavelengths

Running commentaries of the Test Matches are being broadcast to the British Empire on two frequencies, namely, GSP, 15.31 mc/s (19.6 m.) and 11.75 mc/s (25.53 m.) through GSD. The former station is on the air from B.S.T. 14.00-15.00, when GSD takes over until close of play.

## Leaves from a Short-wave Log

#### Another Mexican Signal

Correspondents report the reception of experimental broadcasts from OAX1A, *La Voz de Chiclayo*, a 200-watt transmitter at Chiclayo, Mexico. Although in official lists the station is registered as working on 48.78 m. (6.15 mc/s), the tests have been heard on 24.98 m. (12.01 mc/s).

#### From the Arctic Circle

Transmissions from the MacGregor Arctic Expedition in Greenland, now icebound

near Etah, which have been received on 14.38 mc/s (20.86 m.) are now heard on a new channel, or roughly 12.86 mc/s (23.33 m.). The call-sign OX2QY has been changed to W10XAB. The messages heard have been interesting inasmuch as the operator has stated that the ship is frozen in five feet of ice, but that towards July 15th, when the annual thaw sets in, it is hoped that the Expedition may start its return journey to the United States.

#### Vienna's New Interval Signal

The German authorities have decreed that the Vienna medium and short-wave transmitters shall use, as an interval signal, the last notes of the National anthem *Deutschland Ueber Alles*, in order to demonstrate the complete incorporation of the Austrian broadcasting network in that of the Reich. The German studios have long since adopted the opening bars of the same anthem as a "stand-by" call.

A PAGE OF PRACTICAL HINTS

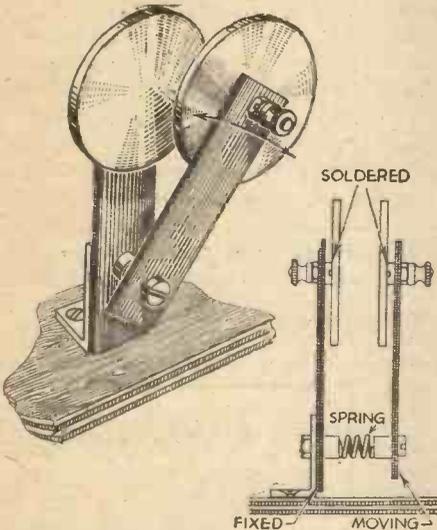
SUBMIT  
YOUR  
IDEA

READERS  
WRINKLES

THE  
HALF-  
GUINEA  
PAGE

A Small Neutralising Condenser

THE accompanying sketches show a small neutralising condenser I have made from odd parts, consisting of 2 brass discs 1 1/4 in. diameter, two pieces of fibre



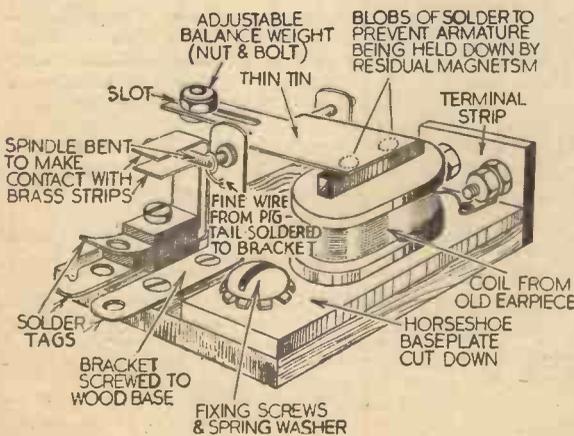
This small neutralising condenser was made from odds and ends.

2 in. x 1/2 in. x 1/4 in., two 1/2 in. 6-B.A. bolts with nuts and terminals, 1 bolt 1 in. long, with nut, 2 washers and spring, and 1 small metal angle piece for mounting. The sketches clearly show how the parts are assembled. The condenser is suitable for most small triode transmitting valves.—R. GILBERT (Long Rock, Cornwall).

A Simple Sensitive Relay

THE cost of sensitive relays in most cases being prohibitive, I constructed one for myself from an old earphone coil and part of the headphone magnet.

I carefully removed the coil needed from the earpiece, leaving the other for future



An inexpensive sensitive relay.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR 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 "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

use by cutting the magnet neatly away with coil all ready for mounting.

Next a piece of thin tin cut to shape and slotted for an adjustable weight, is bent round a wire spindle which in turn is bent at right angles in such a way as to make contact with brass strip contacts as current flows, and armature makes and breaks contacts. Solder tags, and terminal strips, are mounted on a wood base, as shown, and some blobs of solder on the underside of the armature prevent any tendency to stick through the residual magnetism of the magnet-pole-piece. The whole unit measures approximately 2 in. square.—E. J. WELLINGS (Clacton).

A Dodge for Bending

Aluminium

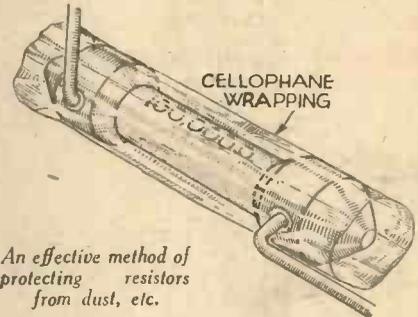
BEING handicapped by only having a small vice, I decided to commission two old bar magnets, the lengths of which exceeded that of the vice jaws by 4 in. and afforded a very useful clamp for long pieces of aluminium which I wished to bend to shape.

The scoring of the aluminium results in a ridge which serves admirably for alignment, this ridge automatically resting along the edges of the bar magnets. Difficulty was experienced in setting the assembly in the jaws in the first place, so I constructed a few end caps of aluminium, these keeping the bars together and facilitating the alignment. The attached sketch shows clearly the arrangement.—H. W. SOMERSBY (Woolwich).

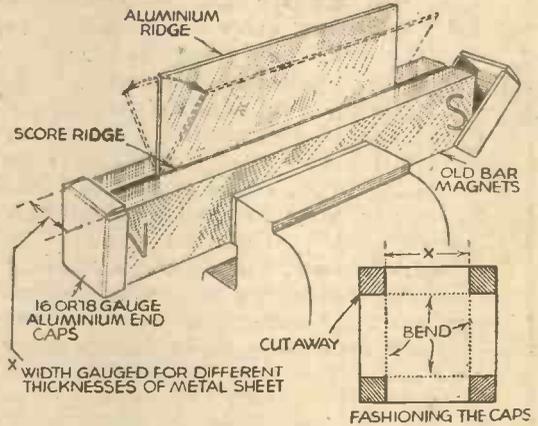
Protection for Resistors

WHENEVER there is any likelihood of a metal-ended resistance coming into

contact with the chassis it is as well to take steps to prevent it from doing so. A neat and effective way of doing this is to wrap round it a layer of cellophane, securing the latter with a spot of glue. This has the advantage that one can see the value of the resistance at any time,



and also of keeping dust and dirt from the resistance. For the latter purpose it is recommended that the ends of the "tube" be closed around the wires. Resistances enclosed in this way look very neat, and other small components can also



A useful dodge for bending aluminium sheet for chassis making.

be enclosed in cellophane in the same way.—WM. NIMMONS (Belfast).

NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

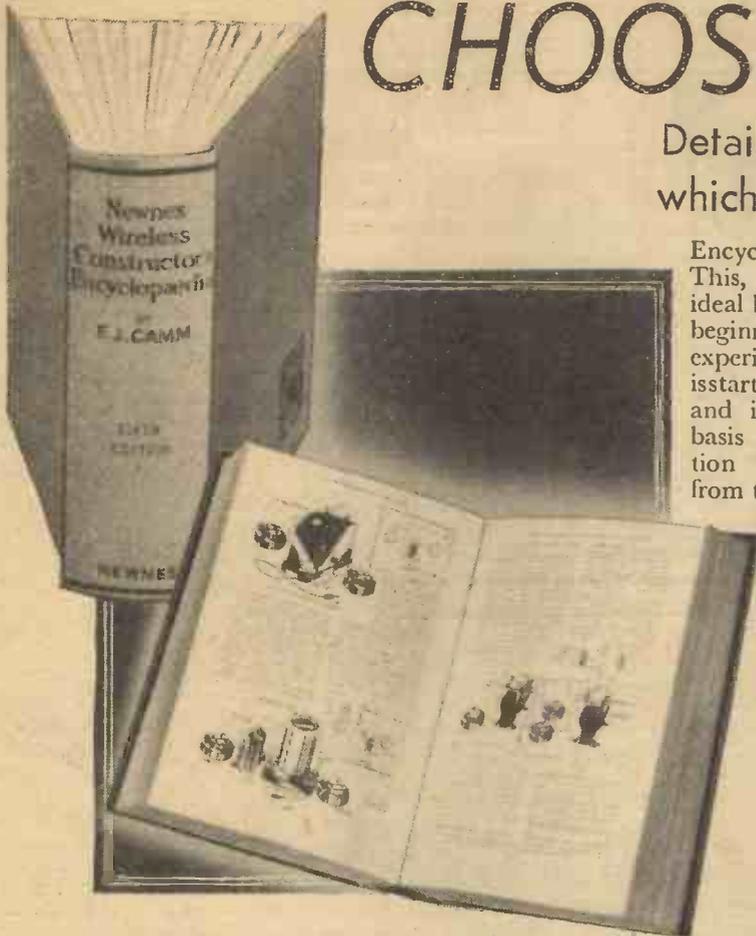
Edited by

F. J. CAMM

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

# CHOOSING YOUR T

Details of the Various Technical Books which are Suitable for the Beginner, the



Encyclopaedia? This, then, is the ideal book for the beginner or the experimenter who is starting a library, and it forms the basis of a collection which will from time to time prove invaluable.

## The Encyclopaedia

In this volume will be found an explanation of every term now used in radio, and it should be remembered that this

**B**OOKS are the fount of knowledge, and every experimenter should make a point of acquiring a complete library of those volumes which deal with the subject of radio in all its branches. Bacon says in his Essays: "Some books are to be tasted, others to be swallowed, and some few to be chewed and digested." Technical subjects do not, of course, lend themselves to interesting continuous matter in the same manner as a novel, but they may be made interesting when handled in a suitable manner by a writer who knows his subject. The beginner, for instance, will often, in reading the various articles published in these pages, come across terms which are new to him. It might be possible to gain some idea of what is meant from the general context of the subject, but in some cases it may be found impossible to do so, and the general subject may be lost to the reader who is unaware of the matter under discussion. Here some form of dictionary is obviously needed, but a mere explanation of words does not in all cases suffice. An encyclopaedic dictionary is much more useful, and in this connection what could be more fitting than the "Wireless Constructor's

is now in its Sixth Edition. It is revised from time to time, and in the latest edition will be found a description and circuits of the latest developments in radio—push-button tuning. All of the terms are arranged in strict alphabetical order, and in addition a list of abbreviations used in modern radio practice is included. A full-page illustration shows all the symbols used in modern circuits, and includes the standard valve types, of which there are twenty. In addition, under the circuit descriptions, will be found over 20 circuits ranging from a crystal set to mains receivers and amplifiers. Tools are explained, and many practical details will be found in the pages of this volume which will enable a beginner to take up the hobby and follow clearly every article given in these pages and to understand the explanations of new devices and ideas which will be published from time to time.

## Practical Receiver Designs

For the experimenter who understands theoretical circuits and who is more concerned with building different types of receiver there is "Sixty Tested Circuits."

This book contains a brief descrip-

tion, a complete list of components, and theoretical and practical designs of sixty different pieces of apparatus. The simplest crystal receiver is included and the various pieces of apparatus described range up to a multi-valve superhet for mains use. The experimenter and service man will find this book of value on his bookshelf, as it is often found necessary to rig up a circuit for various purposes and usually a tested circuit is not available at the moment. All of the receivers described in this book have been built up and tried out and in many cases full-size blueprints are available at 1s. each from this office. It is obviously impossible to include in one book the particular circuits which will be favoured by every

## Important Broadcasts

### NATIONAL (261.1 m. and 1,500 m.)

Wednesday, May 18th.—*In the Tunnel: A microphone visit to the working face of the new flood control tunnel at Derby (electrical recording).*

Thursday, May 19th.—*London Music Festival, 1938, from the Queen's Hall.*

Friday, May 20th.—*Radio Pie, variety programme.*

Saturday, May 21st.—*Light music relayed from Germany.*

### REGIONAL (342.1 m.)

Wednesday, May 18th.—*Speeches at the British Legion Dinner.*

Thursday, May 19th.—*Sands of Suez, a chronicle by Dewan Sharar.*

Friday, May 20th.—*Night Must Fall, by Emyln Williams.*

Saturday, May 21st.—*The Aberdeen Fish Market, feature programme.*

### MIDLAND (296.2 m.)

Wednesday, May 18th.—*Band concert.*

Thursday, May 19th.—*Variety from the New Theatre, Northampton.*

Friday, May 20th.—*Night Must Fall, by Emyln Williams: Oxford Repertory Company.*

Saturday, May 21st.—*Six Pastorals by Walford Davies: Instrumental and choral programme.*

### WEST OF ENGLAND (285.7 m.)

Wednesday, May 18th.—*Dance Cabaret from the Royal Bath Hotel Ballroom.*

Thursday, May 19th.—*Organ recital from Westbourne Methodist Church, Bourne-mouth.*

Friday, May 20th.—*Strike Sound, Boys! a sing-song from the Cornish Arms, St. Merry.*

# TECHNICAL LIBRARY

which are Available from this Office and  
 Experimenter and the Service Engineer

listener, but the range which has been selected may be relied upon to be fully representative, and the advanced amateur will easily find ways and means of modifying the designs to suit his particular requirements. Furthermore, in many cases complete kits for the receivers are readily available from advertisers in these columns.

### Making Components

Many listeners find the greatest enjoyment in making up their own components, but, of course, there are many items which cannot be made at home without very elaborate apparatus. Coils are, however, a very simple matter to construct and many hours of interest may be spent in trying differ-

ent coil combinations in an experimental receiver. In the volume "Coils, Chokes and Transformers," full details of various coils will be found and these range from a simple unit for use in a crystal receiver to elaborate ganged and screened assemblies, and very complete data for short-wave coils will also be found. Associated with these are details for chokes of various types, and a special section deals with the construction of L.F. and mains transformers.

Short waves are now gaining in popularity and there is much experimental work to be done on certain wavelengths. The amateur will find great scope for experimental work on the short waves, especially in conjunction with modern high-definition television.

menter should be without a copy of this book, which includes, for historical purposes, brief details of the earlier forms of television transmitters and receivers used for B.B.C. transmissions. Here will be found an explanation of how modern television systems operate and details of the present wave-forms and other associated data.

### "Everyman's Wireless Book"

Finally, a general form of handbook, somewhat on the lines of a beginner's guide to radio, is included under this title, and many beginners will find this an ideal guide before embarking on the fuller study of the subject. It will form a useful entry into the general field of radio and is so arranged that even the schoolboy will find it simple to follow the various subjects dealt with. It describes the various items of equipment in a modern receiver and also explains how to make testing apparatus and how to use it. It shows you how to build a receiver and how to trace and check the faults which might arise in it. Details are given of modern sources of voltage supply, how to select and use a loudspeaker, and various other items which are likely to interest the newcomer to radio.

These are, of course, only five of the books from the extensive range published by us and a catalogue of all of them may be obtained on application to this office.

### "S.W. and Television Handbook"

In the volume bearing this title many short-wave circuits are given, with an explanation of the various points of interest which arise in short-wave working. Aerial designs and associated equipment, and particulars of modern television equipment, are also included and no serious experi-

## Events of the Week

*Saturday, May 21st.—Agricultural Bee—Somerset v. Dorset, a competition for Young Farmers.*

### NORTHERN (449.1 m.)

*Wednesday, May 18th.—Dancing Here and There: Dance music programme.*

*Thursday, May 19th.—Manxmen: a programme about the Isle of Man.*

*Friday, May 20th.—Concert party programme.*

*Saturday, May 21st.—The Yorkshire Hymn Singing Festival from the Highfield Road Methodist Church, Doncaster.*

### WELSH (373.1 m.)

*Wednesday, May 18th.—Music by Welsh Composers: Orchestral programme.*

*Thursday, May 19th.—Concert Party Memories.*

*Friday, May 20th.—The production and marketing of honey in Wales, a talk.*

*Saturday, May 21st.—Organ recital from St. Catherine's Church, Pontypridd.*

### SCOTTISH (391.1 m.)

*Wednesday, May 18th.—Orchestral programme from the Concert Hall, Empire Exhibition (Scotland).*

*Thursday, May 19th.—Variety programme.*

*Friday, May 20th.—Music of the Bens: Gaelic programme.*

*Saturday, May 21st.—Boys Brigade Display, feature programme.*

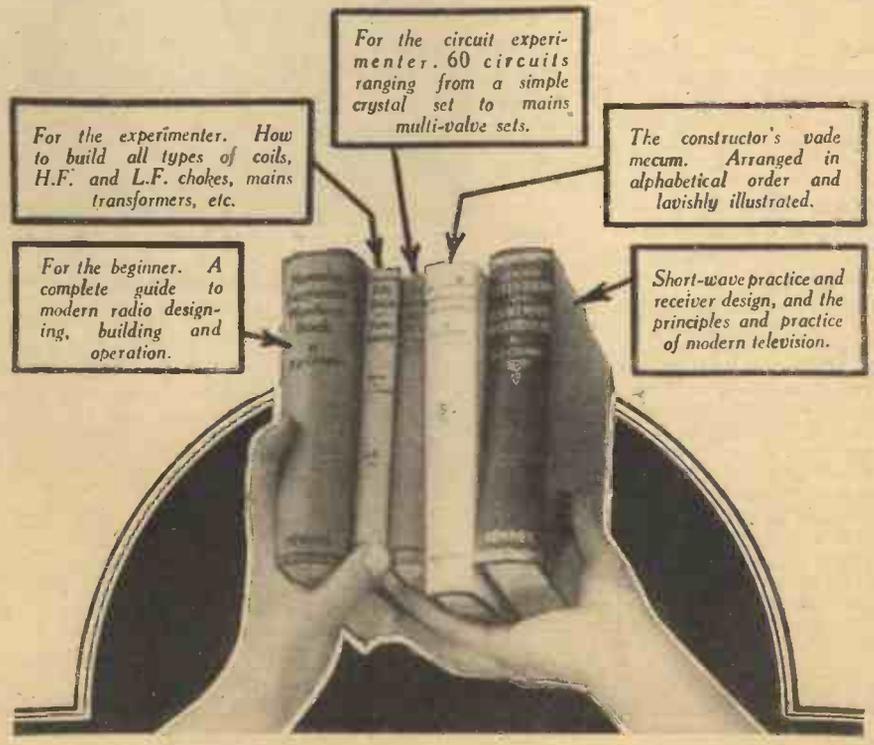
### NORTHERN IRELAND (307.1 m.)

*Wednesday, May 18th.—Irish Dance Music: Orchestral concert.*

*Thursday, May 19th.—The Late Christopher Bean, a play adapted for broadcasting.*

*Friday, May 20th.—Orchestral concert.*

*Saturday, May 21st.—Band concert.*



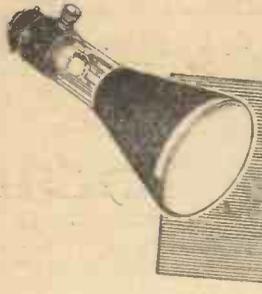
For the experimenter. How to build all types of coils, H.F. and L.F. chokes, mains transformers, etc.

For the circuit experimenter. 60 circuits ranging from a simple crystal set to mains multi-valve sets.

The constructor's vade mecum. Arranged in alphabetical order and lavishly illustrated.

For the beginner. A complete guide to modern radio designing, building and operation.

Short-wave practice and receiver design, and the principles and practice of modern television.



# Practical Television

May 21st, 1938. Vol. 3. No. 101.

## Judging a Set

UNTIL a set has been installed in a home for a week or two, the value of the service, and the results obtained, cannot be thoroughly appreciated, and it is certain that the steady increase in sales is a direct result of personal recommendation. The enthusiasm of those who have acquired their own sets is unbounded, and there should be a real boom once stations in the midlands and north are operating, for people in those localities have been denied this pleasure from the very beginning, even in the days of low-definition television.

It is interesting to note that although at first sight contrary to technical requirements, a great deal of time is being spent in investigating the possible use of ordinary normal telephone circuits. In the days of low-definition signals where the frequency range was so small, trunk line telephony cables were used for relaying the signals without any difficulty, but the advent of high-definition television presented problems of an entirely different character. While it is not anticipated that long lengths of telephony cable would be used for high-definition signal distribution, to be in a position to use it as a "spur" cable up to a mile or so from a main television cable route, or a directional ultra-short-wave transmitter, would extend enormously the area over which transmissions could be undertaken. The Germans claim to have done this successfully, but in this case a definition of 180 lines was used, working at 25 frames and 25 pictures per second sequential scanning. With the present B.B.C. picture standard it is quite a different matter, but even so the results obtained so far are most encouraging, providing at both ends terminal equipment of a rather elaborate nature is used. Signal attenuation, phase distortion and circuit balancing present intricate problems, but engineering skill coupled with involved mathematical calculations appear to be solving these difficulties, and if wholly successful the idea may have far-reaching effects.

## Curious Effects

DURING the course of installing receiving sets in viewers' homes, the engineers occasionally meet with very curious effects. Many of these can be traced to the aerial itself, and prove that it is always a good plan to carry out a series of proper tests before finally deciding on the site for the aerial proper. Apart from questions of signal strength, which as a rule require the aerial to be positioned at the highest point, and problems of interference which may involve the use of reflectors or in some cases special types of aerials, there is also the item of double images. It is sometimes found that a pronounced double image is observed on the picture screen which is in no way due to faulty correcting circuits or bad tuning, and investigations have to be undertaken to locate the source of the trouble. A case in point occurred during the preliminary tests undertaken prior to televising the boat race. At a check point the

engineers observed a ghost image appearing after the main picture, and a simple calculation involving the distance between the two pictures on the screen, size of screen and speed of scanning showed that there was approximately a five micro-seconds delay between the reconstitution of the two pictures. Since the speed with which the signals move through space is about 186,000 miles per second, this meant that about a mile away there was a source of reflected signal which produced the effect. It was traced ultimately to some telephone wires, and although the matter was rectified by the Post Office the case serves to prove that each installation needs to be treated on its own merits with careful consideration



Television apparatus at work in Harringay Arena when a championship fight was recently televised.

being given to the peculiarities of the site, should any exist.

## Anxious to View

RECENTLY, a Member of Parliament requested the Postmaster-General to furnish facilities for M.P.s to see the television station at Alexandra Palace at work. The B.B.C. have agreed, but owing to limitations of studio space which still exist, and the need for rehearsal time, it is only possible for parties of ten to be invited at one time. The invitations are being issued in alphabetical order, so that it will be a long time before all members have had the opportunity of seeing the station. The plan is an excellent one, however, for remembering how essential it is to keep Britain's television service ahead of any other in the world, by having first-hand knowledge of the work involved, Parliamentary grants for extensions and the erection of new stations in other parts

of the country will be furnished with greater readiness.

## Retaining Balance

WHEN discussing or examining the results obtained by television transmissions it is remarkable how often the question of sound does not arise. While appreciating that sound must be subservient to the needs of vision, with any television service the two must combine correctly if the proper illusion is to be given to the viewer. Close-ups of speakers or singers demand an intimacy of sound at a correct level, while long shots must produce the effect of a noise at a distance. This is only brought about by a very close liaison between the producer and the sound engineers, and a knowledge of the script coupled with intimation as to which of three or four cameras is to be in operation at any one instant. At no time must the viewers' attention be distracted from the picture itself, or this will mar very seriously the degree of entertainment which is being provided. Sound and vision must not register as separate entities but be combined smoothly and efficiently throughout the whole period of the transmission. Again, it is essential that no shadows from the microphone should be visible, and the microphone itself must never appear in

the picture, otherwise the whole production will be spoilt as far as set owners are concerned. This necessitates both a careful and rapid manipulation of the microphone boom so that a voice or any general sounds accompanying the transmission are not lost. With the small amount of rehearsal time which is generally available for any Alexandra Palace production, it reflects great credit on the engineers concerned with this side of the work that their vigilance is maintained so efficiently, for seldom do errors occur.

## NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

2nd Edition

By F. J. CAMM

Price 3/6 or 4/- by post from the Publishing Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

**FIRST QUALITY PROGRAMMES**

AS announced on page 233, the B.B.C. is to broadcast extracts from the Toscanini programmes on the ultra-short-waves (television sound wavelength) so that music lovers may obtain the advantages of the improved frequency ranges. The items which have been selected are as follows:

Thursday, May 19th

- 8.18 God Save the King.
- 8.19-8.25 Overture, *The Magic Flute* (Mozart).
- 8.27-9.0 *Symphony No. 4 in B flat* (Beethoven).

Monday, May 23rd

- 8.18-8.31 *Brandenburg Concerto No. 2 in F* (Bach).
- 8.33-9.4 *Symphony No. 5 in C minor* (Beethoven).

Friday, May 27th

- 8.18-8.40 *Te Deum* (Verdi).

Monday, May 30th

- 8.18-8.40 *Te Deum* (Verdi).

Friday, June 3rd

- 8.18-8.48 *Symphony No. 41 in C* (Jupiter), K.551 (Mozart).

Friday, June 10th

- 8.18 God Save the King.
- 8.19-8.25 Overture, *La Scala di Seta* (Rossini).
- 8.27-9.7 *Symphony No. 2 in D* (Sibelius).  
The relays will be preceded by a tuning note.

**PROGRAMME NOTES**

**B.B.C. Scottish Orchestra at Glasgow Exhibition**

VISITORS to the Concert Hall in the Exhibition on May 18th, will be the B.B.C. Scottish Orchestra, led by J. Moulard Begbie, and conducted by Ian Whyte. On this occasion it is being augmented by members of the Glasgow String Orchestra and will number between 55 and 60 players. This Concert, which will include three old Scottish airs as well as works by Smetana and Dvorak, will give listeners a good opportunity of hearing the work of musicians who are resident in Scotland. The conductor is a leading Scottish musician.

**Carroll Levis Searching for "Discoveries"**

TO find 12 artists for his next radio show on May 24th (Regional), Carroll Levis, the Canadian talent-spotter, has just left London on a month's tour of the country.

The auditions that he will hold in Swansea, Liverpool, Leeds, Chatham and Stratford, E., will be open to unknown professionals as well as amateurs—particularly comedians—who have never before had the opportunity of broadcasting. Every audition will be held in strict privacy under conditions resembling those of an actual broadcast.

**PETO-SCOTT**  
for all you need in Radio

There's every kind of radio equipment from components to complete receivers in the Peto-Scott range—at prices within the reach of all—for cash, C.O.D. or Easy Payments. Since 1919, Peto-Scott value and quality have been famous. Supply your radio needs from this range. Full lists on request.

**POST ORDERS**

All orders over 10s. Carriage and C.O.D. charges paid. Overseas orders please send full cash plus approximate postage or half value, and we will collect balance C.O.D.

**CALLERS**

All items offered available from our London branches daily: 9 a.m. to 7 p.m. Saturdays: 9 a.m. to 1.30 p.m. Call in and let us help you in your choice of apparatus.

**AMAZING RADIO BARGAIN!**  
1938 DECCA MODEL 99 6-VALVE ALL-WAVE RECEIVER.

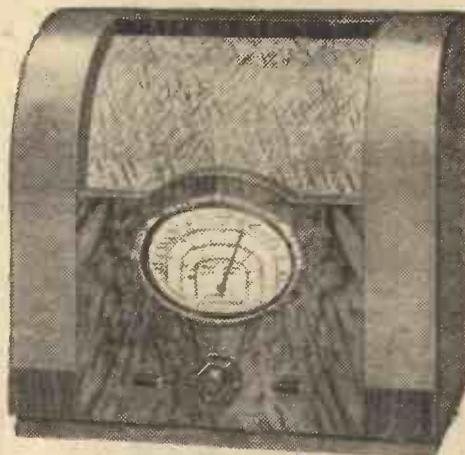
6-valve All-wave A.C. Superhet. 12 to 2,000 metres. Seven tuned circuits. A.V.C. Beautiful hand-polished upright walnut cabinet. Decca commonsense tuning... No complicated trouble-causing mechanism. Bold station-named dial. Spread-tuning, 4 separate easy-to-read wave-bands. Over-size elliptical cone dynamic speaker. Provision for external speaker and gramophone pick-up. Supplied in sealed manufacturer's cartons and covered by maker's guarantee. Supplies now strictly limited.

List Price 13½ Gns.

OUR PRICE

**8**

or 10/- down. Balance in 18 monthly payments of 12/6.



**● PUBLIC ADDRESS EQUIPMENT ●**

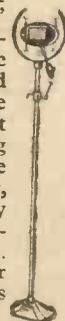
For Dances, Clubs, Sports Meetings, etc.

**AMPLIFIERS.**—6-7-watt model for A.C. Mains. Effective sound-range 500 feet. Ideal for home, club, and sports meetings and P.A. work. Assembled and fully tested, ready for immediate attachment to Microphone or Gramophone Pick-up, complete with 4 valves. List value, £6 10s. 0d. Special Price £3 10s. 0d., or 5/- down and 11 monthly payments of 6/9.

14-watt model. This new amplifier has been designed to give an exceptional performance at the lowest price consistent with using the highest grade components and materials. The overall response is within 2 decibels flat from 32 to 12,000 cycles, and the undistorted output is 14 watts. Peak output powers up to 20 watts can be generated without noticeable distortion. Six valves are used in the following sequence: 1st A.F. stage; 2nd A.F. stage; Push-pull output stage; Rectifier. An input volume control of 50,000 ohms is fitted, and two complete smoothing stages are included. It is not necessary to use a speaker field as a smoothing choke. Price, including valves, 12 gns., or 22/6 with order and 12 monthly payments of 22/-. **22/6 Down**



**MICROPHONES.**—On the highest authority: "equal to a £16 model." These excellent transverse-current microphones for Home Broadcasting, Dance Bands, and Public Address work can also be instantly attached to your present radio when a complete "broadcasting station" is at your disposal. Table Model complete with transformer, 25/- cash or 2/6 down and 10 monthly payments of 2/6. Telescopic Floor-stand Model, real professional type. Chromium-plated, 2 gns. cash or 2/6 down and 11 monthly payments of 4/-.



**PEZOELECTRIC Type Power Pick-up.**—Complete with Pick-up rest, lead and instructions for fixing, 35/- or 2/6 down and 9 monthly payments of 4/-. Cosmocord latest high definition type Pick-up, complete with volume control, 17/6 or 2/6 down and 7 monthly payments of 2/6.

**● TROPHY 3 SHORT-WAVE RECEIVERS**

Editor of "Practical and Amateur Wireless" states: "Even on a poor aerial, the efficiency of the Trophy 3 was very good."

The Trophy 3 is the most efficient and inexpensive receiver ever offered to short-wave enthusiasts. Supplied with coils for 12/52 metres. Full range with extra inductors, 6.2/550 metres. M.C. speaker built in. Phone jack cuts out speaker.

Battery Model, £5/15/0, less batteries, or 9/6 down and 13 monthly payments of 9/11.

A.C. Model, 200/250 volts, £6/6/0, or 10/- down and 13 monthly payments of 10/9.

SHORT WAVE HAMS. Send for details also of the New B.T.S. Trophy 5 Communication Receiver.

**POST COUPON NOW**

**PETO-SCOTT Co., Ltd.,** 77 (Pr.W.38), City Road, London, E.C.1. Clissold 9875-6-7. 62 (Pr.W.38), High Holborn, London, W.C.1. Holborn 3248.

Please send me..... Cash/C.O.D. or H.P.

for which I enclose £.....

Name .....

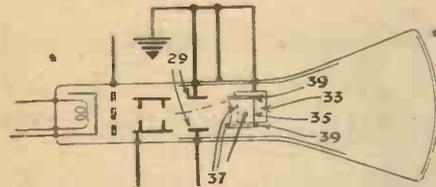
Address .....

# LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5/- per Group Volume or in bound volumes price 2/- each.

## CATHODE-RAY TUBES.—Marconi's Wireless Telegraph Co., Ltd. No. 478475.

In a cathode-ray tube having electrostatic deflection plates, de-focusing and "keystoning" errors are avoided by forming the two plates 33, 35 with a curved edge 37 and providing on the longitudinal edges of one of the

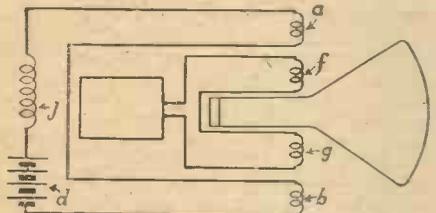


Curved edges to the deflector plates form the main detail in Marconi's patent 478475.

plates 35 flanges 39 extending towards the other plate 33. The edges 37 are arcuate, the centre of curvature coinciding with the point of deflection of the beam produced by the other pair of deflecting plates 29.

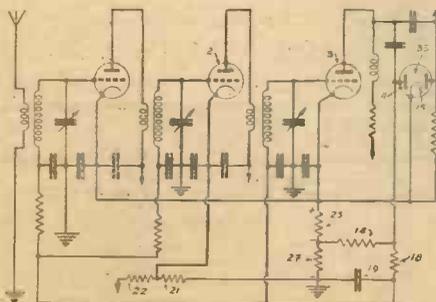
## TELEVISION—Ferranti, Ltd., Taylor, M. K., and Wilson, J. C. No. 478599.

The cathode-ray is deflected electromagnetically to scan the screen by coils *f*, *g*, and a steady deflecting field is provided by coils *a*, *b*, energised from a source *d* over an inductance *j* whose impedance is higher than that of the coils *a*, *b* at the fundamental operative frequency. A variable resistance may be included in series with the coils *a*, *b*,



Another C.-R. tube development covered by a new Ferranti patent.

Fig. 2 (not shown). The coils may be rotatable about the axis of the cathode-ray tube, Fig. 3 (not shown). According to the Provisional Specification, the steady deflecting field may be provided by the scanning coils, and a resistance may be used instead of the inductance *j*. Specifications 418940 and 473836 are referred to.



A very interesting development in valve circuits as covered by patent No. 478584.

## VALVE CIRCUITS FOR WIRELESS RECEPTION.—Johnson Laboratories, Inc. No. 478584.

A.V.C. potentials developed across the load resistance 14 of the diode 11, 15 are applied to the grids of H.F. amplifiers 1, 2, 3 through a filter 18, 19. The cathode circuit of valve 2 includes a fixed source of potential from the potential divider 21, 22, and also the cathode resistance 24 common to the valves 1, 3 across which amplified A.V.C. potentials are developed. Further bias for the grids of valves 1, 3 and for delaying the A.V.C. action of diode 11, 15.

## NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents, and are published by permission of the Controller of H.M. Stationery Office and the Official Journal of Patents, which can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

### Latest Patent Applications.

- 11442.—Anti Static Installation, Ltd., and Sherrin, P.W.—Wireless aerials. April 14.
- 11851.—Cork, E.C.—Aerial systems. April 20.
- 11497.—Field, H.G.—Remote control devices for headphones, used with a wireless receiver. April 14.
- 11612.—Huber, E.—Wireless-receiving arrangements. April 14.
- 11859.—Lowe, A. E. Bower.—Tuning devices for radio receivers. April 20.
- 11744.—Sharp, M.—Antennae for motor vehicles. April 19.

### Specifications Published.

- 483116.—Plessey Co., Ltd., Jones, J. E. Rhys, Barrett, J.O.G., and Haring, H.S.—Thermionic-valve amplifiers.
- 482740.—Blumlein, A.D.—Thermionic-valve amplifying circuit arrangements.
- 483012.—Radioakt-Ges. D.S. Loewe.—Operation of cathode-ray tubes and arrangements therefor.
- 482959.—Baird Television, Ltd., and Willans, P.W.—Electron-discharge devices. (Cognate Applications 33953136 and 5678137).
- 482909.—Cole, Ltd., E. K., and Kennedy, F.W.O.—Thermionic valves.
- 482992.—Naamlooze Vennooschap Phillips' Gloeilampenfabrieken.—Screen-grid thermionic valves.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

## THE CYCLIST.

The leading weekly for every Cyclist, Clubman, Utility Cyclist, or Tourist. Join "The Cyclist" Road Club and also take advantage of the FREE Insurance offered. 2d.—Every Wednesday.



The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

R. de L. (Addlestone). We have no details of the particular set but suggest you communicate with Henry Ford Radio, 22, Howland Street, London, W.1.

W. R.L. (Chorley, Wood). We have not taken over the paper in question and have no blueprints or other details of the special sets referred to.

H. E. C. (Farnborough). Details are nearly complete and the unit will be described very shortly.

T. R. (Mountain Ash). We have not published any book on the subject and cannot trace that one is available in this country.

T. W. A. (Kettering). The makers are General Electric Company, Magnet House, Kingsway, London, W.C.2. The address of K.B. is Cray Works, Sidcup, Kent.

J. L. (Bushey). Messrs. Peto-Scott can supply either the separate parts or the ready-made coil.

C. M. D. (Glasgow). The interference will naturally be worse on short waves, but you may find it possible to erect a good vertical aerial clear of the interference with a twin feeder or other lead-in to cut out pick-up on that.

H. A. (N.W.1.). We cannot insert your request and suggest you take a small advertisement. We would be inundated with requests of a similar nature if we adopted the procedure.

A. R. (Bristol, 3). There is no standard and the component must be wired according to the makers' instructions. A good dealer may be able to trace out the connections for you.

O. H. O. (Trefonen). We suggest you use the Tungram APP4G, which will give you an approximate output of 6 watts.

R. M. (Blackheath, Birmingham). Your receiver is probably designed for a low-resistance extension speaker, and the makers will confirm this. Your speaker is thus of little use without an additional step-up transformer.

J. C. (Mr. Liverpool). You should connect H.T. to the centre-tap, and ignore the connection to one end of the primary. This will maintain the desired ratio.

F. E. (Littlehampton). We cannot supply a blueprint as it is a commercial receiver, and we understand that the makers are no longer able to supply details.

T. McD. (Gosport). We are unable to supply blueprints for the particular components mentioned. The components are rather old and we have not used them in any of our receivers.

L. B. (North Ferriby). All details will be found on the blueprint.

W. J. R. (Rose, Cornwall). Write to Marconi's Wireless Telegraph Co., Electra House, Victoria Embankment, W.C.

## OUR FREE CATALOGUE SERVICE

To save readers trouble, we undertake to send on catalogue of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogues," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

### PIFCO PRODUCTS

IN an attractive and well-illustrated catalogue issued by Pifco, Ltd., a useful range of luncheon and picnic cases and accessories is given, at prices ranging from 7s. 11d. to 32s. 11d. Various cycle accessories, automobile lamps, electric fans, domestic electric irons, and various electric bells, transformers and pushes are also listed, together with a range of oil-air cookers. These are of various types having from one to four burners, and are supplied with or without ovens. Among the other useful appliances listed in this catalogue are vacuum cleaners, massage vibrator, electric hair dryer, electric toasters and kettles, and the Pifco adjustable table lamp.

### SERVICE AND PUBLIC ADDRESS

IN every successful radio business efficient service is essential, and such a service, dealing with the repair of radio receivers of every description, is the business of Holiday and Hemmerdinger, Ltd., known throughout the trade for their efficient organisation. Skilled engineers, with up-to-date equipment, are always available for all kinds of radio maintenance. In addition to service, Messrs. Holiday and Hemmerdinger also specialise in public address equipment, and their latest catalogue covers a varied range of P.A. apparatus, including amplifiers, microphones, loud-speakers (including the Voigt), dry electrolytic condensers, and various service accessories. Copies of the catalogue will be sent to any readers, on application.

# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

### Parlophone

**R**ICHARD TAUBER, who has been engaged to appear in two operas during the Covent Garden opera season, has chosen a song from each for his latest recording. The first is "Dies Bildnis ist bezaubernd Schön" ("This Picture is Enchanting Fair") from "The Magic Flute" and "O wie Angsthlich, o wie Feurig," from "The Seraglio." Both songs are sung in German and Tauber is accompanied by the Vienna State Orchestra, conducted by Carl Alwin. This record, which is one of his best, is Parlophone R 20386. There are a number of attractive records in the 10in. Classic Series, and here again we have another famous tenor, Herbert E. Groh, singing "Always when I am Happy," coupled with "Manola," on Parlophone R 2508. An impressive orchestral recording is supplied by the Grand Symphony Orchestra who play "Victoria Regia" and "Waltz" (Finale), both from the Suite, "The Wonder of the Flowers" on Parlophone R 2510, and in lighter vein we have the Orchestra Mascotte's interpretation of "Song of Hawaii" and "Dream Waltz" on Parlophone R 2512.

"Tears in my Heart," which Leslie A. Hutchinson ("Hutch") featured in a recent broadcast has now been recorded by him on Parlophone F 1093, the coupling being "So Long, Sweetheart." Piano solos with the right artist and right tunes are always popular, and I therefore have no hesitation in recommending Billy Thornburn playing a "Waltz Medley" and "Slow Fox-Trot Medley" on Parlophone F 1091. If you want to enjoy a good laugh you should hear Ronald Frankau's monologue, "The Colonel's Daughter," coupled with "I'd Rather be a Woman than a Man," on Parlophone R 2513. There is no piano accompaniment for the first, but in the second he has Monte Crick at the piano.

Another humorous recording is supplied by Tessie O'Shea who sings "I go Twice a Week to the Pictures" and "Down at Dooley's Dance" on Parlophone F 1098.

### H.M.V.

**N**OEL COWARD'S "Operette" has now settled down at His Majesty's Theatre for a long run, and records are now available of some of the numbers sung by the original artistes and orchestra of the production. Peggy Wood sings "Where are the Songs we Sung" and "Dearest Love"—H.M.V. B 8739; Fritzi Massary sings "Operette" with Sextette, and "Countess Mitzi" with Chorus, on H.M.V. B 8738. "The Stately Homes of England," one of the best numbers in the show, is sung by a quartet consisting of Messrs. French, Landon, Gatrell and Carten on H.M.V. B 8741, whilst His Majesty's Theatre Orchestra play a selection introducing the principal tunes on H.M.V. C 2999. Noel Coward has also made a record of "Dearest Love" with which is coupled his own rendering of "I'll see you again" from his earlier success, "Bitter Sweet," on H.M.V. B 8740.

Betty Driver's second H.M.V. record more than fulfils the promise given by that issued last month. Her voice is ideal for recording, her words very clear, and she can

whistle and hum most attractively. This seventeen-year-old artist has chosen two new film hits—"I'll take Romance" from the film of that name, and "I love to Whistle" from "Mad about the Music"—H.M.V. BD 545. Elsie Carlisle sings "You're an Education" and "Somebody's Thinking of You To-night," on H.M.V. BD 544, and Max Miller is heard in two of his latest "Maxims," which are typical of the Cheeky Chappie, "Every Sunday Afternoon" and "Un-ta-ra-ra" on H.M.V. BD 541. The Comedy Harmonists, whose vocal arrangements of well-known instru-

mental pieces are now becoming famous, apply their unique treatment to Schubert's favourite "Moment Musical" and a very neatly arranged version of the same composer's song "Heidenroslein" ("Hedge Roses"), on H.M.V. B 8742. To the latter they sing the German words. Al Bowly has discovered a new expression for his chorus, he calls them the Crooners Choir and they make a very melodious affair of "Sweet Someone" from the film "Love and Hisses" and "Sweet as a Song" from the film "Sally, Irene and Mary," on H.M.V. BD 543.

Under this heading is also included a second medley of Gershwin Songs including "The Man I Love," "Swanee" and "Tell me More," with Elizabeth Welch and Robert Ashley as the vocalists, accompanied by the New Mayfair Orchestra on H.M.V. C 2992.



## EVERYTHING RADIO AT THE RIGHT PRICE

POST ORDERS: over 5/- sent Carriage Paid. C.O.D. charges extra under 10/-. Overseas Orders please send full cash plus approx. postage, or 50% value, balance C.O.D. SEND FOR FULL LISTS.

EST. 1924

### N.T.S. KITS—VALVES FREE!!

#### SHORT WAVE ALL-WAVE

4-VALVE BANDSPREAD RECEIVER. 12-94 metres. Amazing performance, amazing value. Complete with coils and comprehensive instructions, 42/-, or 2/8 down and 12 monthly payments of 4/-. 4 matched valves given FREE.

2-VALVE BANDSPREAD SHORT-WAVE KIT. 12-94 metres. Amazing performance. Amazing value. Complete Kit. List 59/6. BARGAIN 32/6, or 2/8 down and 12 monthly payments of 3/1. Two matched valves FREE.

3-VALVE BANDSPREAD S/W KIT. 12-94 metres. Complete Kit, including three coils. List value 43/17/6. BARGAIN 37/6 cash, or 2/8 down, and 11 monthly payments of 4/1. Three matched valves FREE.

4-VALVE A.C. BANDSPREAD KIT. 12-94 metres. Entirely new design. Guaranteed world wide reception. Kit Complete with all coils. List value 47/15/6. BARGAIN. 43/15/0, or 5/- down and 12 monthly payments of 7/-. Four matched valves FREE.

1-VALVE SHORT-WAVE KIT. Complete 1-Valve Receiver Kit, including 3 coils: 12-94 metres, and pair of super-sensitive headphones, 27/6 cash, or 2/8 down and 11 monthly payments of 2/6. Valve FREE.

3-in-1 CONVERTOR ADAPTOR for Battery sets, or may be used as a 1-Valve Battery Receiver. Complete Kit with coils. 12-94 metres, 25/-, or 2/8 down and 11 monthly payments of 2/6. Valve FREE.

N.T.S. WORLD S.G.3 and S.G.4 Pentode Output Kits. For use with B.T.S. or N.T.S. Coils, detailed below. Ideal, modern-circuit receivers for Short-wave work and coils available for Broadcast bands. 3-Valve Model List 95/-. BARGAIN, 27/6 or 2/8 down and 12 monthly payments of 2/6. Valves FREE. 4-Valve Model, with extra S.G. audio stage. 37/6, or 2/6 down and 12 monthly payments of 3/9. Valves FREE. Available alternative Coils for N.T.S. WORLD KITS. ONE-SHOT INDUCTORS. Type 9/MW 178-580 metres, per pair 5/6. Type 9/LW 900-2,000 metres, per pair 6/6. Type 9/S 15-48 metres, per pair 5/-. Type 9/S 24-70 metres, per pair 5/-. Type 9/S 9.5-27 metres, per pair 5/-. N.T.S. B.T. 6-PIN COILS. Medium Wave (180-550 metres), per pair 4/6. Long Wave (900-2,000 metres), per pair 5/6. Short Wave, three wave ranges (15-43, 24-70, 9.5-27 metres), per pair 4/-.

### COMPONENT BARGAINS

Orders over 5/- sent carriage paid C.O.D. charges extra under 10/-

OUTPUT CHOKES. Benjamin, Universal Class "B" tapped output chokes. List 11/-. Our price, 4/6. Telsen tapped Pentode output choke, 2/6. Telsen 1-1 output transformer, 2/-. TRANSFORMERS. Telsen, 6/1 and 1.75/1, 2/-. T.G.C. DUBILIER CONDENSERS, Metal cases; 400 volt working; 5 mfd., 3 3/4; 1 mfd., 1/9.

JACKS AND PLUGS. B.T.S. Single and Double Circuit Jacks, List, 1/1; each. Jack Plugs, 1/1; each.

VALVEHOLDERS. Chassis type porcelain, 4- and 5-pin, 2/1d. 7-pin, 3/1d. Octal, 6d. Baseboard W.B. type, 4-pin, 2d. each. 5-pin, 3/1d. each.

GANG CONDENSERS. Plessey type, shielded 3-gang condensers, with Trimmers, .0005 mfd. for Straight Circuits, New, 2.11. Superbet 2-gang type shielded, .0005 mfd., same price.

JACKS AND PLUGS. B.T.S. Single and Double Circuit Jacks. (List 2/3 each), 1/- each. Jack Plugs, 1/- each.

TRICKLE CHARGER. 2v. 1 amp. Model Metal Rectifier, 10/-.

METAL CHASSIS. Steel, ready drilled for 1-9 valve-holders, Electrolytics and mains transformers. Size 15in. x 9in. x 3in. Grey enamel finish, brand new. Bargin, 2/- each. Also size 10in. x 7in. x 2 1/2in. ready-drilled with 3 valve-holders fitted and A. and L. strip, 2/8.

KNOBBS. 1 doz. assorted control knobs, 1/-.

VOLUME CONTROLS. POTENTIOMETERS. Well-known makes, all values up to 1 meg., 2/-; with switch, 2/6.

VALVE SCREENS. 3 portion, latest type, 1/- each.

TUNING CONDENSERS. .0005 mfd. Alspaced, 1/8.

HEADPHONES. Super-sensitive type, 3/6 per pair. Post 6d.

RESISTORS. Erie, all values, 1-watt, 4d., 3/8 doz. 1-watt 5d., 4/8 doz. 2-watt 5d., 6/8 doz. 3-watt 9d., 8/- doz.

4-VALVE A.C. BANDSPREAD CHASSIS. Complete with all valves, engraved dial, 200-2,000 metres, pick-up sockets. 3 watts output, fully tested. 22/19/6. 12 monthly payments of 5/-. BATTERY S.G.3 Chassis, 200-2,000 metres, Pentode output, less valves, 19/6.

STRAIGHT THREE Chassis, ready assembled, less valves, fully tested, 10/6.

TRIMMING CONDENSERS. Cyclon double type, 220 mmfd., 8d., also 30 mmfd. type, 2d. each.

CHASSIS S-v. 6-stage All-Wave Superbet. For A.C. mains, 18-2,100 metres. A.V.C. provision for Pick-up. Mains speakers offered quite suitable. Tone Control, station-name dial. With all Valves Guaranteed, fully tested. 44/17/6, or 7/8 down and 15 monthly payments of 7/11.

S.T. 900 Finished Instrument Chassis Model with station-name dial and all valves and coils to specification. List price, 27/10/-. Our price, 25/2/6.

ALL-WAVE S.G.3 CHASSIS Complete with matched valves, knobs and escutcheon. List value 44 : 15 : 0 BARGAIN

Exceptional purchase. Pentode output. Wide choice British, foreign and short-wave stations 1752 metres. Engraved dial 200-2,000 metres. Amazing tone and volume. Matched valves. Assembled and fully tested. Dimensions: 10in. x 7 1/2in. d. x 8in. h. to top of scale. 52/6 or 5/- down and 12 monthly payments of 4/10.

### SENSATIONAL OFFER

BARGAIN PARCELS. Value 26-30/-. Bargain 4/11, post 9d. Exceptional opportunity for "Practical Wireless" readers. Huge stocks not cleared of components, well-known makes, for Mains and Battery sets, building and repairs, comprising Mains and L.F. Transformers, Tuning condensers and coils, fixed and variable resistances, fixed condensers, switches and chokes, etc. Assorted parcels, our selection—but leave it to N.T.S. to give amazing value. 4/11, post 9d. extra. Order Early.

SPEAKERS. P.M.'s, well-known makes, 8in. cone, for Power or Pentode, 12/6. Goodman and Celestion, 6in. P.M.'s, 7/6. Mains Amplified. Rola, 6in. cone, Pentode Output, 2,500 ohm, 10/6. ALL NEW.

TRICKLE CHARGER, 2v. 1 amp. Model, Metal Rectifier, 10/-.

AMPLIFIERS. Assembled and fully tested ready for immediate use. Battery 3-4 watt Model Push-pull Output for H.T. Battery 150/150-volt. Complete with valves. 22/15/-, or 4/8 down and 12 monthly payments of 4/8.

7-Watt A.C. Model Push-pull output. Complete with valves, 22/10/-, or 5/- down and 12 monthly payments of 6/-.

MICROPHONES. Table Model Transformer current type, unsurpassed reproduction, including Transformer, 25/-, or 2/8 down and 10 monthly payments of 2/6.

Telescopic floor-stand Model, 2 Gns., or 2/6 down and 12 monthly payments of 4/-. Telescopic stand only, extended height 6in. ring dia., 8/-.

CHROMIUM PLATED, 21/-.

WAIN UNITS. MODEL A.C.22. Cash or C.O.D. 25/-, or 2/6 down and 10 monthly payments of 3/-. Suitable for sets operating on output of up to 12 m.a. For A.C. Mains 200/250 v. 40 to 100 cycles. Output 120 v. at 12 m.a. 4 tapping.

MODEL 10/30. Cash or C.O.D. 38/6, or 2/8 down and 11 monthly payments of 4/9. Incorporates Trickle Charger, which re-charges a 2-volt L.T. accumulator at 0.5 amp. For A.C. Mains 200/250 v. 60/100 cycles. Westinghouse Metal Rectifier, Four H.T. tappings: Screen, Detector, Medium Power, High Power. Output 20 m.a. at 120 volts.

3 MATCHED BATTERY TYPE VALVES, 2-volt type (3 S.G. H.F.'s and one Output Pentode). List value 35/- YOURS FOR 5/8 BARGAIN only. POST FREE. 3 valve-holders and circuits given FREE. Ideal valves for experimental purposes, Short Wave, All-Wave receivers and replacement purposes. Secure your set NOW.

5/6 Post Free

SEND P.O. NOW

GRAMOPHONE UNITS NEW comprising Motor and Pick-up, Gramobord Model. For A.C. Mains, 100-250 volts, 60 cycles. Highly sensitive pick-up. Automatic Stop and Start, patented speed regulator, 12" wheel covered turntable, needle cup. Dimensions 12in. x 14in. Usual Price 59/6. BARGAIN, Cash or C.O.D., 38/6.

PICK-UPS. Comocord highly sensitive type. Complete with rest. Usual price 15/-. BARGAIN, Cash or C.O.D., 7/6.

NEW TIMES SALES CO. (Pr. W. 65), 56, LUDGATE HILL, LONDON, E.C.4

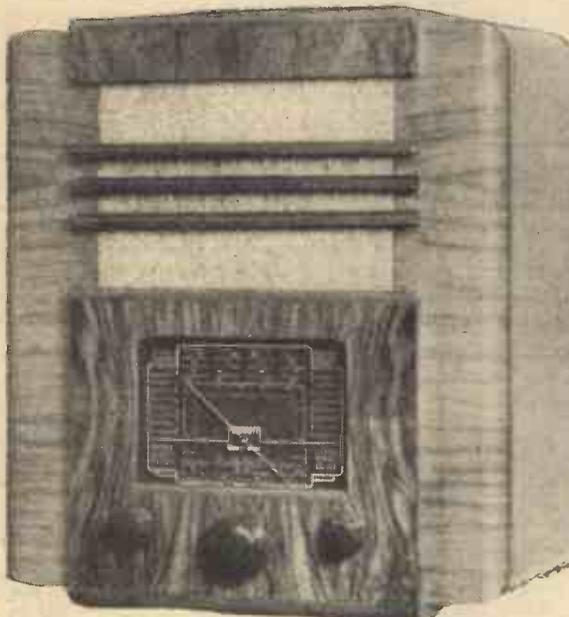
Tel.: City 5516.

# NOTES FROM THE TRADE

## New Ferranti Receivers

TWO new all-wave superhets are announced by Messrs. Ferranti, both for A.C./D.C. mains use, and both employing a new type of neutralised converter arrangement. The circuit is a 7-stage 5-valve combination with an I.F. of 450 kc/s, and a special feature is an output transformer of new design and generous proportions giving improved bass response without boom. The speaker is also designed to

The moving-coil speaker is inclined at an angle for uniform sound distribution, and a polished metal grille is provided to enable good high-note reproduction to be obtained and to avoid absorption. The remaining two controls are for volume and combined wave-change and on/off. The cabinet is finished in hard-wearing dark-blue leatherette with chromium metal parts and highly polished black mouldings, and extension speaker and aerial-earth sockets are fitted on the cabinetsides. A turntable is provided as standard equipment, and the price is 8 guineas. The H.T. consumption is 70 watts.



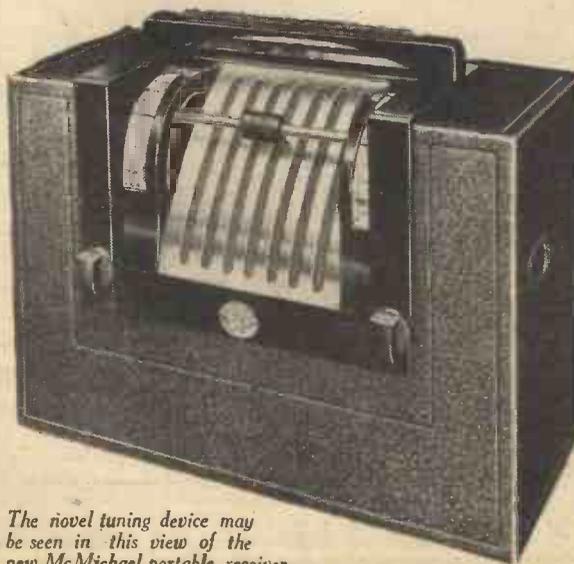
The new Ferranti AC/DC Superhet, Model 513AM.

provide crisp high-note reproduction. The dial is edgelit with station names and wavelengths in three colours, and the output valve is a beam-power tetrode rated at 3 watts undistorted. The model numbers are 512 AM and 513 AM, the latter being illustrated on this page, and this differs from model 512 AM in that no tone control is provided. This receiver costs 12 guineas, and model 513 AM costs 13½ guineas.

## McMichael Portable

THE accompanying illustration shows the new portable produced by Messrs.

McMichael. Known as the "Bijou" this possesses many novel points, amongst which the tuning is the most interesting. This is known as the "Rotabar" system, and it dispenses entirely with the usual small control knob. It is only necessary to run the finger lightly up or down the thumb grip on the metal bar, seen in front of the speaker grille, when the bar travels rapidly in an arc carrying the tuning pointers at each side with it. The circuit embodied is a four-valve arrangement with built-in aerials, utilising an H.F. pentode followed by a triode detector and triode L.F. stage. The output pentode is fed from the L.F. stage through a transformer and is rated to deliver 250 mW.



The novel tuning device may be seen in this view of the new McMichael portable receiver.

McMichael. Known as the "Bijou" this possesses many novel points, amongst which the tuning is the most interesting. This is known as the "Rotabar" system, and it dispenses entirely with the usual small control knob. It is only necessary to run the finger lightly up or down the thumb grip on the metal bar, seen in front of the speaker grille, when the bar travels rapidly in an arc carrying the tuning pointers at each side with it. The circuit embodied is a four-valve arrangement with built-in aerials, utilising an H.F. pentode followed by a triode detector and triode L.F. stage. The output pentode is fed from the L.F. stage through a transformer and is rated to deliver 250 mW.

## Valve Testing Equipment

IN view of the wide variety of valve types now installed in radio receivers in this country, provision for testing them on the part of suppliers and servicing dealers entails rather costly and intricate instruments. Furthermore, the technical qualifications of some of those who engage in such testing are not always above suspicion.

With the object of helping those who sell valves and service sets, the G.E.C. has just adopted a scheme which will no doubt commend itself to many. The Company has installed at its trade counters in Magnet House, Kingsway, W.C.2, comprehensive valve-testing equipment so that practically every type of valve used for broadcast reception can be tested, and its characteristics determined by a competent technician. This equipment is duplicated at every one of the Company's branches throughout the British Isles, and all valve-dealers are recommended to take advantage of this free service. Further details may be obtained from the G.E.C. at the above address, and Service Engineers are invited to call or write for full particulars.

## TRANSMITTING TOPICS

(Continued from page 237).

efficiency of the arrangement is not high.

A transformer is connected in the anode circuit of V2, its secondary being in series with the grid-bias supply which is fed to the grid of the valve through a good H.F. choke. In this instance it is not a question of varying the bias by means of the L.F. output of V2, but rather of modulating the grid-bias voltage which, in turn, directly affects the radio-frequency output of V1 in a similar manner. While quite low audio power can be used, it must be appreciated that for given conditions the modulated R.F. output of V1 will be less than that obtained by the other methods.

## General Observations

To the beginner, especially the A.A. man, I would say, try all the various methods of applying modulation, and make careful notes of your observations, paying particular

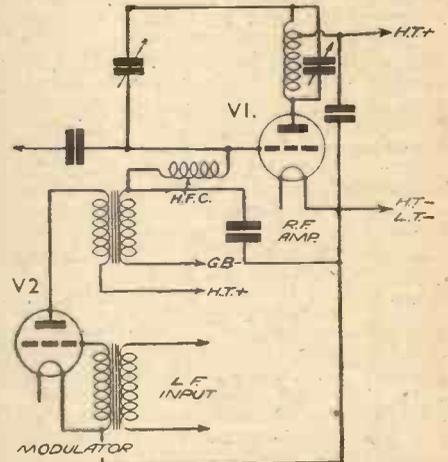


Fig. 3.—Theoretical circuit showing the arrangement for grid-bias modulation.

attention to the quality of the modulated signal, the amount of audio power required for a given R.F. output, and the consistency of the signal. It is not sufficient to trust to the ear in such tests, get in the habit of taking measurements, making calculations, and verifying the whys and wherefores of each system. Elaborate apparatus is not always necessary, but I would advise the inclusion of at least two or more good meters for volts and milliamps in the equipment of the initial station.

## Join Newnes' Practical Group!

### PRACTICAL MOTORIST

The owner-driver's journal which tells you how to repair, overhaul and obtain the best performance from your car.  
3d.—Every Friday.

### PRACTICAL MECHANICS

The only English journal of its type. It deals with every branch of Science, Mechanics, Invention, Model-making, Chemistry, Astronomy, Photography, Television.  
6d.—Every Month

### THE CYCLIST

The leading weekly for every Cyclist, Clubman, Utility Cyclist or Tourist. Join "The Cyclist" Road Club and also take advantage of the FREE Insurance.  
2d.—Every Wednesday

# B.L.D.L.C. The British Long-Distance Listeners' Club

## Auto-bias

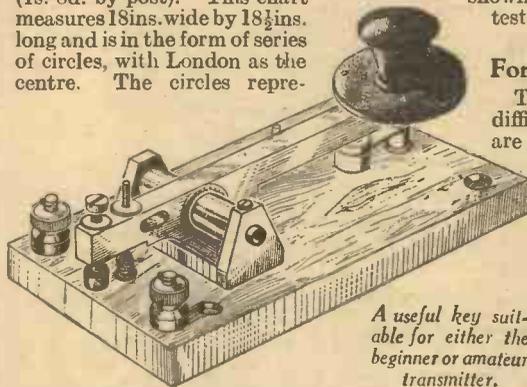
THERE is still some confusion evident regarding the method of applying auto-bias to mains receivers, and it appears that the main difficulty arises in a receiver where a single heater winding is employed. Indirectly-heated valves are, of course, provided with biasing resistances in the cathode circuit, and this renders the matter very simple. In other cases, that is, where the valves are mixed, different tactics have to be adopted, and in most cases it will not be possible to use a directly-heated valve except in the output stage. The best plan is, of course, to use a separate heater winding for the directly-heated and the indirectly-heated valves, and then the bias for the former types may be included in the centre tap to the winding. Where a single winding is used, however, the bias resistance may still be included in the centre tap and the accompanying circuit diagram of one of our receivers shows how this may be carried out. The detector valve may be biased for pick-up working, by including a resistance between the earth line and the junction of the cathode and grid leak, removing the lead at present joined from that point to earth. This circuit is also useful as it shows clearly how the H.F. stage may be controlled for variable-bias by making the bias control part of the S.G. voltage potentiometer device and it should be noted that a minimum bias resistance is included so that it is not possible to remove all bias from the valve. The values given are applicable, of course, only to the Cossor MVSG valve, and the valve maker's instructions should be followed in each case.

## Morse Practice

Several members now in possession of A. A. licences are only needed to brush up their Morse practice in order to obtain the full transmitting licence. Some doubt has been expressed by these readers as to the best type of Morse key to be used, their decision being swayed by claims made for the American type of "bug" key. For the benefit of those who are not familiar with this, it may be mentioned that the action is sideways instead of up and down as in the standard key, one type of which is shown on this page. The claims of the bug key are that the wrist does not tire so quickly, the arm may be rested on the table and the key may be used in a more or less lazy manner. Sea-going operators will confirm, however, that the American operators do not come up to English operators for style, and they blame the key. They claim that you can always identify an American by the raggedness of the signal, and that tests by operators who have been sending for years confirm that the ordinary key is in the long run preferable for good code work. No doubt many readers will prefer to try the different types for their own use, and the American keys are available from several firms in this country, such as Webbs Stores, 14, Soho Street, London, W.1, Raymart, 44, Holloway Head, Birmingham, etc.

## How Far Is It?

When logging long-distance stations additional interest is added when the distance between the stations is known. Many members already have a wall map in their den upon which the distances may be marked off, and no doubt many will be interested to know that a useful chart may be obtained from Messrs. Foyles, of 119-125, Charing Cross Road, W.C.2, for 1s. 6d. (1s. 8d. by post). This chart measures 18ins. wide by 18ins. long and is in the form of series of circles, with London as the centre. The circles repre-



A useful key suitable for either the beginner or amateur transmitter.

sent distances of 100 miles up to 1,000 miles and then progress by 250 miles up to 2,000 miles, after which by increase by 500 miles up to 4,000. The final three rings represent 5,000, 6,000 and 7,000 miles from London, and the outer circle is marked off in degrees, with the compass points indicated. The majority of the principal stations of the world are indicated and a special code is employed to indicate wavelengths and other details. Additional stations may be marked in as desired.

## Measuring Output

We still receive queries regarding the best way of measuring the output of a receiver. As we have mentioned before in these pages, the only effective way is to use an A.C. meter and have the dial calibrated in milliwatts and decibels. This

enables most accurate measurements to be made and at the same time it is a simple matter to connect the instrument to any receiver and thus obtain direct comparisons. It is also possible with this type of instrument to ascertain exactly what alterations to the L.F. or H.F. stages can do to the output. All that is necessary for such an instrument is a good milliammeter and a metal rectifier of the instrument type, and the only difficulty will be in the calibration. This may be carried out on the actual dial of the instrument or a series of charts may be drawn up. For those readers who are interested in this subject we think the best plan is to obtain a copy of the Westinghouse Company's booklet DP.11b, which costs 3d. This gives much valuable information on the topic of meters and test equipment and includes diagrams and tables showing how to make up an all-purpose tester from a simple milliammeter.

## Formulae Problems

The beginner sometimes experiences difficulty due to the fact that formulae are given with certain units which sometimes are not used in radio practice. For instance, the formula for watts is amperes<sup>2</sup> × ohms, but in most radio calculations the current calculations are in milliamps — not amps. It should therefore be remembered that it is not necessary first to convert the current into amps, but that the figure in milliamps may be used by dividing the answer by 1,000. Thus, the standard formula is watts equals volts × amps, which may be rearranged volts × milliamps divided by 1,000 ( $\frac{\text{volts} \times \text{milliamps}}{1,000}$ ). The formula previously mentioned, namely, watts = amperes<sup>2</sup> × ohms, would then be rearranged to read  $\frac{\text{milliamps}^2 \times \text{ohms}}{1,000,000}$ . This fact should be remembered whenever some calculation is needed where the current cannot be expressed in the normal way.

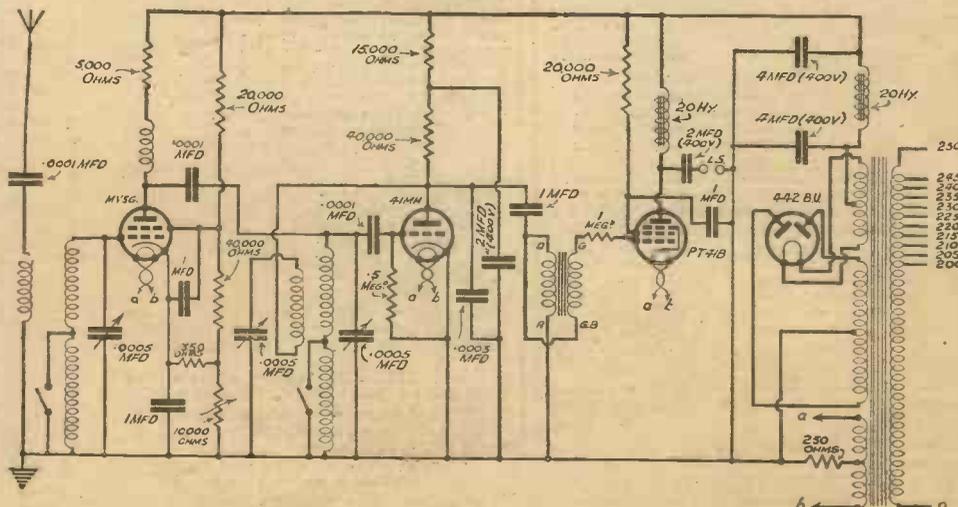
**THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA**

By F. J. CAMM (Editor of "Practical and Amateur Wireless")

6th Edition **5/-** net

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language.

From all Booksellers, or by post 5/6 from George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.



A good 3-valve mains circuit which discloses some of the points raised from time to time by members.

# A GOOD JOB IN RADIO FOR YOU

The Radio Industry is short of trained men. You may still be an untrained assistant in a wireless shop, or doing a dead-end job on the bench, yet you have a grand opportunity to get a progressive, highly paid post—if you equip yourself for it by spare-time study.

Whatever branch of the Industry appeals most strongly to you, the International Correspondence Schools have a Course to fit your needs. Under I.C.S. direction, you study when and where you like. You are guided throughout by highly qualified instructors, whose advice and assistance is yours just as often as you care to ask for it. Nearly half a century of unrivalled experience is at the back of this work.

The I.C.S. are the creative pioneers of vocational training by the postal method, and by far the largest, greatest and most successful correspondence institution in the world. You can trust I.C.S. Instruction. It is sound, practical and profitable.

Write for our free "Radio" booklet, stating your subject—or use the coupon below if you wish.

## THE ADVISORY DEPARTMENT INTERNATIONAL CORRESPONDENCE SCHOOLS Ltd.

94, INTERNATIONAL BUILDINGS, KINGSWAY, LONDON, W.C.2

- |                          |                             |
|--------------------------|-----------------------------|
| Radio Engineering.       | I.E.E. Grad. Exam.          |
| Complete Radio.          | I.W.T. Exam.                |
| Radio Servicemen's       | C. & G. in Radio Com. Exam. |
| Elementary Radio.        | P.M.G. Certif.              |
| Radio Service and Sales. | Air Ministry Prov. Certif.  |
| Television.              |                             |

Mark X in front of Courses in which you are interested.

Name..... Age.....  
Address.....



# RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

## RADIO, PHYSICAL AND TELEVISION SOCIETY

ON Friday, May 6th, the above society held a meeting in preparation for the proposed field days. It was decided that this year a wavelength of 2 1/2 metres should be employed, one reason for choosing this wavelength being that the physical dimensions of a 2 1/2-metre aerial are small, and consequently it is possible to construct extremely portable apparatus. The field-days held last year in the Dorking district having proved extremely successful, it was decided to run this year's events upon similar lines. It is, however, a point worthy of note that, so far, no other radio society has attempted to hold a field-day on the wavelength of 2 1/2 metres.

After a general discussion Dr. C. G. Lemon, the president of the society, delivered a short lecture in which he described several super-regenerative receivers suitable for use on 2 1/2 metres. An interesting separate-quech receiver, made up that afternoon by one of Dr. Lemon's assistants, was tried out and found to work well.

The winter session of the society is now drawing towards its close. This, however, does not mean a curtailment of the society's activities as, in addition to field-days, it is hoped to arrange several visits to various places of scientific interest. Particulars of these visits will be posted to members, and announced from time to time in the technical press.

New members are always welcome. Further particulars may be obtained by writing to the Hon. Secretary, at the society's headquarters, 72a, North End Road, West Kensington, London, W.14.

## DOLLIS HILL RADIO COMMUNICATION SOCIETY

AT the last meeting of this society, agreement was reached on the apparatus to be built for the new laboratory. The building of this will be commenced during the next two weeks. A 5-metre field-day has been arranged for June 12th, and the society will be represented by a party taking part in a D.F. hunt organised by the Golders Green Radio Society. Hon. Sec., Mr. E. Eldridge, 79, Oxgate Gardens, Cricklewood, N.W.2.

## NORTH MANCHESTER RADIO SOCIETY

THE above society is about to be re-formed, and new headquarters have been obtained, with better facilities for all. The subscription fee is to be the same as before, 2s. 6d. a year, which entitles members to all the usual club facilities and advantages. If the plan of re-forming is well supported, the work of arranging lectures by representatives of the various radio manufacturers will be followed up, and also a series of visits to places of interest, such as Broadcasting House, telephone exchanges, airports, etc., will be arranged. The society offers its services to commercial, broadcast or amateur stations requiring a signal survey of their transmissions, etc. It also hopes to investigate such matters as station and noise interference. It is not the policy of the society to trespass on the work of other societies about the country, but rather to co-operate with them in tests and visits. The first meeting under the new system will be held at 14, Fairfax Road, Prestwich, near Manchester, on Sunday, May 29th, 1938, at 3.30 p.m. (The new headquarters is only two minutes from Prestwich railway station, a ten-minute journey from Manchester). So Manchester and district short-wave enthusiasts come on May 29th and let us have your suggestions. If further details are required, a 1d. stamp will be appreciated for a reply. Address all communications to the Secretary, Mr. R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

## PROPOSED CLUB FOR CARLTON, YORKS

SHORT-WAVE enthusiasts, residing in Carlton and district, and who may be interested in the formation of a local club, are invited to get in touch with Edwin Leech, 50, Carlton Terrace, Carlton, Barnsley, Yorks.

## LONDON TRANSMITTING SOCIETY

TWO challenge cups are being presented by London Transmitting Society, one for full licence holders for best modulated 'phone signals received at headquarters during June. The other cup is for A.A. licence holders, for best home-made transmitting gear (crystal-controlled). All licence holders in Great Britain may compete, by sending their Q.S.L. card to the secretary by May 21st, which is the closing date for entries. Names of winners will appear in PRACTICAL AND AMATEUR WIRELESS.

Hon. Sec., G. Vale, 40, Raeburn Road, Edgware.

(Continued on opposite page)



Wailed Smithers, "Oh pity my plight,  
On the tiles I must spend half the night.  
When I first fixed this lead,  
I forgot what I'd need,  
To fix it for good—that's FLUXITE!"

See that FLUXITE is always by you—in the house—garage—workshop—wherever speedy soldering is needed. Used for 30 years in government works and by leading engineers and manufacturers. Of Ironmongers—in tins, 4d., 8d., 1/4 and 2/8.

Ask to see the FLUXITE SMALL-SPACE SOLDERING SET—compact but substantial—complete with full instructions, 7/6. Write for Free Book on the art of "soft" soldering and ask for Leaflet on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE.

TO CYCLISTS! Your wheels will NOT keep round and true, unless the spokes are tied with fine wire at the crossings AND SOLDERED. This makes a much stronger wheel. It's simple—with FLUXITE—but IMPORTANT.

## THE FLUXITE GUN

is always ready to put Fluxite on the soldering job instantly. A little pressure places the right quantity on the right spot and one charging lasts for ages. Price 1/6.



# FLUXITE

IT SIMPLIFIES ALL SOLDERING

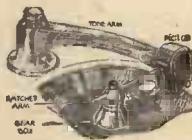
FLUXITE LTD. (Dept. W.P.) DRAGON WORKS, BERMONDSEY STREET, S.E.1.

## ELECTRADIX

Have you got our new May SALE LIST?

MODEL CONTROL BY RADIO. 1 mile Transmitters, 25/- Coherers, 5/-, 10,000 ohm Relays, light special 4 1/2 ozs., 10/- Spark Coils, 10/6 to 40/- Shocking Coils with handles, 4/6. Motor Commutators, 24 copper segments, 1/6. Electric Governors, centrifugal, 7/6. Binoculars, 10/6, 25/- and 25/10/-. Telescopes, Navy, 25/- Periscopes, 6d. AUTOMATIC SWITCHES, 6 volt Relay, 5/- Polarised, 6v. change-over 5/-. Transmitter Relays 7/6; ditto Sounder type 10/-. Creed Relays, 30/- Magnetic Key Relay, 15/- Time Switches, 1 amp. to 200 amps., cheap. 35 mm. CINE PROJECTOR on stand, Dallmeyer lens, motor drive, lantern arc and spools, 27/10/-. Suitable for Talkies. Table Projectors for slides, 230v. 250 watt focus bulb, 25/-

MICROPHONES.—Lesdix Microphones reproduce your voice amplified from your radio set to loud speaker. SOLO BUTTON MICROPHONES, 1/- A new Practical Solo Microphone for broadcasting at home. It is a general purpose, robust mike, with solid bakelite body, back terminals, front metal grille. No. 11. New design, finely finished, 5/6. No. 11A. Special, in solid brass body, 7/6. "NW" 11 Table Mike.—Bakelite case, containing a 2in. mike and transformer, is on a bronze pedestal. It stands unrivalled for quality and price, 15/-



SOUND RECORDING Electric FEIGH set has ball-bearing centre gear box and geared traverse rod. Set with Tracking Gear, Pick-up and Tone-arm fitted diamond, 37/6. Tracker gear only, less Pick-up and Tone-arm, is 21/6. Diamond Cutter Needles fit all pick-ups, 7/6. Luxe, 18/-; No. 2, 10/6; Junior Type, 5/6 each, complete.

CRYSTAL SETS.—No battery or valves wanted. Quiet and efficient. 5/6 and 7/6 each.

PARCELS of experimental odd coils, magnets, wire, chokes, switches, terminals, etc., post free; 10 lbs., 7/-; 7 lbs., 5/-.

1,000 other Bargains in our enlarged Illustrated 1938 List "N" Free

## ELECTRADIX RADIOS

218, Upper Thames Street, London, E.C.4  
Telephone: Central 4611

RADIO CLUBS AND SOCIETIES

(Continued from previous page)

BRADFORD SHORT-WAVE CLUB

THE Bradford Short-wave Club is continuing all past activities, and, in addition, is pursuing a few new ones. There is now a club library, run by two efficient librarians, and recently a "Construction Committee" has been formed to handle the building of club apparatus. A field-day is being arranged by the club, as is usual during the summer, and we are also supporting the Halifax Radio Society in their activities in this direction. The secretary is always pleased to hear from enthusiasts in the district. Hon. Sec., S. Fischer, Edenbank, 10, Highfield Avenue, Idle, Bradford, Yorks.

THE CARDIFF AND DISTRICT SHORT-WAVE CLUB

ALTHOUGH no reports have been published in recent issues of PRACTICAL AND AMATEUR WIRELESS, the above club has remained very active, and a magazine is now being circulated to members in which topics of both transmitting and receiving interests are being dealt with.

With the coming of summer, and thus longer evenings, meetings are being held fortnightly, and on alternate Thursday nights lectures are being given of interest not only to the short-wave listener, but also the keen experimenter.

The club has recently had the pleasure of testing one of the latest receivers of Messrs. Lissen, Ltd.—the Hi-Q4 Valve Superhet—and Mr. A. J. Williams demonstrated three commercially manufactured superhets—one American, one British, and another British built from American design. Strange as it may seem in view of present ideas, the British receiver was voted the best. Further details of club activities may be obtained from the Hon. Secretary, H. H. Phillips (2IQB), 132, Clare Road, Cardiff, upon receipt of a stamped, addressed envelope.

WILLESDEN AND DISTRICT SHORT-WAVE SOCIETY

A PRELIMINARY meeting of an informal kind was held on May 8th at 31, Willesden Lane, N.W.6, with quite a good muster. We have twenty-one members so far. Temporary officers were appointed to draw up a list of rules to submit to a general meeting, to be held at the same address on Thursday, May 19th. Readers interested in short-wave work, whether novices or experts, will be welcomed. For further particulars write to the Secretary, T. C. Mahon, 28, Denzil Road, N.W.10.

CUT THIS OUT EACH WEEK.

Do you know

- THAT in an emergency a normal triode valve may be used as a half-wave rectifier.
- THAT an old long-wave tuning coil may be used as a temporary H.F. choke for medium-wave reception.
- THAT for variable- $\mu$  volume control a graduated potentiometer is desirable.
- THAT a delay switch in a mains eliminator will enable components and valves to be safeguarded.
- THAT for safety purposes the working voltage of condensers in mains apparatus should be rated at three times the working voltage.
- THAT a make-shift tone control for gramophone reproduction consists of a variable resistance in one pick-up lead.

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

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

Copyright in all drawings, photographs and articles published in PRACTICAL AND AMATEUR WIRELESS is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden.

EVERYMAN'S WIRELESS BOOK

By F. J. Camm

Wireless Principles and Fault Tracking simply explained.

3/6 or 4/- by post from Geo. Neumes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

LETTERS FROM READERS

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).

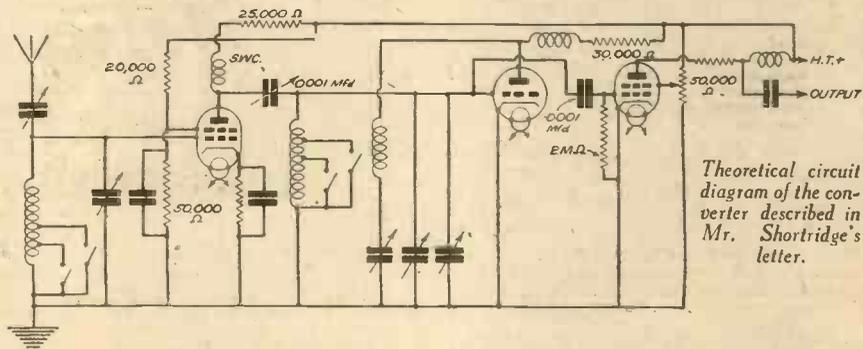
Results with a Converter

SIR,—I should like to congratulate you on publishing the details of the "Cyclo" converter. Personally, I am not interested in battery circuits except in so far as they are capable of giving ideas for mains sets, and from the "Cyclo" converter I have evolved a perfectly simple "mains" counterpart which may interest other readers. I have been waiting a long time for a converter circuit using a separate

New Station at Lahti

SIR,—In reply to A. L. King's question concerning the Finnish S.W. station, I heard it first on Thursday, April 14th. I received their QSL card on the report I sent them on May 3rd. The card has a white ground printed in black except the words Lahti Suomi, which are in pale blue. There is also a photo of the 1 kW. transmitter.

The card gives two wavelengths, 31.58 m.



Theoretical circuit diagram of the converter described in Mr. Shortridge's letter.

oscillator, and many "mains" fans who, like myself, are, or were, using ordinary converters, could easily make up the set I have just completed. I was previously using a triode detector-oscillator with an H.F. stage in front which was inclined to be unstable when adjusting reaction, but worked well when carefully handled. But this new converter is a delight to operate, is very stable, and oscillation is maintained untouched throughout the band.

The circuit is roughly as shown in the accompanying diagram.

The power pack is a standard 250-volt job smoothed by 8 mfd. electrolytics, and no special precautions were taken to avoid instability, but the heater wiring is screened. Coils used are the old Lissen 3-band S.W. coils with switch attached, and the detector and H.F. valves are screen-grids. The screen potentiometer for the detector is fitted with the on-off switch, and the screen voltage is found to be very critical. No decoupling is used for any anode supply, and is apparently unnecessary.

The whole set is placed in my radiogram cabinet which has record cupboards on both sides, and the converter is fitted so that its panel is visible when the record cupboard door is opened. This necessitated building it in two tiers, and this was done by using a spare metal chassis, and putting wooden legs on it to raise it about 7in. from the floor. The power pack is thus placed under the chassis at the back and screened, while the H.F. stage is also under the chassis, at the front, the detector and oscillator stages being on top—WM. SHORTRIDGE (Leeds).

(9,500 kc/s), and 19.75 m. (1,519 kc/s). I have so far heard only the 31.58 m. transmission. No times are given for transmissions, but they are on the air daily, usually relaying the regular Finnish broadcast programmes, and welcome reports. QRA is the Finnish short-wave broadcasting transmitter, Lahti Suomi, Finland.—M. MARKS (Ewell).

Reaction Circuits

SIR,—I regret the further error which occurred in the correction of my article "Reaction Circuits," and confirm that it should read

$$1\omega C \text{ or } 1/2\pi fC.$$

The error was due to an oversight on my part, for which I apologise.—R. J. STRICKLAND (Kensington).

Transmissions of Swedish S.W. Stations

SIR,—I have just received from S Radiotjänst this schedule of transmission of the Swedish S.W. stations as from May 1st.

Day	Station	W'lgth	Hours (G.M.T.)
Weekdays	Stockholm SM5SX	19.80 m.	16.00-22.00
	Motala SBP	25.63 m.	{ 06.20-07.00 11.00-14.00
	.. SBO	49.46 m.	21.15-22.00
Saturdays	Stockholm SM5SX	19.80 m.	16.00-22.00
	Motala SBP	25.63 m.	{ 06.20-07.00 11.00-21.15
	.. SBO	49.46 m.	21.15-22.00
Sundays and hols. (generally)	Stockholm SM5SX	19.80 m.	14.00-22.00
	Motala SBP	25.63 m.	08.00-21.15
	.. SBO	49.46 m.	21.15-22.00

Trusting this will be of interest.—C. M. NAYLOR (Manchester).

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		No. of	Universal £5 Superhet (Three-		
Date of Issue.		Blueprint	valve)		
<b>CRYSTAL SETS</b>					
Blueprint, 6d.			F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW44
1937 Crystal Receiver	9.1.37	PW71	F. J. Camm's Universal £4 Super-		PW59
<b>STRAIGHT SETS. Battery Operated.</b>					
One-valve : Blueprints, 1s. each.			"Qualitone" Universal Four	16.1.37	PW60
All-wave Unipen (Pentode)		PW31A	<b>SHORT-WAVE SETS.</b>		
Beginner's One-valver	19.2.36	PW85	One-valve : Blueprint, 1s.		
Two-valve : Blueprints, 1s. each.			Simple S.W. One-valver	9.4.38	PW88
Four-range Super Mag Two (D, Pen)	29.8.36	PW36B	Two-valve : Blueprint, 1s.		
The Signet Two (D & LF)		PW76	Midget Short-wave Two (D, Pen)		PW38A
Three-valve : Blueprints, 1s. each.			Three-valve : Blueprints, 1s. each.		
The Long-range Express Three	24.4.37	PW2	Experimenter's Short-wave Three		
(SG, D, Pen)			(SG, D, Pow)		PW30A
Selectone Battery Three (D, 2 LF		PW10	The Prefect 3 (D, 2LF (RC and	7.8.37	PW63
(Trans))			Trans)		
Sixty Shilling Three (D, 2 LF		PW34A	The Band-Spread S.W. Three	29.8.36	PW68
(RC & Trans))			(HF Pen, D (Pen) Pen)		
Leader Three (SG, D, Pow)	22.5.37	PW85	<b>PORTABLES.</b>		
Summit Three (HF Pen, D, Pen)		PW37	Three-valve : Blueprints, 1s. each.		
All Pentode Three (HF Pen, D		PW30	F. J. Camm's ELF Three-valve		PW65
(Pen, Pen)	29.5.37	PW30	Portable (HF Pen, D, Pen)		
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41	Parvo Flyweight Midget Port-	19.6.37	PW77
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48	able (SG, D, Pen)		
F. J. Camm's Silver Souvenir (HF			Four-valve : Blueprints, 1s. each.		
Pen, D (Pen, Pen) (All-wave			Featherweight Portable Four (SG,	15.5.37	PW12
Three)	13.4.35	PW49	D, LF, Cl. B)		
Genet Midget (D, 2 LF (Trans))	June '35	PW1	"Imp" Portable 4 (D, LF, LF,	19.3.38	PW86
Cameo Midget Three (D, 2 LF		PW51	Pen)		
(Trans))	8.6.35	PW51	<b>MISCELLANEOUS.</b>		
1936 Sonotone Three-Four (HF		PW53	S.W. Converter-Adapter (1 valve)		PW48A
Pen, HF Pen, Westector, Pen)			<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
Battery All-Wave Three (D, 2 LF		PW55	<b>CRYSTAL SETS.</b>		
(RC))		PW61	Blueprints, 6d. each.		
The Monitor (HF Pen, D, Pen)	21.3.36	PW62	Four-station Crystal Set	12.12.30	AW427
The Tutor Three (HF Pen, D, Pen)	14.8.37	PW04	1934 Crystal Set		AW444
The Centaur Three (SG, D, P)		PW04	150-mile Crystal Set		AW450
The Gladiator All-Wave Three	29.8.30	PW66	<b>STRAIGHT SETS. Battery Operated.</b>		
(HF Pen, D (Pen, Pen)			One-valve : Blueprints, 1s. each.		
F. J. Camm's Record All-Wave	31.10.36	PW69	B.B.C. Special One-valver		AW387
Three (HF Pen, D, Pen)			Twenty-station Loudspeaker		
The "Colt" All-Wave Three (D,	5.12.36	PW72	One-valver (Class B)		AW449
2 LF (RC & Trans))			Two-valve : Blueprints, 1s. each.		
The "Rapide" Straight 3 (D,	4.12.37	PW82	Melody Ranger Two (D, Trans)		AW388
2 LF (RC & Trans))			Full-volume Two (SG det., Pen.)		AW392
F. J. Camm's Oracle All-Wave	28.8.37	PW78	B.B.C. National Two with Lucerne		
Three (HF, Det, Pen)			Coil (D, Trans)		AW377A
1938 "Tribaud" All-Wave Three	22.1.38	PW84	Big-power Melody Two with		
(HF Pen, D, Pen)			Lucerne Coil (SG, Trans)		AW388A
F. J. Camm's "Sprite" Three	26.3.38	PW87	Lucerne Minor (D, Pen)		AW426
(HF Pen, D, Tet)			A Modern Two-valver		WM409
Four-valve : Blueprints, 1s. each.			Three-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4	Class B Three (D, Trans, Class B)		AW386
Fury Four (SG2, D, Pen)	8.5.37	PW11	New Britain's Favourite Three		
Beta Universal Four (SG, D, LF,		PW17	(D, Trans, Class B)	15.7.33	AW304
Cl. B)			Home-built Coil Three (SG, D,		AW404
Nucleon Class B Four (SG, D,	6.1.34	PW34B	Trans)		
(SG), LF, Cl. B)		PW340	Fan and Family Three (D, Trans,	25.11.33	AW410
Fury Four Super (SG, SG, D, Pen)			Class B)		AW412
Battery Hall-Mark 4 (HF, Pen,		PW46	£5 5s. S.G.3 (SG, D, Trans)	2.12.33	
D, Push-Pull)			1934 Ether Searcher ; Baseboard		AW417
F. J. Camm's "Limit" All-Wave	26.9.36	PW67	Model (SG, D, Pen)		
Four (HF Pen, D, LF, P)			1934 Ether Searcher ; Chassis		AW419
All-Wave "Corona" 4 (HF Pen,	9.10.37	PW79	Model (SG, D, Pen)		AW422
D, LF, Pow)			Lucerne Ranger (SG, D, Trans)		
"Acme" All-Wave 4 (HF Pen, D	12.2.38	PW83	Coscor Melody Maker with Lucerne		AW423
(Pen), LF, Cl. B)			Coils		
<b>Mains Operated.</b>					
Two-valve : Blueprints, 1s. each.			Mullard Master Three with		AW424
A.C. Twin (D (Pen, Pen)		PW18	Lucerne Coils		
A.C.-D.C. Two (SG, Pow)		PW31	£5 5s. Three : De Luxe Version	10.5.34	AW435
Selectone A.C. Radiogram Two		PW10	(SG, D, Trans)		
(D, Pow)			Lucerne Straight Three (D, RC,		AW437
Three-valve : Blueprints, 1s. each.			Trans)		AW443
Double-Diode-Triode Three (HF		PW23	All-Britain Three (HF Pen, D, Pen)		
Pen, DDT, Pen)		PW25	"Wireless League" Three (HF	3.11.34	AW451
D.C. Ace (SG, D, Pen)		PW29	Pen, D, Pen)		WM271
A.C. Three (SG, D, Pen)		PW35C	Transportable Three (SG, D, Pen)		WM318
A.C. Leader (HF Pen, D, Pow)		PW35B	£6 6s. Radiogram (D, RC, Trans)	June '33	WM327
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B	Simple-tune Three (SG, D, Pen)		
Ubique (HF Pen, D, (Pen, Pen)	28.7.34	PW36A	Economy-Pentode Three (SG, D,	Oct. '33	WM337
Annada Mains Three (HF Pen, D,		PW38	Pen)		WM351
Pen)			£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
F. J. Camm's A.C. All-Wave Silver	11.5.35	PW50	Iron-core Band-pass Three (SG,		WM362
Souvenir Three (HF Pen, D,			D, QP21)		
Pen)			1935 £6 6s. Battery Three (SG, D,		WM371
"All-Wave" A.C. Three (D, 2		PW54	Pen)		WM389
LF (RO))			PTP Three (Pen, D, Pen)	June '35	WM393
A.C. 1936 Sonotone (HF Pen, HF		PW56	Certainty Three (SG, D, Pen)		
Pen, Westector, Pen)			Minute Three (SG, D, Trans)	Oct. '35	WM396
Mains Record All-Wave 3 (HF	5.12.36	PW70	All-Wave Winning Three (SG, D,	Dec. '35	WM400
Pen, D, Pen)	28.8.37	PW80	Pen)		
All-World Ace (HF Pen, D, Pen)			Four-valve : Blueprints, 1s. 6d. each.		
Four-valve : Blueprints, 1s. each.			65s. Four (SG, D, RC, Trans)		AW370
A.C. Fury Four (SG, SG, D, Pen)		PW20	"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
A.C. Fury Four Super (SG, SG, D,		PW34D	2HF Four (2 SG, D, Pen)		AW421
Pen)			Crusader's A.V.C.4 (2HF, D, QP21)	18.8.34	AW445
A.C. Hall-Mark (HF Pen, D,	24.7.37	PW45	(Pentode and Class B Outputs for		
Push-Pull)			above : Blueprints, 6d. each)	25.8.35	AW445A
Universal Hall-Mark (HF Pen, D,	9.2.35	PW47	Self-contained Four (SG, D, LF,		WM331
Push-Pull)	6.11.37	PW81	Class B)	Aug. '33	
A.C. All-Wave Corona Four			Lucerne Straight Four (SG, D,		WM350
<b>SUPERHETS.</b>					
Battery Sets : Blueprints, 1s. each.			LF, Trans)		WM381
£5 Superhet (Three-valve)	5.8.37	PW40	£5 5s. Battery Four (HF, D, 2LF	Feb. '35	WM384
F. J. Camm's 2-valve Superhet	13.7.35	PW52	The H.K. Four (SG, SG, D, Pen)	Mar. '35	
F. J. Camm's £4 Superhet		PW53	The Auto Straight Four (HF Pen,		WM404
F. J. Camm's "Vitesse" All-	27.2.37	PW75	HF Pen, DDT, Pen)	Apr. '36	
Waver (5-valver)			Five-valve : Blueprints, 1s. 6d. each.		
Mains Sets : Blueprints, 1s. each.			Super-quality Five (2HF, D, RC,	May '33	WM920
A.C. £5 Superhet (Three-valve)		PW43	Trans)		
D.C. £5 Superhet (Three-valve)	1.12.34	PW42	Class B Quadrydne (2 SG, D, LF,	Dec. '33	WM344
Class B)					

These Blueprints are drawn full size.  
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the Blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless	..	4d.	Post Paid
Amateur Wireless	..	4d.	"
Practical Mechanics	..	7d.	"
Wireless Magazine	..	1/3	"

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, P.M. to Practical Mechanics, W.M. to Wireless Magazine.

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

New Class B Five (2 SG, D, LF, Class B)	Nov. '33	WM340
<b>Mains Operated.</b>		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.		AW403
Economy A.C. Two (D, Trans) A.C.		WM286
Unicorn A.C.-D.C. Two (D, Pen)		WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric		
Three (SG, D, Trans) A.C.		AW383
S.G. Three (SG, D, Pen) A.C.		AW390
A.C. Triodyne (SG, D, Pen), A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen)		AW430
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.	Jan. '36	WM401
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386
<b>SUPERHETS.</b>		
<b>Battery Sets : Blueprints, 1s. 6d. each.</b>		
Modern Super Senior		WM375
Varsity Four	Oct. '35	WM395
The Request All-Waver	June '36	WM407
1935 Super Five Battery (Superhet)		WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.		AW425
Heptode Super Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.		WM366
1935 A.C. Stenode	Apr. '35	WM385
<b>PORTABLES.</b>		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)		AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)		WM367
<b>SHORT-WAVE SETS—Battery Operated</b>		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)		AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver		AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)		AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)		AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen)	Jan. 19, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)		AW436
Empire Short-Waver (SG, D, RC, Trans)		WM313
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.	Nov. '35	WM397
Simplified Short-waver Super		
<b>Mains Operated.</b>		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.		AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.		WM368
"W.M." Long-wave Converter		WM380
Three-valve : Blueprints, 1s.		
Emigrator (SG, D, Pen) A.C.		WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short waver (SG, D, RC, Trans)	Aug. '35	WM301
<b>MISCELLANEOUS.</b>		
Enthusiast's Power Amplifier (1/6)	June '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)		WM392
Radio Unit (2v) for WM392	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electro-gram	Mar. '36	WM403
New Style Short-Wave Adapter (1/-)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW402
Short-wave Adapter (1/-)		AW456
Superhet Converter (1/-)		AW457
B.I.D.L.C. Short-wave Converter (1/-)	May '36	WM405
Wilson Tone Master (1/-)	June '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)		WM409



# QUERIES and ENQUIRIES

## Live Leads

"I have a commercial all-electric set, and wishing to connect an extension speaker, I have a wire from the plate of the output valve through a 2-mfd. condenser thence to the extra speaker. The other side of the speaker is to earth, and although this works satisfactorily I cannot understand why the lead from the speaker to earth should be 'alive,' considering that the condenser is in the lead to the other side of the speaker."

—W. T. B. (Newport).

IF the set is a Universal mains model the chassis will no doubt be in contact with one side of the mains supply. This will produce a "live" lead. If, however, the set is an A.C. model fed through a transformer the set chassis and earth lead will not be in direct contact with the mains supply, but it is possible for the chassis to be live in respect to earth owing to the fact that the mains may be wired in a certain manner. It is often found that this occurs but the trouble may be remedied by reversing the mains plug on a standard A.C. supply. It is also important to remember that in a powerful receiver the signal voltage in the output stage is sufficient to give a mild shock to persons susceptible to shocks and this may be the only trouble in your particular case. However, try reversing the mains plug.

## Getting Short Waves

"Do you consider it best to have the 'Cyclo' (two valves), to have a one-valve adapter, or to have an adapter to plug into the first valve of the main set (battery)? Do you think an ordinary two- or three-valve short-wave set is better?"—G. D. B. (Marlborough).

BY a one-valve adapter we presume you mean a one-valve converter, as the adapter to plug into a receiver would be an ordinary adapter. Thus, you are doubtful regarding the use of converter or adapter, and the selection of this type of unit depends mainly upon the standard broadcast receiver in use. If this employs only an ordinary detector stage (followed by L.F. stages or not) you cannot use a converter and thus are forced to use an ordinary adapter. This replaces the detector stage and simply cuts out the broadcast tuning circuit. If, however, the broadcast receiver employs H.F. stages a converter is undoubtedly the solution, as it enables all of the stages to be used, converts the set into a very selective superhet, and does not necessitate the cutting out of the H.F. stage or stages which would be needed with an adapter. The choice between a one-valve converter and the two-valve converter is purely one of personal choice—some amateurs considering that the two-valve arrangement is to be preferred. If your receiver is of the H.F. type the addition of a converter is to be preferred to the building of a special two- or three-valve short-wave set.

## Condensers In Series

"I cannot follow your reasoning in Problem No. 293 regarding the use of the

series condenser. You state that Atkins would have to take turns off his coil as the minimum capacity is .0002 mfd.—that of the fixed condenser. Can you explain this?"—G. E. (Portsmouth), and others.

IN the case given in this problem Atkins added a series condenser to reduce the capacity of his tuning condenser. This will only give effective results at the maximum capacity to which the tuning condenser would tune the coil, and when at minimum the series condenser is still in circuit. Obviously, however, the minimum tuning capacity of the condenser will be very small and this will be in series with the fixed condenser, but it will not enable him to tune down low enough to get the station mentioned. We inadvertently stated that the minimum capacity would be .0002 mfd., whereas it is less than that owing to the fact that the minimum capacity of the variable is in series with it, and the total capacity of condensers in series is  $C1 \times C2$  divided by  $C1 + C2$ . In the case

## RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

mentioned the minimum was not sufficient to get the station and thus turns had to be stripped from the coil.

## Making a Microphone

"I had a small moving-coil speaker which I endeavoured to convert into a microphone. I removed the surround and cut down the cone to a rectangular shape, roughly 2in. by 3in. It has one disadvantage, reproduction of the whole being excellent, and that is that it is very insensitive—it being necessary to speak about 1½in. away to obtain any appreciable volume. Can you suggest any method of increasing the sensitivity?"—W. S. W. (S.E.3).

YOU do not state whether you have attached the periphery of the cone to any form of support, and we think your trouble may lie there. The very lightest

support should be employed, and the general weight reduced as much as possible. The fact that this type of speaker is as sensitive as a microphone may be proved by remembering that it is used in modern room-to-room communicators where the sensitivity is such that the "mike" picks up sound from a distance of 15ft. with only a two-stage amplifier.

## Condenser Damage

"I have just built a short-wave one-valver, but find that as the condenser is turned there are loud bangs and clicks, and on looking I see that the vanes are all touching. Should this be so, or have I been sold a dud condenser? I might mention that this is my first constructional attempt."—H. E. (Perth).

YOU have probably fallen into a common trap which meets the beginner. The hole you drilled in the panel for the condenser was probably slightly on the small side and the one-hole fixing bush on the condenser was undoubtedly too large. Instead of enlarging the hole you probably forced the condenser through and the pressure on the end plate has forced the supporting strips outwards and thus distorted the entire condenser framework. This is a fairly common occurrence, and you may be successful in bending the condenser straight again. This will have to be done very carefully. Always make certain that fixing holes provide sufficient clearance to enable components to be mounted without forcing.

## Increased Eliminator Output

"I have a small H.T. unit for my D.C. set which delivers just about 110 volts. I should like to get more so that I can use a better power valve, but I have been told that there is no way of stepping up the voltage from the D.C. unit. Is this so? If not, what is the best way to do it?"—G. H. E. (Oxford).

YOU cannot step up the output or otherwise increase it so far as the unit itself is concerned. You may obtain the additional voltage, however, by adding an ordinary H.T. battery in series with the positive lead from the unit, adjusting the plug in the battery to give the necessary total voltage. When doing this you must make certain that the voltage to the earlier stages is not overdone or instability may result.

## Eliminating Howls

"I have made up the Economy Three, but cannot understand why the set howls when I pull out the coils. I noticed this when I wanted to change wavelengths and it is most annoying as the howl can be heard all over the house. As I use the set at night for short-wave work you will appreciate that this is troublesome. How can I stop it?"—G. P. (Hounslow).

YOU should switch off before changing the coils. The trouble you are experiencing is often met with in receivers of this type, but it is a simple matter to switch off and no time will be lost. It is not a mains set where the valves have to heat up and, therefore, you simply need to switch off, change the coils, and switch on again.

PATENTS AND TRADE MARKS.—Any of our readers requiring information and advice respecting Patents, Trade Marks or Designs, should apply to Rayner and Co., Patent Agents, of 5, Chancery Lane, London, W.C.2, who will give free advice to readers mentioning this paper.

The coupon on Cover iii must be attached to every query.

## Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

## RADIOMART

### THE SHORT-WAVE SPECIALISTS

We carry large stocks of British and American Short-wave Apparatus and Components. Our latest S/W Catalogue has many new lines illustrated and fully described. Send 1½d. stamp for a copy; post free.

**NOTE:** Garrard Record Changers recently offered in our Special Bargains are now **SOLD OUT**. Only two or three Receivers left for **CALLERS ONLY**. Stocks of W.B. 8" Permanent Magnet Speakers. Now running low.

Extension Type **7/6** Standard Type **12/6**  
(no Transformer) (with Transformer)  
**65NI 66-PAGE MANUAL** for all short-wave fans **7½d.** Post Free  
Send 1½d. stamp and put your name on our mailing list. You must have our Short-wave Catalogue "N."

## RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

ALL goods previously advertised are standard lines, still available. Post card for list free.  
**AUXHALL UTILITIES**, 163a, Strand, W.C.2.  
Over Denny's the Booksellers. (Temple Bar 9338.)

**CONVERSION UNITS** for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components.  
**WARD**, 40, Farringdon Street, London, E.C.4.  
Telephone: Holborn 9703.

**25 ONLY FOR SALE.**—3-valve kits with valves and diagram, 12/6; 3-valve 8/G kits with valves and diagram, 20/-. Orders executed in rotation.  
—Universal Radio Co., 221, City Road, London, E.C.1.

**1938 RADIO** at 50 per cent. Discount. Components, Speakers, Receivers, etc. 1½d. stamp.—**COULPHONE, ORMSKIRK.**

## VALVES

**AMERICAN Valves** in Sealed Cartons, all types, 5/6, post paid.—Valves, 661/3, Harrow Road, N.W.10.

## LOUDSPEAKER REPAIRS

**LOUDSPEAKER** repairs, British, American, any make. 24-hour service, moderate prices.—Sheila Speakers, Alma Grove, Copenhagen Street, London, N.1.

**REPAIRS** in Moving Coil Speakers, Cones and Coils fitted and Rewound. Fields altered. Prices Quoted including Eliminators. Loudspeakers repaired, 4/-; L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service, Estimates Free.—**L.S. Repair Service**, 5, Balham Grove, London, S.W.12. Battersen, 1321.

## SITUATIONS VACANT

**DRAUGHTSMEN.**—Numerous vacancies in Engineering, Building, G.P.O., etc., for men age 17-40. Exp. unnecessary if willing to learn. Details of openings, salaries, etc. FREE on application to N.I.E. (Dept. 37J), Staple Inn Bldgs., W.C.1.

**WANTED**—ambitious young men to prepare for well-paid posts in TELEVISION, the great career of the future. Apply for free booklet from **BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY**, 18P, Stratford Place, W.1.

# PREMIER SUPPLY STORES

## POST ORDERS

"Jubilee Works"  
167, Lower  
Clapton Rd.,  
London, E.5.  
Amherst 4723.

## CALLERS

can now obtain their requirements at "Jubilee Works," as well as—  
165 & 165a,  
Fleet Street, E.C.4  
Central 2833, and  
50, High Street,  
Clapham, S.W.4.  
Macaulay 2381.

## Premier 90 Page Giant Illustrated Catalogue, Handbook, and Valve Manual. Now Ready, Price 6d.

**SPECIAL STOCKTAKING OFFERS.** There are only a few of each item, and they will be speedily sold out, so get your bargain now!

**MAGNAVOX 61" Moving Coil Speakers**—2,500, 6,500 and 10,000 ohm Fields—with Transformers—3/11 each.

**MAGNAVOX 8" Moving Coil Speakers**—2,500 and 6,500 ohm Fields with transformers—4/11 each.

**MAGNAVOX 8" 1,500 ohm field, no transformer, 3/3 each.**

**B.T.H. 8" 7,500 ohm field, no transformer, 2/11 each.**

**110 K.C. I.F. Transformers, 1/3.**

**LISSEN Power Packs** in aluminium cases, 150v., 25 m.a., with 6.3v. L.T., 100-250v. mains, 10/6, with Rectifier.

**METAL RECTIFIERS, 250v., 60 m.a. output, 4/6 each.**

Telsen Slow Motion Drives, 6d. each. Telsen Twin H.F. Chokes, 6d. each. Telsen Variable Condensers, .0001 or .00075 bakelite, Dielectric, 6d. each.

Phillips Wet Electrolytics 4mf. or 8mf., 320v. working for universal sets, 10d. each.

T.C.C. 15mf., 100v., Dry Electrolytics, 4d. each. Cossor 1+mf. Condensers, 3d. each.

2-Gang, .00016 all brass short-wave stentite based Condensers, 2/11 each.

Potentiometers, 1/- each. 10,000, 25,000, 250,000 500,000, 1 meg., 2 meg., with switch, 1/3 each. 10,000, 20,000, 250,000, 500,000.

**MAINS TRANSFORMERS.** Primary 200-250 v. Secondaries, 350-0-350v., 90 m.a., 4v., 2a., 4v., 5a., 4/6. Primary 230v-250v. only. Secondary 250-0-250v., 60 m.a., 4v., 2a., 13v., 1a., 3/6.

3-Gang Condenser 0005, shielded with trimmers and slow-motion dial, 3/11.

**AMERICAN TYPE VALVES.** All the following types at 2 for 3/-: 45, 46, 60B, 71A, 2A6, 58, 57, 33, 42, 41, 1223, 56, 53, 85, 6A7, 59, 12A, 2A3, 2B7, 55, 2(50), 78, 2A7, 77, 24, 2(81), 35/51, 2(10).

**BATTERY VALVES, 2 volts, H.F., L.F., 2/3.** Power, Super-Power, 2/9. Var-mu-S.G., 4- or 5-pin Pentodes, H.F. Pens, V-mu-H.F. Pens, 5/-; Class B, 5/-; Freq. Changers, 7/6.

**EUROPA MAINS VALVES.** 4v. A.C. Types, A.C./H.L., A.C./L., A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P., and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens., I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. changers, 8/6; Double Diode Triodes, 7/6; Triode Hex. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 3½ watt, D.H. Triode, 7/6.

**UNIVERSAL TYPES.** 20v. 18a. S.G., Var-mu, S.G. Power, H.F. Pen., Var-mu. H.F. Pen, 4/6 each.

13v. 2a. Gen. Purpose Triodes, 5/6; H.F. Pens and Var-mu. H.F. Pens. Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

**PREMIER 5 VALVE ALL-WAVE SUPERHET CHASSIS, 10.5/2100, A.V.C.** Over 4 watts output. 200/250 volt A.C. mains. With American Octal valves and moving coil speaker, 25/19/6.

**PREMIER "TROLITUL" Short-Wave CONDENSERS.** Certified superior to Ceramic. All-brass Construction, 15 mmfd., 1/6, 40 mmfd., 1/9, 100 mmfd., 2/-, 160 mmfd., 2/3, 250 mmfd. 2/6; Double Spaced 15 mmfd., 2/9; 40 mmfd., 3/6; S.W.H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion .00015 Tuning, 4/3; .00015 Reaction, 3/9. **UTILITY 4" MICRO-CURSOR DIALS.** Direct and 100:1 ratio, 3/9 each.

**SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. coil, 11-25, 10-43, 38-80 metres. Suitable any type circuit, 2/6.**

**COIL FORMERS, 4- or 6-pin low-loss, 1/- each.**

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

## RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1. Holborn 4631.

This is your last opportunity to obtain a first-class All-wave A.C. Chassis or Receiver. Stocks have been practically cleared, and early application is advisable to avoid disappointment.

**SPECIAL! SPECIAL!** We score again by a keen purchase of the entire Radio Stocks of Messrs. Gambrell, enabling us to offer same at a fraction of the original cost. Stock includes Chassis and complete Table and Console Receivers. The demand is sure to be heavy, **ORDER EARLY TO AVOID DISAPPOINTMENT.**

**GAMBRELL 7-valve All-Wave, All-stage Chassis.** Constructed throughout of heavy Cadmium plated steel. This Chassis represents a real engineering job. Fitted with all the latest refinements, including Six Harries All-stage Valves, one Valve for All Positions, plus standard Hivac U/120/350 Rectifier. Wave Band Ranges: Long Wave 800 to 2,000 metres, Indicator Light Red; Medium Wave 200 to 550 metres, Indicator Light Yellow; Short-wave Band 2, 30 to 75 metres, Indicator Light Green; Short-wave Band 1, 12.5 to 30 metres, Indicator Light Blue. Provision for Pick-up and External Speaker. Fitted 2-speed Drive, Built-in Visual Tuning. Wave-change Switch, Combined Volume Control, Push-pull Tone Control and Mains On-Off. The Dial is a really magnificent affair, size 8ins. long and 5ins. wide, Tuning Indicator being built in the Dial. The Chassis throughout is heavily screened, thus providing stability on all bands, with the finest all-round performance. Valve Screens spun from one piece. Transformer and Choke are of massive construction. In fact, the Chassis throughout is constructed in such a way that overloads, etc., are provided for without strain. Size of Chassis, 14½ins. long, 10½ins. wide and 3½ins. deep. Pre-H.F. stage operates on all bands. Reports from satisfied customers more than confirm our contention that this chassis represents the finest value we have ever offered to the Public. Supplied complete with Six of the latest Harries All-stage Valves, plus Rectifier, 24 9s. 6d. each.

As above, but with Celestion 10in. Moving Coil Speaker, 24 19s. 6d. each.

As above but fitted in Handsome Table Piano Finish Walnut Cabinet, complete with Valves and Speaker, 25 10s. each. Cost of Packing and Carr. 2s.

As above, but fitted in handsome Piano Finish Walnut Console Cabinet, complete with Valves and Speaker, 26 6s. each. Cost of Carriage and Crating, etc., 5s.

Hunt's 1,000 mfd. Cardboard Electrolytics, Wire Ends, Peak Voltage, 12 volts, 2/- each.

Special offer in ½ gross lots only, T.C.C. 0.1 Wire End, Tubulars, 15/- per half gross.

Polar N.S.F. Resistances, Our Selection, ½, 1 and 2 watt, 4/- gross.

Tubular Condensers, our selection, 1/- dozen.

Dubilier ½ meg. Volume Controls, with Switch, standard model, very compact, 1/6 each.

H.T.8 Type Rectifiers (skeleton type). A really splendid job, 4/6 each.

6 Bank 4 Position Yaxley Type Switches, beautifully finished. Each Bank 5 Contact Type, plus Common. 5/- each.

Visual Tuning Indicator, m/a type, complete with mounting Bracket, 1/3 each.

3-gang .0005 Straight Condensers. A precision instrument with Ceramic Insulation, suitable for all Circuits, including All-wave, 3/- each.

Dials for above, 2-Speed type, 9" Long, 5" Wide. Station Marked for 4 Wave Bands, Two Short, Medium and Long, 4/6 each.

465 I.F.3, Iron Corel, with Trimmers, 2/6 each.

Plessey Can Type Condensers (Electrolytics), complete with Fixing Clamp, 8 plus 16 Mfd., 8 Mfd., working voltage 450, 16 Mfd., working voltage 350, 2/- each. Plessey 16 Mfd., 150 volt working, 1/3 each.

Special offer Mains Transformers, 350-0-350, 120 m.a. 15 volts C/T at 4 amp., 4 volts C/T at 2.5 amp. Mains Input Adjustable 200-250 volts. Heavily Shrouded, 4/6 each. Postage 1/-.

20 Hy, 100 m.a. 500 ohms Choke, Unshrouded, 5/11 each.

350/120 Indirectly Heated Rectifier, Octal Base type, well-known make, complete with Octal Base Valveholder, 4/6 each.

All orders 5/- or over, post free: orders under 5/- must be accompanied by a reasonable amount for postage: C.O.D. orders under 5/- cannot be accepted. Hours of business 9 a.m. to 7 p.m. weekdays; 9 a.m. to 1 p.m. Saturdays. All enquiries must be accompanied by 1½d. stamp if reply expected.

**RADIO CLEARANCE, 63, High Holborn, W.C.1. Holborn 4631.**

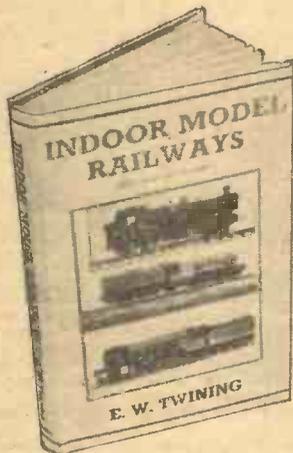
## TUITION

"R.T.I."—established 1920.—still lead. Get free particulars latest Radio and Television courses: postal and private.—Radio Training Institute, 40a, Earl's Court Road, London.

Just Published

# INDOOR MODEL RAILWAYS

Dealing with HO and OO Gauges  
By E. W. TWINING  
The famous model railway expert



Demy 8vo; 151 pages; hundreds of photographs and diagrams drawn to scale.

This book provides the model railway enthusiast with a standard textbook and work of reference, dealing in an exhaustive and authoritative way with the subject.

**LIST OF CONTENTS**

- Early small-gauge railways: origin of HO and OO gauges.
- Gauges, scales and dimensions.
- Electric traction motors, rotation and reversing.
- Prototype locomotives and modelling same.
- Motor mechanisms and their adaptation to prototype engines.
- The twin railway, its locomotives and electrical working. Electric motor coaches, carriages, wagons and auto-couplers.
- Track, layout and engineering works.
- Third-rail and two-rail systems, control and signalling.
- Architectural features.

**5/- NET**  
(5/6 post free)

**GEORGE NEWNES LTD.**  
TOWER HOUSE, SOUTHAMPTON STREET, STRAND, W.C.2.

**NEW RECEIVERS AND CHASSIS**

ARMSTRONG Company pioneer firm supplying all British Radio receivers in chassis form, announce several new models as under:  
**A** RMSTRONG Model 3NBP/T, 7v. (Including Cathode Ray), all-wave radiogram chassis, complete with moving coil speaker, £7/18/6.  
**A** RMSTRONG Model RF73/T; this 8-valve chassis has been designed in answer to many requests for a luxury chassis with smaller output.  
**A** RMSTRONG Model RF94/T 10-valve Radiogram Chassis, with 10 watts push-pull output; £13/13.  
**A** RMSTRONG Latest Catalogue Contains Illustrated Technical Data of Model 3NBP/T; also many new models.  
**A** RMSTRONG Chassis Carry Generous Guarantee, no charges for material, labour, or carriage for 12 months.  
**A** RMSTRONG Chassis Sent on 7 Days' Trial, packing and carriage free.  
**A** RMSTRONG Co., 100, King's Road, Camden Town, N.W.1. Gulliver 3105.

**NEW RECEIVERS, COMPONENTS AND ACCESSORIES**

**C**ONDENSERS: British Manufacture, metal case (paper): 800 volt Wkg., 4mf., 3/-; 2mf., 2/0; 1mf., 2/-; 500 volt Wkg., 4mf., 3/-; 2mf., 2/-; 1mf., 1/6; 400 volt Wkg., 4mf., 1/9; 2mf., 1/3; 1mf., 8d. Electrolytic: 500 volt Pk., 4mf., 1/6; 8mf., 1/9; 8+4mf., 2/6; 8+8mf., 3/-. Postage 6d. or C.O.D.—The Static Condenser Co., 11, Eden Street, London, N.W.1.

**BATTERY CHARGING PLANT**

**2**-VOLT, 3 amp. charger, 8/6; 1 amp., 12/6; 2 amps., 18/6; 6-volt 1 amp., 15/-. Complete in steel cases, metal rectifiers; just plug-in.—Brighton Radio Service, 34, Middle Street, Brighton.

**MISCELLANEOUS**

**N**OS. 1—204 "Practical and Amateur Wireless" for sale; offers.—Williams, 28, Bunswick Square, Hove.

**T**HE PRACTICAL MOTORIST'S ENCYCLOPEDIA, by F. J. Camm, 3s. 6d. net. A lucid exposition of the principles, upkeep and repair of every part of the car. 442 illustrations. From book-sellers everywhere.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

**"ENGINEERING OPPORTUNITIES" FREE!**

This unique Hand-book shows the easy way to secure A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T., A.M.I.R.E. and similar qualifications.

**WE GUARANTEE—"NO PASS—NO FEE."**

Details are given of over 150 Diploma Courses in all branches of Civil, Mech., Elec., Motor, Aero., Radio and Television Engineering, Building, Government Employment, etc.

Write for this enlightening Hand-book today FREE and post free. **British Institute of Engineering Technology.** 409, Shakespeare House, 17, 18, 19, Stratford Place, W.1.

**FREE ADVICE BUREAU COUPON**

This coupon is available until May 28th, 1938, and must accompany all Queries and Wrinkles.

PRACTICAL AND AMATEUR WIRELESS, 21/5/38.

**ADVERTISEMENT INDEX**

	Page
British Institute of Engineering Technology	Cover iii
Electradix Radios	252
Fluxite, Ltd.	252
International Correspondence Schools, Ltd.	252
London Radio Supply Co.	Cover iii
M.P.R. Electrical Co.	Cover iii
McCarthy Radio, Ltd.	Cover iii
New Times Sales Co.	249
Peto-Scott Co., Ltd.	247

**MCCARTHY**  
The Chassis Specialists

A new 4-Wave Battery Receiver, price 9 guineas, complete with valves, with exceptionally lively performance, unusual waveband coverage, and satisfying output. 7 stages, 19 separately tuned circuits. Circuit comprises: R/F amplifier; triode-hexode frequency changer with separate oscillator; I.F. amplifier; double diode-triode detector, A.V.C. and L.F. amplifier; double pentode quiescent output valve. Wave-ranges: 12.8-33, 28-80, 190-550, 1,000-2,000 metres.

Full technical details, catalogue, easy terms on application.

**MCCARTHY RADIO LTD**  
44a, Westbourne Grove, London, W.2.  
Telephone: Baywater 3201/2.

**EVERYTHING RADIO**  
SUPPLIED FOR CASH OR ON EASY TERMS

Item	Cash Price	With Order	Monthly Payment
S.T.900 Complete Kit	5 15 3	10/-	11 of 10/7
W.B. Stentorian Senior 300	2 2 0	2/6	11 of 4/-
Garrard A.C.5 Radiogram Unit	3 15 0	5/6	11 of 7/-
Garrard A.C.5 Motor only	2 2 6	4/-	10 of 4/3
Rothermel Piezo-Electric Pick-up	2 2 0	4/-	10 of 4/3
Avonmor Test Met. r	2 5 0	5/-	10 of 4/6
Goodman's L.S. Twin-Cone Unit	3 10 0	6/6	11 of 6/5

**CASH or C.O.D. ORDERS DELIVERED BY RETURN OF POST.** We can guarantee such prompt delivery only because we carry large stocks and, being placed so favourably, we are able to secure anything Radio or Electrical immediately.

Write us your requirements—we will quote best terms by return.

**LONDON RADIO SUPPLY ESTD. COMPANY 1925**  
11, OAT LANE, NOBLE ST. LONDON, E.C.2.  
Phone: NATIONAL 6828-9

**Add 50/- WEEKLY to your earnings**

Charge accumulators in your spare time.

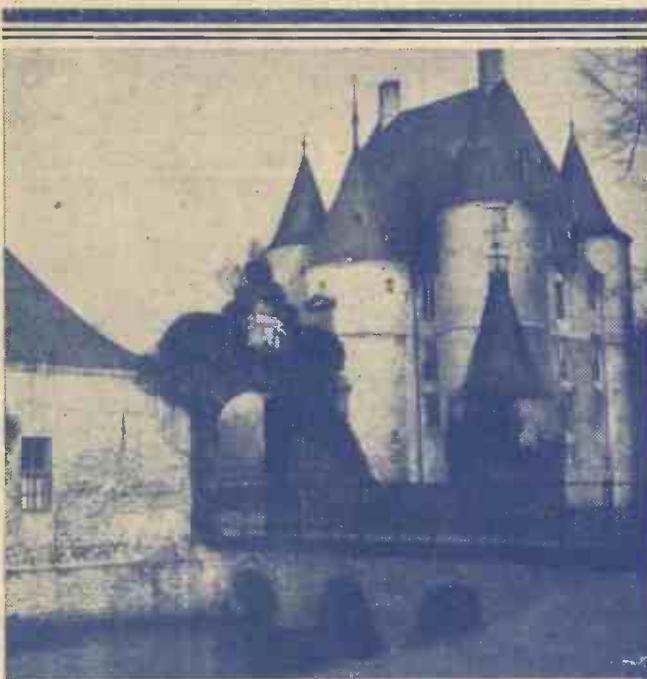
Complete Charger, Incorporating Westinghouse Metal Rectifiers. Will charge 8/4 accumulators weekly.

Price £4.4.0 or 8/- monthly.

Send for full particulars.

**M.P.R. ELECTRICAL CO., 252, Victoria Road, Romford, Essex.**

When writing to Advertisers please mention "Practical and Amateur Wireless"



A well-balanced study—Belgium

## Do You Waste Money—

when you use your camera? So many people take photographs on a "hit or miss" principle. But you can be certain of really good results—photographs worth entering in the various competitions held at this time of the year—by reading regularly

## The HOME PHOTOGRAPHER

The Helpful Monthly for the Amateur

On sale at all Newsagents and Bookstalls, or by post  
7½d. from the Publisher, George Newnes, Ltd., Tower  
House, 1 Southampton St., Strand, London, W.C.2.

**6<sup>D</sup>** MAY

George Newnes, Ltd.

# The New Popular Air Weekly



**I**F you are air-minded you will enjoy **FLYING**. Every week it presents enthusiastic, non-technical reading—an air pageant of the world in every issue! With its stirring air fiction, true adventures of Service and civil pilots and the pioneers of flight, its "inside" information on all that is new in flying, and its profuse illustrations, it satisfies the very keenest desire for aerial knowledge.

Contents of this week's **FLYING** include—

### AFRICAN FLIGHT

By F. A. SWOFFER

With Striking Aerial Pictures

### SPECIAL MISSION IN PALESTINE

By "VIGILANT"

### MAPPING THE MIGHTY AMAZON

With Photogravure Illustrations

Also in Photogravure:—

### LEAVES FROM A WAR- PILOT'S SCRAPBOOK HEROES OF THE AIR



**3<sup>D</sup>**

**EVERY  
FRIDAY**

Of all Newsagents and Bookstalls, or by post  
4d. from the Publisher, George Newnes,  
Ltd., Tower House, Southampton Street,  
Strand, London, W.C.2.

George Newnes, Ltd.

# MAKING H.T. ELIMINATORS— See page 259

# Practical and Amateur Wireless

3<sup>p</sup>  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 12. No. 297.  
May 28th, 1938.

AND PRACTICAL TELEVISION

## Making the

# "ARGON" CHARGER



*Full  
Details  
Inside!*

### THE BOOK FOR THE AMATEUR! **WIRELESS COILS, CHOKES AND TRANSFORMERS:** AND HOW TO MAKE THEM. By F. J. CAMM.

An important new Handbook for every home constructor and anyone interested in radio. With Special Chapters on Selectivity, Break-through, Coil Winders, Coil Troubles and their Remedies. 180 pages, cloth bound, with 126 easy-to-follow illustrations.

From all booksellers 2/6 or By post 2/10 from the Publishers,  
GEORGE NEWNES, LTD. (Book Dept.), Tower House, Southampton Street, Strand, LONDON, W.C.2.

# World's Greatest Family Weekly

# “To-day”

## No. 1 OUT NOW

“TO-DAY” is to-day's biggest achievement—big in conception, big in value and big in size! It is the greatest family weekly ever produced—portraying the vivid panorama of life as it is lived to-day—with pages of magnificent photographs in colours... long and short stories... irresistible humour... stirring features and articles of outstanding interest for the whole family—unbelievable value for 2d. In addition, a Gift Book of 40 Big Pages inside—“FORTY WONDERFUL YEARS”—which will be treasured in countless homes all over Britain. It presents in dramatic pictures a cavalcade of the years 1898-1938—the most dynamic period in our history.



All these Features in  
“TO-DAY” No. 1

- 1 **IN GLORIOUS COLOURS**, George Belcher's Royal Academy paintings, and **HIS OWN STORY** of the plain people who are his models.
- 2 “The Great Trafalgar Square Mystery,” popular **AUGUSTUS MUIR'S** enthralling new-style serial story.
- 3 **VIVID COLOUR PHOTOGRAPHS** of the Story of Steel—13 million tons of Glowing Prosperity!
- 4 **NEWS PARADE**—Exclusive “In the Know” pages and pictures of Men and Women you want to read about.
- 5 Exclusive **PHOTOGRAPHS IN COLOUR** of the Bridal Feast of Africa's strangest tribe.
- 6 Long Complete Adventure Story by **SAX ROHMER**, Master of Mystery.
- 7 Watch the **BRAVEST RESCUE OF THE YEAR**: an Alpine S O S told in Dramatic Photographs.
- 8 The intensely interesting story, exclusive to “TO-DAY,” of the astonishing family which rules the destinies of China's 450 millions.
- 9 The experience of dining with Britain's Most Mysterious Woman—she gives all guests £1 for taxi fares, and runs a castle with a hundred bedrooms.
- 10 A Famous Psycho-analyst sets you revealing questions on Success in Marriage.

And many other great new ideas in “TO-DAY”—48 **BIG PAGES** that are a Thrill to look at and a Joy to read!

# ON THE ULTRA-SHORT WAVES — See Page 272



## Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:  
W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,  
B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 297. May 28th, 1938.

# ROUND *the* WORLD of WIRELESS

### Accumulator Charging

ONE of the main difficulties met with by the listener who has no mains facilities is that of keeping the accumulator in good condition. Constant visits to the charging station are necessary, and in many cases a listener decides to have the mains installed even only to overcome this trouble. There are many listeners, however, who in spite of the mains facilities prefer the ordinary battery-type receiver, and use a small H.T. battery eliminator for the high-voltage supply and then grumble at the difficulty of keeping the accumulator charged. Small trickle chargers have been described on these pages on several occasions, and in this issue we describe a larger type of unit which will be found of more general interest. This charger makes use of a valve rectifier and will deliver a current of 1 amp. This output is delivered whether the charger is joined to a small 2-volt cell or to a bank of a dozen or so. The total output is sufficient to enable the charger to be used for the replenishing of car batteries and similar apparatus, and where speedier charging is desired a second valve may be added in parallel with the existing one.

### Morse Interference

ON certain parts of the coast interference is experienced on the broadcast wavelengths from morse signals, and a leading British manufacturer is now making a special morse filter which will be incorporated free of charge in their receivers supplied to customers in the districts mentioned.

### A.R.P. Demonstration

MESSRS. PHILIPS recently installed an interesting public-address equipment at the factory of Messrs. Crosse and Blackwell in London. The apparatus comprises mike, radiogram, amplifier and seventy loudspeakers. The telephone operator can speak through all the loudspeakers in order to call any member of the staff to the 'phone, or the apparatus may be used to sound an air-raid or fire warning.

### International Hill Climb

THE open hill climb at Shelsley Walsh in the afternoon of May 28th will be described by F. J. Findon, well-known motoring commentator, in the Midland programme. This broadcast should be interesting as many crack drivers from the

Continent will compete, and the thousand-yard climb includes some tricky double bends on stiff gradients.

### New U.S.A. S.W. Transmitters

AT W3XAL two new short-wave transmitters are to be installed. They will be rated at 25 kW and will be provided with directional aerial arrays beamed on Europe. This station, it will be remem-

### Ascension Day Custom

THURSDAY, May 26th, is Holy Thursday, and in the village of Wicken, in Northamptonshire, the rector, in his canonicals, meets the villagers under an old elm tree on a spot called Gospel Bank, and after singing the Hundredth Psalm, specially made cakes and eight gallons of beer are distributed. The historic ceremony will be described by Michael Langley, a journalist, in the Midland programme.

### Welsh Coal

A B.B.C. Recording Unit has recently been visiting various parts of South Wales, and records have been made at a coal mine, a railway station and the Cardiff docks. These records will be included in a special broadcast to children on May 28th in the Welsh programme.

### Rehearsal Broadcast

THE well-known Alexandra Theatre at Hull will be the scene in the lunch-time programme on May 25th of a broadcast to all Regional listeners. The relay will enable listeners to hear the rehearsal at the theatre for the variety show appearing that week, and the broadcast from the performance will be heard in the Northern programme on May 26th.

### Lawrence of Arabia

ON May 28th a former friend of Lawrence of Arabia will answer the query "Was Lawrence of Arabia in Aberdeen?" The friend is John Bruce, and the reply will probably surprise those people who had never thought of such a connection. Bruce was in the Air Force, the Tank Corps, and in civil life with Lawrence.

### Promenade Concerts, 1938

THE summer season of the B.B.C. Promenade Concerts at Queen's Hall will begin on Saturday, August 6th, and will continue until Saturday, October 1st. Sir Henry J. Wood will conduct the B.B.C. Symphony Orchestra of 90 players, under the leadership of Paul Beard.

### Spotlight on Cricket

A. E. LAWTON, former Derbyshire County cricket captain, will be the speaker in the Northern "Spotlight on Sport" programme on May 26th.

### ON OTHER PAGES

	Page
Making H.T. Eliminators ..	259
Servicing with the C.-R. Tube	261
On Your Wavelength ..	263
Technical Fundamentals ..	265
Readers' Wrinkles ..	267
Making the "Argon" Charger ..	268
Transmitting Topics ..	270
Short-wave Section ..	272
Practical Television ..	274
Club Reports ..	276
Readers' Letters ..	277
Queries and Enquiries ..	279

bered, is the N.B.C. international station at Bound Brook, New Jersey.

### Dealer Position in Switzerland

A DECREE recently issued in Switzerland restricts the sale of radio to traders holding a special licence. As a result of this the number of radio dealers has fallen from 3,000 to 850.

### Swedish Test Broadcasts

A SERIES of daily broadcasts on the short waves is being radiated by SM5SN. These broadcasts take place from 8.30 a.m. to 3 p.m. on frequencies from 56 to 57.5 mc/s. The broadcasts will consist of a short text and the call-sign, and will be given continuously between the hours stated.

# ROUND the WORLD of WIRELESS (Continued)

## Preparing the New Cairo Plan

**B**EFORE any amendment can be made to the Lucerne Plan for the readjustment of medium-wave channels allotted to European stations, the matter must be discussed at the Conference to be held in Switzerland in February, 1939. The new plan will be worked out at the meeting of the U.I.R. at Ouchy-Lausanne (Switzerland) during the period June 20-29th, and finally discussed, and eventually confirmed at Brussels on October 1st, 1938.

## Holland's Super-power Station

**W**ITHIN the next 18 months the Dutch broadcasting organisations hope to transmit their radio programmes through the new 125-kilowatt station which is now being installed at Jaarsveld. It is probable that it will work on 301.5 m. (995 kc/s), the channel now used by Hilversum II.

## Milan Now Has Three Stations

**T**HE new 1-kilowatt station installed on the site of the Milan Fair and to be known as Milan III has been working since April 1st on 209.9 m. (1,429 kc/s); it exchanges programmes with Rome III (221.1 m., 1,357 kc/s).

## Nationalist or Republican?

**S**PAIN at present is divided into three groups, namely, Nationalists, Republicans and Catalonians. The Nationalist or Insurgent (Franco) party operates Radio Salamanca (238.5 m., 1,258 kc/s); Saragossa (EAJ10); Burgos (EAJ27); San Sebastian (EAJ8), all working on 207.3 m.; Seville (EAJ5), on 410.4 m. (731 kc/s); and Pamplona (EAJ6), on 227.5 m. (1,320 kc/s). In addition, some 30 stations of a power of 200 watts or less on 200-201.1 m. (1,500-1,492 kc/s) are linked up to the main network for the relay of programmes and news bulletins from Salamanca. The Republican, or Spanish Government, stations consist of Valencia (EAJ5), on 352.9 m. (850 kc/s); Madrid (Radio España, EAJ2), on 410.4 m. (731 kc/s), which shares the channel with Radio Jaen (EAJ70); Almeria (EAJ54), on 200 m. (1,500 kc/s); and Murcia, on 201.1 m. (1,492 kc/s). The Catalonian network is composed of Radio Barcelona (EAJ1), on 377.4 m. (795 kc/s) and Radio Asociación (EAJ15) in the same city, working on 293.5 m. (1,022 kc/s), with a number of small stations using either 200 m. (1,500 kc/s) or 201.1 m. (1,492 kc/s).

## New B.B.C. Appointment

**W**E are informed that Mr. J. G. Macleod has been appointed to the B.B.C. staff for training as an announcer. After leaving Oxford, Mr. Macleod was called to

## INTERESTING and TOPICAL NEWS and NOTES

the Bar, and from 1930 to 1935 he was associated with the Festival Theatre, Cambridge, of which he was producer and sole director for several years. Mr. Macleod

has also contributed talks to broadcast programmes.

## Schools Radio in the Isle of Man

**I**T is interesting to note that in the Isle of Man, one of the very few areas in this country in which all schools are radio equipped, every school has recently been provided with a Philips receiver. This was made possible by additional funds raised by the schools themselves to supplement the grant from the Education Authority.



Carroll Levis discovers how K.B. Radio Sets are made.

## Midland Orchestral Concert

**L**ESLIE HEWARD will conduct the B.B.C. Midland Orchestra in an afternoon symphony concert devoted to familiar classics on May 27th. Schumann's D minor symphony and movements from Mendelssohn's "Midsummer Night's Dream" will be repeated in the evening.

## Variety from Coventry

**F**LORENCE DESMOND, who appeared at the Royal Command Performance, is the principal attraction at the New

Coventry Hippodrome Theatre on May 31st. The Four Play Boys and Edwin Lawrence are also in the "bill," which Midland and Regional listeners will hear on that date.



*Felix Bartholdy Mendelssohn—descendant of the famous composer of "Spring Song" fame—second son of Mr. and Mrs. Martin Mendelssohn of Golders Green, N.W., and Miss Angela Diego, only daughter of Mrs. Santos Diego, also of Golders Green, N.W., who have announced their engagement. Mr. Felix Mendelssohn is well known in entertainment circles as a prominent concert organiser, broadcasting band leader, composer of dance tunes and manager to many well-known stage, screen and radio celebrities. Miss Angela Diego is a well-known beauty specialist. The wedding will take place some time next year.*

## SOLVE THIS!

### PROBLEM No. 297

Atkins had a three-valve battery set built on an ordinary wooden baseboard, and he decided to bring this up to date. He accordingly bought one or two new parts and mounted the receiver on a metallised chassis, taking all the necessary leads to an earthed bolt and generally keeping to his original design. When tested results were fully up to standard and he noted a slight improvement in stability and general performance. After two or three days, however, his accumulator ran down and he had it recharged. He found that it did not last more than a week where previously it had lasted three weeks. He suspected a valve, but when tested all valves were in order. What was the cause of his trouble? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Envelopes must be marked Problem No. 297 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 30th, 1938.

### Solution to Problem No. 296

When Richmond changed his output valve he reversed the screening grid and anode leads and thus the valve acted more or less as a simple triode and the advantages and characteristics of the pentode were lost. The following three readers successfully solved Problem No. 295 and books have accordingly been forwarded to them: R. Fuller, 38, Ash Road, Kings Farm Estate, Gravesend, Kent. O. Greenfield, c/o Mrs. F. Melhuish, 30, Richee Street, Wolverhampton, Staffs. W. Baeston, 9, Johnston Street, Blackburn.

# MAKING H.T. BATTERY ELIMINATORS

A Few Alternative Circuits for Units Suitable for Use with D.C. and A.C. Mains Supplies.  
By THE EXPERIMENTERS

**A**LTHOUGH it has become customary for those who have a mains electricity supply to use a normal type of mains-fed receiver, it is clear from the correspondence we receive that there are still many battery-set users who wish to obtain their H.T. current from the mains supply. Some of them explain that they consider that a battery set gives better reproduction; others apparently feel more confident to build a battery set than one of the all-mains type. It is not for us to dictate, for everyone is entitled to his own opinions, but we are in favour of the mains set every time. In spite of that, however,

this can be done in Fig. 2. The three positive output terminals are marked with the voltage and current which they will provide when the mains voltage is about 220. Of the three outputs shown the first would be suitable for a leaky-grid detector, the second for the H.F. or I.F. valves, and the third for the L.F. and output valves.

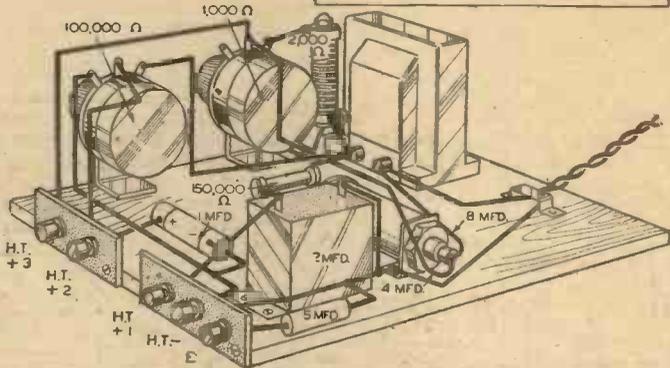


Fig. 2.—How additional resistors can be added when voltage-dropping arrangements are not included in the set.

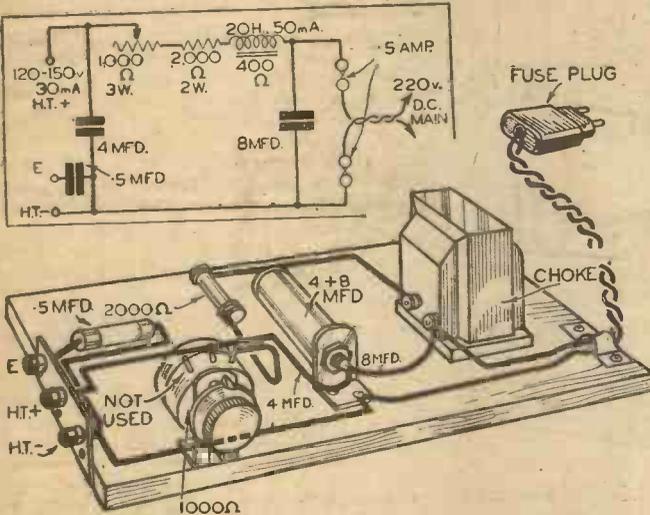


Fig. 1.—A simple form of D.C. eliminator in theoretical and practical form.

it is often cheaper to build a battery set, whilst the constant experimenter who frequently re-builds his set can certainly effect a saving by making battery sets and keeping a power-supply unit that can be used with practically any type of set that he might construct.

## The D.C. Unit

The simplest type of eliminator is, of course, that intended for use with D.C. mains. All that is normally required is a smoothing choke, a couple of smoothing condensers, a fixed and variable resistor, and a few connectors and small items. A circuit and pictorial illustration of a unit of this type are given in Fig. 1. It will be seen that there is only one H.T. positive lead, and that the voltage supplied can be varied to suit any type of battery set. Extra tappings could easily be arranged if desired, but they are seldom necessary with a fairly modern type of receiver. This is because voltage-dropping resistors and potentiometers for screening-grid supply and the like are usually included in the circuit of the set itself.

## Additional Output Taps

In case any reader wishes to provide additional tappings, however, we show how

wire-wound type and the variable resistor should be rated at not less than three watts.

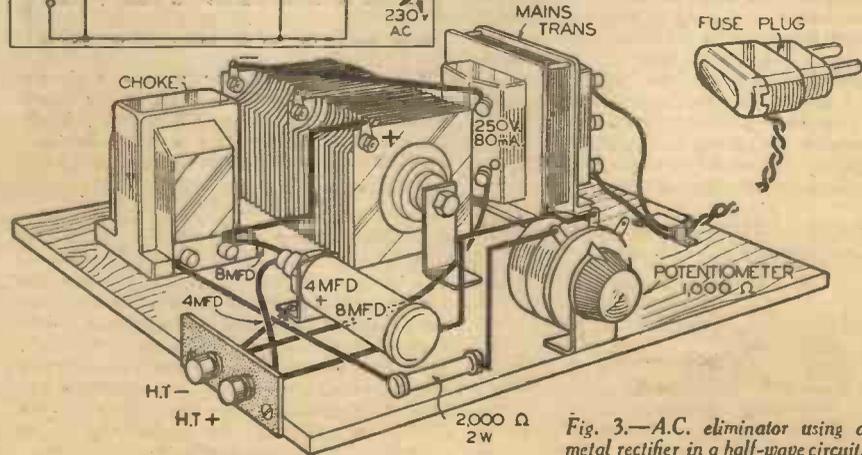
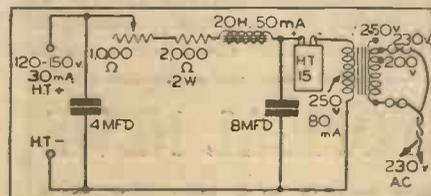


Fig. 3.—A.C. eliminator using a metal rectifier in a half-wave circuit.

## Components

Note the inclusion of a fused connector for the mains supply, and also observe that the smoothing choke is rated at 20 henries, 50 mA, and has a resistance of 400 ohms. Actually, these values are not critical, but it would be unwise to employ a choke with a lower inductance than 20 henries or with a lower maximum current-carrying capacity than 50 mA. Nearly all chokes of this type and of medium price have a D.C. resistance of between 300 and 500 ohms; any value between these two limits will provide the approximate outputs indicated.

The smoothing condensers can be either electrolytics or of the paper type, rated at not less than 250 volts working. A very convenient system is to employ a twin tubular electrolytic condenser mounted on a small metal bracket, as shown, from which the negative lead can be taken. Alternatively, a twin block condenser can be used, in which case a mounting bracket is not required.

The components are shown mounted on a wooden baseboard, but it is a good plan to make a cover from perforated metal or tinplate with ventilation holes drilled in it. This must be clear of all connections, but should be connected to the earth terminal.

## Negative or Positive Earth

When the eliminator is used on a D.C. supply with negative earth, it is necessary only to connect it in place of the H.T. (Continued overleaf)

**MAKING H.T. BATTERY ELIMINATORS**

*(Continued from previous page)*

battery, and to transfer the earth lead from the set to the E terminal on the eliminator. If the positive side of the mains is earthed greater care must be taken. It is also important that a condenser be included between the set and the aerial lead-in. Even if there is a small condenser in this position inside the set it is wise to fit an external one of not less than 250 volts working. The omission of the condenser might result in shocks being received should the aerial be touched.

**Simple A.C. Unit**

An A.C. eliminator is slightly more complicated, due to the fact that a rectifier

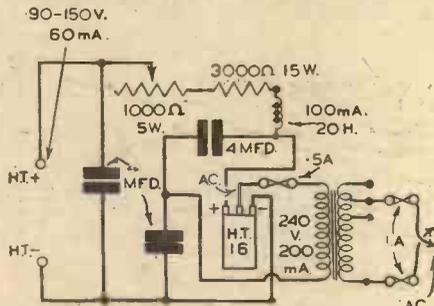


Fig. 4.—Circuit of an A.C. unit with voltage-doubler rectification.

and transformer are needed in addition to the parts used in the circuit already explained. When an H.T. current of not more than 30 mA is required—and this is sufficient for most types of battery set—a very satisfactory arrangement is to use a Westinghouse style H.T.15 metal rectifier in a half-wave circuit, as shown in Fig. 3. When this is fed from a mains transformer giving a secondary output of 250 volts 80 mA the maximum unsmoothed output from the rectifier is 230 at 30 mA. This is, of course, approximately the same voltage as that of the D.C. mains used for the circuit first described. Consequently, any additional voltage tappings can be provided in the same manner as shown in Fig. 2.

The general form of construction can be the same as that mentioned in connection with the D.C. unit, and the eliminator can be used in the same manner, except that an earth connection is not required unless there is a long lead between the unit and the set.

In those rare cases where a current in excess of 30 mA is required, a larger metal rectifier could be used, preferably in a voltage-doubler circuit, as shown in Fig. 4. For a maximum output of 330 volts, 60 mA a suitable rectifier is the H.T.16, and it should be fed from a transformer providing a secondary output of 240 volts, 200 mA. For either of these A.C. units it is best to use smoothing condensers with a maximum working voltage of 500, to ensure a reasonable factor of safety.

**Valve Rectification**

A very satisfactory method of obtaining a D.C. output, before smoothing, of 230 volts, 60 mA is by employing a full-wave valve rectifier such as the Cossor 506 BU. Connections for this are given in Fig. 5, where both theoretical and pictorial arrangements are illustrated. Here again, the

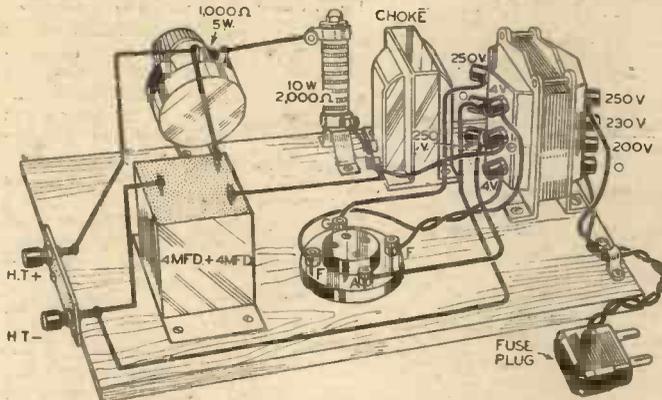
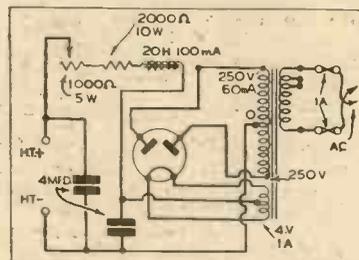


Fig. 5.—This A.C. eliminator uses a full-wave rectifier.

few simple parts may be mounted on a baseboard, with or without a metal shield. The shield, made of iron or tinplate, is always desirable since it helps to prevent mains interference and also prevents the constructor from accidentally touching any

“live” parts when the mains are connected. For the screen to be fully effective it should always be earthed.

**Grid Bias**

When using any type of eliminator it is a convenience to employ automatic grid biasing, although a G.B. battery is perfectly satisfactory and will last for at least six months. An alternative system when using an A.C. eliminator is to use a transformer with an additional secondary winding in conjunction with a low-voltage rectifier, but that is rather an expensive method, and not one that most readers would favour. As we are dealing only with the simpler types of mains unit, we are not going to describe an eliminator with trickle-charger built integral with it. As small trickle chargers suitable for 2-volt accumulators of average capacity are so extremely inexpensive, we are inclined to favour the use of two separate units. If two small accumulators are obtained, one of them can be charged while the other is in use, or a single accumulator can be used, a change-over switch being fitted to bring the charger into circuit when the set is switched off.

**Switching**

There are two simple rules which should be borne in mind when using eliminators:

The filaments should be switched on before the eliminator, and—

The eliminator should be switched off before the filaments.

If these rules are reversed additional strain is thrown on the valve filaments and also on the various fixed condensers in the set. It is just permissible to switch on both eliminator and L.T. at the same

time, but this is not very good practice when using a metal rectifier, because a fraction of a second elapses between the time that the rectifier supplies the H.T. and the time that the filaments reach their working temperature.

**New European Broadcasters**

IT is anticipated that before the end of the current year Europe will see the inauguration of the following new broadcasting stations: Stolp (Germany), 15 kW., to work on 225.6 m. (1,330 kc/s); Ankara (Turkey), 120 kW., 1,639 m. (183 kc/s); Zagreb (Yugoslavia), 20 kW., 276.2 m. (1,086 kc/s); Split (Yugoslavia), 5 kW.; and the new high-power station France-National which is to take over the duties of Radio-Paris and which should be in operation by the end of August.

**A Communal Radiogramophone**

THE small private radio station opened in 1936 near Libramont, in the province of Belgian Luxembourg, has inaugurated a novel way of letting its listeners hear a broadcast of their favourite records. Through the agency of 165 receiving depots in and around the district covered by the transmitter, the studio collects all the desired programmes and transmits them

**TOPICAL NEWS**

for the benefit of the unseen audience every Wednesday and Saturday from B.S.T. 17.00-19.00 on 203 metres. Daily from B.S.T. 07.00-09.00 a news bulletin and items of regional interest are broadcast on 267.4 m.

**German Radio Villages**

DR. GLASMEIER, Director-General of the German Reichsfunk, recently announced that large sums of money are to be spent in the construction of new Broadcasting Houses at Stuttgart, Saarbruecken and Cologne, and that more spacious and convenient headquarters are also to be erected at Berlin. Moreover, as in the opinion of the authorities it is

desirable that the broadcasting studios should be moved out of the cities, they will be installed in the vicinity of the transmitters. In consequence, special radio villages will be built to house the engineers, announcers, musicians and regular artists.

**Short Waves and Goods Trains**

EXPERIMENTS are being carried out in short-wave transmission on the Sundsvall-Trondheim line cutting through the Scandinavian peninsula. For the improvement and acceleration of traffic a number of trains have been equipped with radio apparatus. The transmitter is located in the guard's van, and the receiver in the driver's cabin. By this means the guard is able to communicate information to the latter who, in his turn, signifies by siren according to code whether he has understood the message. In view of the noise on the footplate of the engine it has not been found practical to use two-way communication by microphone.

# RADIO SERVICING WITH THE CATHODE RAY-2

Time Base Systems, a "Waveform" Picture, and Obtaining H.F. Response Curves, are Dealt With in this Article

**Q**UITE a lot can be written about time-base systems, but we will content ourselves here with the basic principle. Fig. 4 (last week) is a simplified time-base circuit, and will serve to illustrate the principle. A condenser, C, is connected in series with a resistance, R, across an H.T. D.C. source. Upon first switching on, the condenser will charge up and the voltage across it will rise at a rate governed by the values of both C and R. If it were not for the presence, across C, of the gas-filled triode V, the condenser would charge up to the voltage of the D.C. supply and further action would cease. As matters stand, however, the condenser will charge up to the break-down voltage of V (the voltage at which the gas ionises). The valve becomes conductive and the condenser will discharge through it, the condenser voltage dropping very rapidly to the extinguishing voltage of V. Then C will charge up again until the triode once more permits discharge, and so on.

There is a natural tendency with the simple arrangement of Fig. 4 for the condenser voltage, during the charging period, to rise exponentially, but it is very desirable that the voltage rise shall be linear. If the striking voltage of the triode is kept well below the H.T. voltage, the voltage rise will then be approximately linear, but another way of tackling the problem is to charge the condenser through a valve, generally a diode or a pentode, worked at saturation point. With suitable operating conditions the condenser voltage variation can be made to be a close approximation to the saw-tooth waveform, and can be utilised to give us the particular X deflection discussed last week.

Flexibility of control is an important requirement with a C.R.O. and it is very desirable that the speed of the left to right traverse shall be adjustable, according to needs of any particular test that is being made. With the simple arrangement of Fig. 4, variation of C or R will give speed control. As the light spot keeps repeating its left to right traverse we can speak of the "sweep frequency." Obviously, the speed of the traverse, and the sweep frequency are closely related.

It is to be understood that the fly-back (right to left) sweep of the spot should be so fast as to render the return stroke invisible (or only faintly discernible). It is to be mentioned, however, that certain oscillographs have arrangements for modulating out the beam during the fly back sweeps.

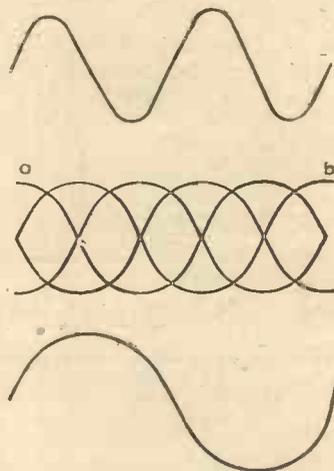
## A Waveform "Picture"

Any person handling C.R.O. testing gear for the first time will be well advised to make some tests on an A.C. voltage derived from the mains (suitably stepped down). Such tests form useful preliminary practice in handling the apparatus and getting to know the scope of the controls of the oscillograph.

Suppose the time-base voltage is in operation on the X plates at a frequency of 25 sweeps per second and that the A.C.

test voltage is applied to the Y plates at a frequency of 50 cycles per second. During each visible traverse of the spot it will be moved from left to right by the X deflection and will also be moved up and down by the voltage on the Y plates, the vertical deflection being in strict accordance with the Y voltage. The net result will be that the line trace made by the spot will mark out the waveform of the voltage on the Y plates and with the frequency values specified above two cycles will show up on the screen. (See Fig. 5.) If the time base is speeded up to 50 sweeps per second one cycle only will appear. (See Fig. 7.)

In both these cases the ratio of the



Figs. 5, 6 and 7.—Screen traces of an alternating voltage waveform for different ratios of A.C. frequency to the time base "sweep" frequency. The traces are appropriate to ratios of 2/1, 5/4 and 1/1 respectively.

"work" frequency (as we will now call the frequency of the voltage under test) to the sweep frequency is a whole number. The ratio of work to sweep frequency is 2/1 for Fig. 5, and 1/1 for Fig. 7. It is interesting to consider what will happen for work/sweep frequency ratios which are not whole numbers. If, starting with the conditions appropriate to Fig. 5, the time base is slowly speeded-up it will be found that before the simple, single cycle "picture" of Fig. 7 appears the trace on the screen will pass through a succession of interlace patterns. An interlace pattern will appear whenever conditions are such that the light spot finishes the end of one sweep at a different point in the A.C. cycle to that at which it started the sweep. Then, naturally, it will trace out, during the next sweep, a curve which appears on the screen in out-of-phase relationship to the first curve.

An example is shown in Fig. 6. Such an interlace pattern is not as crazy as it might appear at first sight. As a matter of fact the ratio of work to sweep frequency can be accurately determined by inspection

of the pattern. The rule for determining the work/sweep frequency is simple. The ratio of work to sweep frequency is equal to the ratio of the number of peak amplitude points to the number of curves. In Fig. 6 there are five peak amplitude points (a and b together count as one) and four curves. Hence the ratio of work to sweep frequency is 5/4.

## Frequency Calibration

From the foregoing it is easy to see that if the work frequency is known, the sweep frequency can be very readily ascertained. Conversely, if the sweep frequency is known the work frequency can be determined. With the C.R.O., therefore, it becomes a simple matter to determine the frequency of any L.F. voltage applied to the Y plates.

In normal radio fault tracing, or ganging work, the need to do this is not likely to arise, but since most service workshops contain audio oscillators (even if they are only rough and ready "howlers") it is worth noting that the C.R.O. provides a delightfully simple means of calibrating an audio-oscillator in terms of cycles per second.

If the audio-oscillator's output is made to operate on the Y plates, and the ratio of work to sweep frequency determined, as described above, then, provided that the sweep frequency is known, it is a matter of simple calculation to determine the frequency of the Y voltage. The fact that the sweep frequency must be known, and known accurately, presents no difficulty, because this can be ascertained beforehand with the aid of the A.C. mains.

## Locking the "Picture"

Any irregularities, or drift, in the operation of the time base are most undesirable in frequency calibration work, or when a waveform is being closely examined, and it is, therefore, important to have provision for synchronising.

In the case of a gas-filled triode the voltage at which the discharge occurs is very dependent upon the grid potential, and by applying an alternating voltage to the grid it becomes possible to synchronise the time base, and this A.C. voltage. It is customary, with servicing oscillographs to have switching, or terminal connections, enabling the time base to be synchronised either with the mains voltage or with any particular test voltage that is operating on the Y plates.

When the time base and the voltage on the Y plates are synchronised it is possible to lock the screen trace so that it does not wander, and thus a steady "picture" is obtained.

In frequency calibration work, the time base should, of course, be kept synchronised with the A.C. mains throughout the tests since the mains frequency is the frequency standard upon which the calibration is based.

## Obtaining H.F. Response Curves "Wobulation"

For radio service testing it is absolutely

(Continued on next page)

## RADIO SERVICING WITH THE CATHODE RAY.

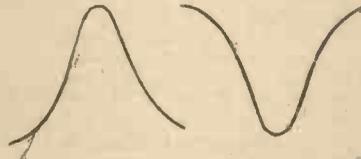
(Continued from previous page.)

essential to have, in addition to the oscillograph itself, an accurately calibrated oscillator providing not only the normal amplitude modulated H.F. output but also, when required, an H.F. output that is "wobbled" by the time base of the oscillograph. The expressive word "wobulation" has been created to describe a variation of the oscillator frequency over a band of frequency values and in the manner described below.

For an H.F. response curve to be shown on the screen of the C.R.O. we want, first, the frequency of the testing oscillator to vary in a linear manner during each sweep of the light spot. With the light spot at the commencement of a sweep the oscillator frequency must be so many kc/s (according to the band-width covered) below the frequency corresponding to the tuning setting of the oscillator. Then, as the light spot moves across the screen, the oscillator frequency must come up to the tuning setting value, rise above it and, at the end of the sweep, be as many kc/s above the tuning setting value as it was below at the commencement of the sweep. The next sweep must give a repetition of the foregoing, and so on.

Since the X deflecting voltage, from the time base, controls the horizontal traverse of the light spot it should be obvious that, in some way, the X deflecting voltage must be made to bring about the required frequency variation (wobbling) of the oscillator. There are various ways in which this can be brought about. One commonly used method takes advantage of the fact that the input capacity of a triode is dependent upon the working amplification factor of the valve,

this effect occurring as a result of the anode to grid feed-back through the inter-electrode capacity. It is a simple matter to arrange that the input capacity of a triode shall form part of the capacity of the oscillator's tuned circuit. For "wobulation" of the oscillator output the input capacity of the triode must vary with the sweep of the oscillograph. The input capacity changes with the effective amplification of the valve and this amplification depends upon grid bias, so it should be obvious that some connection between *voltage* and *tuning* can be secured. Very careful design is, of course, necessary to secure the particular kind of frequency



Figs. 8 and 9.—H.F. response curve inversion.

variation that is required, but as far as we are concerned at the moment it will be sufficient for us to appreciate that the "wobbling" of the oscillator H.F. output can be brought about by feeding the grid of the triode (or other type of valve connected as a triode) from the time base circuit.

### Constant Amplitude

The ordinary amplitude modulation of the oscillator is cut out of action while the oscillator is being "wobbled," and with a good outfit the output of the oscillator will be constant in amplitude but varying in frequency in the manner described.

It is important to understand that the

X deflection of the oscillograph must now be looked upon not so much as being a function of time as a function of frequency. The X axis of the screen must, in other words, be regarded as a frequency base.

For obtaining the "picture" of an H.F. response curve it will be necessary that a direct voltage acts on the Y plates and that this voltage shall vary with the amplitude of oscillations in the circuits under test. As regards receiver testing the receiver itself contains the necessary item for the production of the direct voltage. We refer to the receiver's detector. In radio service testing, therefore, the Y deflection is operated by the rectified output of the detector. The trace on the screen will be a graph of the detector output volts against frequency, over the range of H.F. values covered by the "wobulation."

The horizontal and vertical scales are to be regarded as linear scales by the way—not logarithmic.

Fig. 8 shows a possible result that would be obtained from one or more H.F. circuits, plus the detector, in the case where the receiver has no band-pass couplings. Sometimes the curve will be inverted, as in Fig. 9. As to which way the curve will extend, up or down, on the screen will depend first upon the type of detector and the point from which the Y voltage is taken, e.g., a Y input taken from a grid detector anode will give inversion with respect to the trace obtained if the Y input is taken from a diode anode. The question of inversion will also depend upon the use, or otherwise, of any stages of R.C.C. amplification between the receiver's detector and the Y plates, and upon the number of stages, if an amplifier is in use.

(To be continued)

## NEW DEAF-AID SYSTEM

A NEW era for deaf people who have hitherto heard talkies under difficulties was opened up by a "wireless" deaf-aid system for cinemas and churches introduced by Sir Ambrose Fleming, the well-known inventor, who is himself very deaf, at the Gaumont Palace, Camden Town, London, N.W., last week.

The apparatus, entitled the Multitone Telesonic Deaf Aid Instrument, consists of a little portable receiver barely heavier than a cigar box, and a light pair of headphones for the ears. These are handed to patrons by an attendant, and—strong argument in favour of the new system—the deaf person can sit wherever disposed, instead of being "harnessed" to specially wired seats. This in itself should overcome the main objection, preventing a great number of the deaf who are not at present film fans from attending.

The receivers are miniature three-valve amplifiers of very robust construction, but extremely light. They provide a high order of quality reproduction from the receivers in spite of the very loose coupling that has necessarily to be employed. It is also necessary to ensure that the working of the system in a theatre will not produce external electrical interference.

The system works, not by modulated radio-frequency radiation, but by speech-frequency induction between specially arranged loops of copper foil underneath the carpets and a search coil in the base of the receiver. No plugging in or attachment to any fixed point is required, and volume

control is secured by a simple knob device attached to each receiver.

That the system is of great value for other things than helping deaf people in cinemas was demonstrated by a number of exceedingly interesting experiments, including one with a gas-mask. The Home Office was represented among the audience. A man in a regulation gas-mask on the stage could talk easily with all those with receivers, although those standing close to him without receivers could only hear a confused jumble of muffled sounds.

A film was shown, and as a test of the range of the instrument we walked about in the auditorium and through the corridors into the outer vestibule and could still hear the programme which was going on inside the cinema.

It will be possible for private persons to possess their own Telesonic receivers, Sir Ambrose Fleming stressed. He himself was using one which was scarcely larger than a sixpenny packet of cigarettes.

The system is equally efficient for cinemas, churches, theatres, lecture-halls and board-rooms. It is cheap to install and the upkeep costs are negligible.

Test installations already carried out by Gaumont-British engineers in two cinemas at the Empire Exhibition, Scotland, and at the Camden Town Gaumont Palace, have proved very successful. Since the official opening over 1,200 people have used the receivers in the Beardmore Cinema at the Exhibition, and orders for further receivers have been fulfilled. At the

Gaumont Palace the attendance has gone up by 10 per cent. in six weeks. Sir Ambrose Fleming and a number of other deaf people present at the demonstration heard their first talkies, consisting of a Gaumont-British Instructional nature film and a news reel.

### "ESTIMATION OF WATTAGE"

UNDER this heading on page 213 of PRACTICAL AND AMATEUR WIRELESS dated May 14th, it was stated: "... using four 4-volt, 1-amp. A.C. valves and a 4-volt, 2 amp. rectifier . . . cathode and filament consumption is four times four, plus four times two, which is 18 watts."

It is obvious, of course, that the final figure should be 24 watts. The total consumption in the set taken as example is thus 24 plus 35, or 59 watts. The mains current consumption, allowing for all circuit losses, would be between 75 and 80 watts.

### A NEW WEEKLY

Have you seen "TO-DAY," George Newnes' great new family weekly? It is a paper which, in every way, is far in advance of anything of its type yet produced in this country. It contains pages of magnificent photographs in colour, stories for all tastes, lively humour, stirring features and articles—a vivid panorama of life to-day.

Inside every copy of No. 1 is presented a Gift Book—"FORTY WONDERFUL YEARS." It is a graphic souvenir of the period 1898-1938—a calcade of the most eventful years in the history of the Empire.

Don't miss this Gift; don't miss "TO-DAY." Everyone in the family will want to read it at the same time! No. 1 is now on sale everywhere—price 2d.

# ON YOUR WAVELENGTH



By Thermion

## The Hire Purchase Bill

I AM pleased to see that Miss Ellen Wilkinson's Hire Purchase Bill has been grafted, pruned, amended, edited, and generally knocked into such a form that it bears no comparison with its original draft which in my submission did not go far enough. I do not think that many of my readers purchase commercial receivers on hire-purchase terms. Such hire-purchase agreements that I have read (and I admit that this is not many) are the most astonishing documents; they give the owner the right to collect the goods back if only 1s. remains unpaid of the original purchase price. We know that some companies did not hesitate to exercise their rights in this connection, and some very hard cases have come before the County Courts. Now I am not in favour of presuming that every hirer is a haloed saint, and I am equally of the opinion that there are many unscrupulous people against whom manufacturers ought to be protected. In fact, it is no doubt due to the unscrupulous methods adopted by certain sections of the public that finance houses have been compelled to insist upon safeguarding clauses. It can be argued that an honest person has nothing to fear, and that if he intends to pay it does not matter what clauses are in the agreement. Unfortunately, finance companies do not differentiate between the honest and the dishonest people. Once you have defaulted, their machinery is set into motion and you are treated in exactly the same way as a person with felonious intent. In thousands of cases when nearly the whole of the amount has been paid, the set has been snatched back, although the hirer has only defaulted by a matter of a day. It is good to know that when Miss Wilkinson's Bill becomes an Act, as it assuredly will when it has been passed by the House of Lords, it will not be possible to grab sets in this way. It is just as important for honest members of the public to be protected as it is for honest manufacturers. The Bill becomes law on January 1st, 1939. The Bill does not apply in certain instances where the hire purchase exceeds £50, and the cash price

must be made known to the hirer before the agreement is made. The hirer under the Bill may, if he so desires, at any time before the final payment falls due, be entitled to conclude the agreement by giving notice of termination in writing to any person entitled or authorised to receive the sum or payment under the agreement. Formerly, a set could be returned after one-third of the hire purchase had been paid.

I am glad to know that this Bill has passed through the House of Commons and has reached the House of Lords, through which it will pass, I have no doubt, with the minimum of delay.

## Automatic Tuning

HOW many readers are interested in a receiver incorporating one of the systems of automatic tuning? I make this inquiry because in spite of the fact that the trade has been pushing sets of this type for some months not one request has reached me from a reader for a set of this type. I believe that automatic tuning will be one of the selling points of sets at this year's radio show. If you want such a set, now is the time to voice your request.

## Car-radio Aerials

I BELIEVE that several readers take an active interest in car-radio nowadays, and I wonder how many have taken the trouble to experiment with aerial systems. My tests show that the type consisting of a couple of curved rods running over the roof is most satisfactory, but I cannot decide whether a V formation or the use of parallel rods is better.

During my tests I had occasion to use a V-wire fitted inside the hood of an open car; it worked almost

as well as the more attractive rod type mentioned above.

I was most surprised to find that a couple of gauze mats mounted under the metal running boards gave signal strength almost as good as with the elevated aerial. The chief disadvantage was that interference was more pronounced, especially when driving anywhere near tram-cars. An under-chassis V, running towards the two ends of the rear axle, gave similar results, the screening effect of the chassis and body being far less than expected.

## Car Television

SPEAKING of cars and radio reminds me that I have not yet seen any reference to experiments having been conducted in the reception of television in cars or coaches. In view of the many difficulties which beset the designer of car radio equipment I imagine that a keen experimenter would find great fields of interest in the equipment of a car with a television receiver. Coaches or other public vehicles could be provided with multi-screens for the entertainment of passengers during darkness or when the weather is bad, and I can see a very pretty job in designing a receiver for installation at the rear of the coach or in some other unused position, with either one large screen up forward where everyone can see it, or small screens above each pair of seats. Go to it, you experts, there is an interesting job of work for you.

## More Humour

W. STEPHENSON, of Blyth, Northumberland, writes as follows:—

"Having chuckled at other efforts in your competition for articles on 'My Most Embarrassing Moment in Radio,' my club-mates have persuaded me, much against my wishes, to submit my latest *faux pas*.

"As I entered the converted building which also bears the name of 'The Blyth and District Radio Club Headquarters,' the faint moonlight picked out the various pieces of apparatus lying on our test-bench. I switched on the lights, and set about coupling our one-valve oscillator preparatory to morse practice for the juniors. While I was thus occupied most of the

'boys' came in, and stood watching me with awe. I put on a knowledgeable air and carried on with the good work. Connections completed, I switched on, depressed the key and—silence! Silence except for the chuckles of my young spectators.

"I soon put an end to that by saying in a lordly manner, 'Oh, it's probably a failure of the low-tension current, I'll switch off the lights, and see if the filament glows' (it normally does in the valve); I turned away to switch off the lights, and groped my way back to the bench. My eyes picked out a speck of light, and cupping my hands round it, murmured, 'It's O.K., switch the lights on.' Somebody moved to do so, and the room was filled with light. There I was with my hands cupped around a spare valve lying some distance away from the oscillator, and peering intently at its innocent surface. The members' mirth and my embarrassment can be imagined."

#### A.R.P. in a Large Factory

IT is interesting to learn of the special precautions taken for evacuation and protection of the staff of one of England's largest factories in the event of air bombardments during working hours.

At the Coventry factory of The General Electric Co., Ltd., the home of G.E.C. Radio, a complete A.R.P. scheme has been evolved. Plans have been made for the construction of sufficient trenches to house the entire personnel of the factory—some 6,000 in all—together with accommodation for the inhabitants of the company's housing estate situated close to the works. A sample trench has already been constructed, and when this was inspected recently by Home Office officials the opinion was expressed that it was perfect and superior to anything seen in Spain.

A staff of 600 A.R.P. volunteers has been recruited from the personnel of the factory. For training purposes full sets of protective clothing, gas masks, decontamination apparatus, etc., are available, whilst the plans provide for suitable containers, in the factory itself, in order that employees may have their gas masks always at hand during working hours. Very complete schemes have been devised for orderly evacuation of the factory during an air attack. Each department is to be allotted its own section of trench, and notices, distinctively coloured, will be posted along the routes from each department to the allotted section of trench. A full system of alarms, warnings, and "all-clear" signals is being drawn up.

A new fire-station has recently been

## Notes from the Test Bench

### Push-Pull Circuits

WHERE the highest quality is desired in a push-pull stage it should be remembered that the single stage phase-inverter will produce the best results. When a transformer is used distortion may be introduced due to the characteristics in the transformer. When a separate phase inverter valve is employed distortion due to non-linearity in the valves may be amplified and passed on to the final stage. By using a single valve and taking the output from both cathode and anode, distortion due to these effects will be minimised, and furthermore, it will be found that should such distortion be introduced it may be balanced out by means of a negative feed-back circuit.

### American Valves

ALTHOUGH there are many low-priced American valves now available on the British market, some care is necessary in selecting types for use in circuits designed in this country, and also in choosing English valves for use in American circuit designs. The reason for this care is that the efficiency of the two valve types differs, and in many cases disappointment may result in using American valves in English circuits due to the lower efficiency of the valves. On the other hand, instability may be experienced in an American circuit if English high-efficiency valves are employed.

### Meter for Q.P.P.

AN ordinary milliammeter cannot be used for reading the current of a Q.P.P. or Class B stage as the current fluctuates, but it is possible to make a small meter which will serve the purpose. The meter should be made from two spoils of wire on formers with a central hole, and they should be separated so that an iron needle (from an old pocket compass) may be suspended between them. Each coil is connected in the two anode leads and a pointer soldered to the needle pivot. It will take up a steady position and will not flicker as in the case of an ordinary meter.

opened, and is equipped with the most modern types of fire-fighting appliances, while a special lecture-room has been constructed adjacent to the fire-station, and is used for a regular series of A.R.P. lectures, at which a consistently good attendance is obtained. The extent of the precautionary measures has been an example to other industrialists, who have visited the factory in considerable numbers.

### The Spelling Bee and Pronunciation

I SUGGEST a variant of the childish spelling bee item in the B.B.C. programmes, and my suggestion is that the B.B.C. should run a pronunciation contest on similar lines inviting well-known people to take part. Whilst the B.B.C. is doing its best to standardise pronunciation, and therefore adding to the confusion of lexicographers, I think it important that members of His Majesty's Government should at least help to standardise the King's English. I have compiled a list of words which important people have mis-pronounced over the air. We all know that Lord Snowden said "Sitooation," that Ramsay MacDonald said "Wurrrruuld," and the other day I was present at a dinner where the Minister of Transport, Mr. Leslie Burgin, said "Spawert" in referring to the pastime of cycling. Many speakers over the air say "Rekkud," some of the announcers say "Good Mawning," some of them drawing their salutations such as "Good Nate," and so on. Nothing jars on the nerves so much as words wrongly pronounced; even allowing for the variations in pronunciations given in various dictionaries. None of the speakers can justify the words I have quoted. There should be some system of fines at the B.B.C. so that speakers who take gross liberties with our language are suitably punished by having their fees reduced. Alternatively, the B.B.C. could appoint a special investigator to listen for six days of the week, and on the seventh give a summary of the week's mispronunciations. He could award a weekly B.B.C. biscuit to the worst offender.

## A COMPLETE LIBRARY OF STANDARD WORKS.

By F. J. CAMM.

WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA 5/6, by post 5/6.

EVERYMAN'S WIRELESS BOOK 3/6, by post 3/10.

TELEVISION and SHORT-WAVE HANDBOOK 3/6, by post 3/10.

SIXTY TESTED WIRELESS CIRCUITS 2/6, by post 2/10.

WIRELESS COILS, CHOKES and TRANSFORMERS and HOW TO MAKE THEM 2/6, by post 2/10.

All obtainable from or through Newsagents, or from Geo. Newnes, Ltd., Tower House, Southampton St., Strand, W.C.2

# Technical Fundamentals—9

Among the Subjects Dealt With in This Article are the S.G. Valve's "Kink," the H.F. Pentode, the Output Tetrode, and Reaction

THE screen-grid valve has a peculiarity of characteristic which, in many respects, must be regarded as undesirable, although advantage can be taken of it in certain special applications of the valve.

To understand this peculiarity we must refer to an anode current-anode volts characteristic curve of an S.G. valve. A typical curve is given in Fig. 37. (A triode curve is given in Fig. 38 for purposes of comparison.) The S.G. peculiarity referred to is indicated by the very obvious kink in the curve which, of course, represents the variation of anode current with anode voltage, the screening grid and control grid potentials being held constant.

If the anode voltage is increased from the value at which the anode current starts, the latter will, at first, increase as the voltage rises. It is important to remember that, to begin with, the anode potential will be below that of the screening grid. As the anode voltage is increased the intensity of the electron bombardment of the anode increases and at the anode voltage appropriate to the point where the kink of the curve commences (ref. Fig. 37) secondary emission starts at the anode. This means that the high velocity electrons which bombard the anode cause others to be driven off the anode. The screening grid is still at a higher potential than the anode and will attract these "secondary" electrons. Thus there are cathode to anode and anode to screen electron movements, and the actual anode current will depend upon the difference between the number of electrons received from the cathode and the number lost by secondary emission. As the anode voltage is increased above the value at which the secondary emission just starts the secondary emission increases so rapidly that the anode current actually falls with increasing anode voltage. It may even happen that "secondary" electrons will, over a small range of anode voltage, exceed in number those reaching the anode from the cathode, in which case the anode current will show a small reversed value. (Ref. Fig. 37, this would mean that the kink would actually dip below the horizontal axis.)

Still assuming a steady increase of anode voltage the latter will presently approach close to the screening-grid voltage value, and the secondary emission will fall off because the anode will, by now, be getting sufficiently positive to start pulling back some of the "secondary" electrons. As the anode voltage is still further increased the electron movement from anode to screen will rapidly get less, with consequent increase of anode current, until, just as the anode potential rises above the screen potential, the anode current will get up to normal value and there will be no further drop of current with increasing voltage.

Comparison of the S.G. curve with the

triode curve of Fig. 38 shows that there is a striking difference quite apart from the matter of the S.G. curve's kink. After the S.G. anode potential has been raised above the screen volts, and the kink conditions no longer apply, the increase of anode current with increase of anode potential is very slow indeed. With the triode, however, the rise of anode current with volts is comparatively rapid after the lower bend conditions are departed from. Admittedly, the triode characteristic would bend over at the top if the anode volts were increased enough, but this saturation condition would not normally be permitted. The very marked difference in the slopes of the upper parts of the two curves is an indication of the great difference that exists

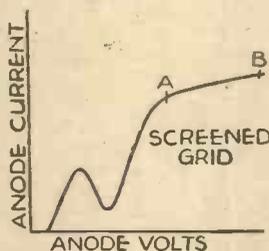


Fig. 37.—The kink in the S.G. valve anode current-anode volts curve.

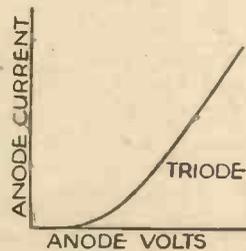


Fig. 38.—The "straight" curve of the triode valve.

between the anode impedances of the two valves.

As a matter of practical interest it is to be mentioned that the S.G. valve is very touchy as regards screen volts, and that both the anode impedance value and the amplification factor are very dependent upon the adjustment of screen voltage.

For normal H.F. amplification the S.G. valve must work under conditions which do not involve the kink in any way. This means that the useful part of the curve of Fig. 37 is the section marked AB.

## The H.F. Pentode

If the kink could be removed out of the characteristic curve an obvious improvement in the effectiveness of the valve would be indicated. This brings us to the subject of the H.F. pentode, because such a condition applies to it. The H.F. pentode contains an electrode, additional to the number in the S.G. valve, in the form of yet another grid placed, this time, between anode and screening grid. This additional electrode is called the suppressor grid. The suppressor grid is kept at low potential (very frequently it is directly connected to cathode) and, as its name suggests, has the effect of suppressing the secondary emission, and therefore of removing the kink out of the anode current-anode volts characteristic. Since the suppressor grid prevents movement of "secondary" electrons from anode to screening grid it follows that the general shape of the pentode's anode current-anode volts characteristic curve will be that of the S.G. valve, less the kink.

Fig. 39 is an example, and it is obvious

that the useful part of the curve is more extended than is the case with the S.G. valve.

The presence of the suppressor grid is bound to affect the anode impedance value for it lessens the control that changes of anode potential have upon anode current; in other words, it puts up the impedance value, compared to that of the S.G. valve (but see later note regarding suppressor biasing).

We can regard the H.F. pentode as a valve of very high anode impedance, and capable of handling a larger anode voltage "swing" than the corresponding S.G. valve. It is more tolerant than the S.G. valve to an anode load of high D.C. resistance value, such as may be used in a detector circuit, and it can also work with higher dynamic H.F. loads.

H.F. pentodes of the 4-pin and 5-pin types have their suppressor grids internally connected to the cathode. With 7-pin valves, however, it is standard practice for the suppressor connection to be brought out to a separate pin, and with this type of valve the suppressor grid must be externally connected to the cathode, or to some other selected point. The fact that advantage is taken of the 7-pin base by the valve manufacturer to give the suppressor its own pin, suggests that occasions must arise when it is desired to put a bias voltage on to the suppressor grid (with reference to cathode). Negative bias on the suppressor grid does, as a matter of fact, lower the anode impedance of the valve, and the impedance control exercised by suppressor biasing will sometimes be found useful.

## Variable-mu

Increasing negative grid potential with either an S.G. or an H.F. pentode valve will reduce the anode current, and in the case of

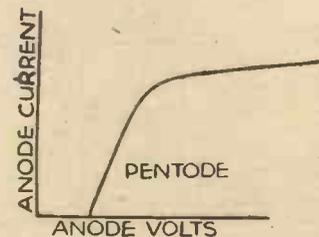


Fig. 39.—The pentode anode current-anode volts curve.

an ordinary (non variable-mu) valve the anode current-grid volts characteristic curve has a fairly sharp lower bend, and the anode current reaches zero at a comparatively small negative grid potential. The valve obviously will not handle much in the way of an input grid voltage "swing" without the pronounced lower bend curvature leading to the two halves of an input voltage cycle receiving disproportionate treatment (the increase of anode current for the positive half-cycle being greater than the decrease of anode current for the negative half-cycle).

(Continued overleaf)

**TECHNICAL FUNDAMENTALS**

*(Continued from previous page)*

This is, in effect, a "detection" process, and is certainly not to be desired in an H.F. amplifying stage. It tends to give rise to a particularly exasperating form of interference referred to as cross-modulation interference. Suppose a receiver containing non-variable- $\mu$  H.F. valves is tuned to a distant station, but it so happens that there are still, despite the mistuning involved, oscillations from a local station in the H.F. input circuit. As far as the ordinary problem of selectivity goes, one could hope that the H.F. circuits following the first H.F. valve would deal with the unwanted signal and cut it out. If, however, the unwanted signals experience, at the first valve, the "detection" process mentioned above, what will happen is that the modulation of the unwanted signal will become impressed on the carrier of the wanted signal. Then all the H.F. circuit selectivity possible, acting after the first valve, will not get rid of the interfering signal, for it will come right through, cheerfully sitting on top of the carrier that the receiver is actually tuned to.

H.F. volume control is an awkward problem with the ordinary S.G. or H.F. pentode valve, and control by variation of screen voltage has the disadvantage that lowering screen volts increases the curvature of the characteristic.

Control of volume by grid bias will not affect the curvature of the characteristic itself, but increasing the negative grid potential will bring the input signal voltage "swing" more on to the sharply curved portion of the characteristic and increase cross-modulation tendencies. This also rules out A.V.C.

The variable- $\mu$  valve has a modified grid construction, the spacing of the grid wires being such as to make the anode current tail off very gradually with increasing negative grid potential.

Figs. 40 and 41 make clear the essential difference between the anode current-grid volts characteristic of an ordinary (Fig. 40) and a variable- $\mu$  (Fig. 41) valve.

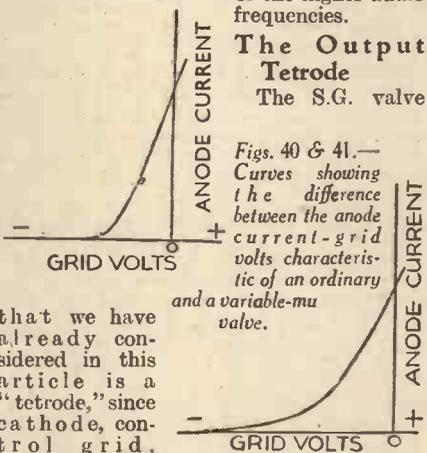
The very gradual change of slope at the

pentode and is designed, not for high amplification of voltage, but for high anode power efficiency (ratio of A.C./D.C. power in the anode circuit).

The general shape of its anode current-anode volts characteristic resembles that of the H.F. pentode, and it is a valve of relatively high impedance. As far as avoidance of distortion is concerned it is rather exacting in its requirements in respect of correct anode load value. It is generally necessary, too, to employ a tone compensating shunt across the anode load in order to prevent accentuation of the higher audio frequencies.

**The Output Tetrode**

The S.G. valve



*Figs. 40 & 41.—Curves showing the difference between the anode current-grid volts characteristic of an ordinary and a variable- $\mu$  valve.*

that we have already considered in this article is a "tetrode," since cathode, control grid, screening grid, and anode make up a total of four electrodes. The output tetrode valve must, however, be considered more in relation to the output pentode than to the S.G. valve. We must remind the reader that the pentode contains a suppressor grid which, in effect, "irons out" the characteristic kink typical of the S.G. valve. This reminder makes the output tetrode decidedly interesting because this valve has an anode current-anode volts characteristic of the same shape as that of a pentode, yet the valve does not contain a suppressor grid. The output tetrode was brought out much later than the pentode, of course, and came into existence when it was found that secondary emission could be prevented, without the aid of a suppressor, by employing certain particular dimensions and spacing for the tetrode electrodes. The inter-electrode capacity from anode to the other electrodes is less in the case of the output tetrode than with the corresponding pentode.

**Reaction**

The idea of feed-back of radio frequency energy from anode circuit to grid circuit arose in a previous article in connection with the inter-electrode capacity. The possibility of conditions arising under which the oscillations in the grid input circuit would be increased in amplitude by the feed-back voltage was discussed, but it was made clear that the feed-back could only be regarded as undesirable in view of the fact that it was not under independent control, and was liable to give varied effects ranging from instability to a degenerative influence.

Controllable feed-back from anode circuit to grid circuit of the correct phase to give "regenerative" amplification of the input oscillations is, however, something that can be usefully employed and it is customary to use inductive coupling between anode and grid circuits for the purpose. The coupling coil associated with the anode circuit is called the "reaction" coil and the actual feed-back process is usually called "reaction."

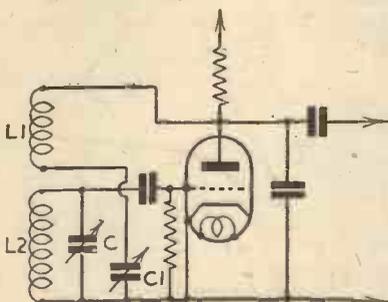
Apart from self-oscillating valve circuits (which will be dealt with later) reaction is generally used with the grid detector, in the case where the receiver would have insufficient H.F. amplification for all the reception requirements that the receiver is intended to meet.

Fig. 42 shows a typical circuit arrangement. L1 is the reaction coil and is coupled with the tuning coil, L, of the grid circuit. As to whether the H.F. voltage induced by L1 back into L will assist or oppose the oscillations in the circuit LC will depend upon the sense of the winding and of the connections of L1. A reversal of the connections of L1 would give the change from the one condition to the other. Naturally it is arranged in practice that the feed-back voltage shall assist the oscillations in LC.

There are various ways in which the degree of the reaction can be controlled. Variation of the coupling between L1 and L is a possibility but is, these days, considered to be inconvenient. Most readers will probably remember the "swinging coil" reaction of the early days, however. Reaction condenser control is the most commonly used method and Fig. 42 shows an example of its use. It will be observed that the reaction coil, L1, and the reaction control condenser, C1, form a series circuit which is in shunt with the main anode circuit. The L1 C1 circuit is of comparatively low impedance to the H.F. component of the anode current, but the actual value of the impedance is very dependent upon the adjustment of C1. Greater or less capacity at C1 will cause greater or less H.F. current to flow in the reaction coil so that adjustment of C1 exercises the required control upon the degree of the reaction effect.

**Using a Tapped Coil**

Fig. 43 is given, first to illustrate how it is possible to use a single tapped winding to provide both tuning and reaction and, secondly, to give the clue as to the correct "sense" of the windings and connections for regenerative results. It is easy to see from Fig. 43 that if one were to trace round the tuned winding from grid to cathode, the direction of circulation would

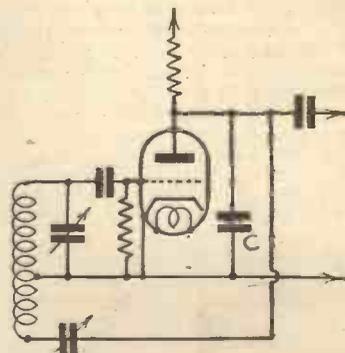


*Fig. 42.—A typical reaction circuit.*

lower section of the variable- $\mu$  characteristic indicates that cross-modulation tendencies will be negligible, and that control of volume by H.F. grid biasing will be a practical proposition, with the consequent fact that A.V.C. can be successfully employed. These are important points where H.F. amplification is concerned, but we must remind the reader that a very popular type of valve for grid detection is the non variable- $\mu$  H.F. pentode.

**The Output Pentode**

The type of pentode valve suitable for use in the output stage of a receiver does not have such close screening as the H.F.



*Fig. 43.—Circuit showing the use of a single tapped winding for tuning and reaction.*

be opposite to that obtained if one were to trace round the reaction winding from anode to cathode.

The circuit of Fig. 43 is that of a detector, and the condenser marked C is the usual anode by-pass condenser. At low capacity settings of the reaction control condenser the by-passing action of C is very necessary, but it will be appreciated that for higher capacity settings of the reaction control condenser the reaction circuit will itself provide satisfactory H.F. by-passing.

# A PAGE OF PRACTICAL HINTS

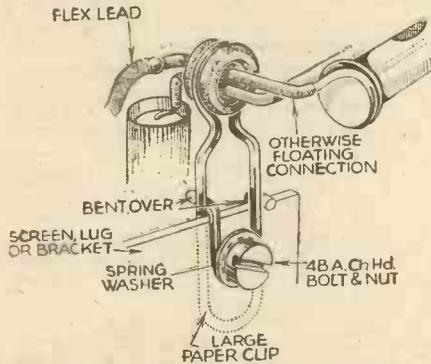
**SUBMIT  
YOUR  
IDEA**

# READERS WRINKLES

**THE  
HALF-  
GUINEA  
PAGE**

### Anchoring Fly Leads

MANY times I have had to make an insulated cleat for retaining certain leads in position, and one such dodge is shown in the enclosed sketch. The small end of a paper clip is formed, with a pair of pliers, into a loop to take a small rubber

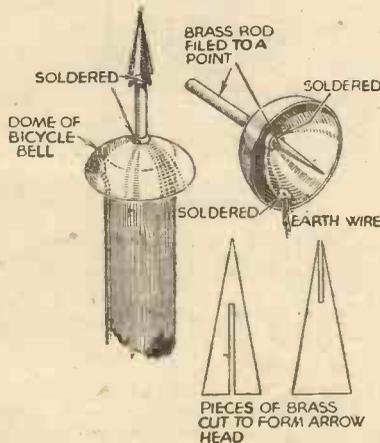


A simple method of anchoring component leads.

grummet, and it will be seen that the clip must be bent in to retain the grummet in position. For mounting on a flat surface the clip may be bent to form an "L," and its natural resilience is, if anything, rather an asset. A spring washer should preferably be included between the cheese head screw and the clip when so mounting.—R. E. SUTTON (Eastleigh).

### A Novel Mast-cap

I HAD been using an ordinary scaffold pole as a mast for my aerial, but noticed that the end-grain absorbed undue amounts of moisture and gradually rotted. Whilst thinking of a way of avoiding this I hit upon the following scheme. In addition to covering the exposed end-grain, this also gives a finishing touch to the mast. As will be seen, a dome from an old cycle bell is used as a cap, and to the centre is soldered a brass rod, to the



Part of an old cycle bell is used for this novel mast-cap.

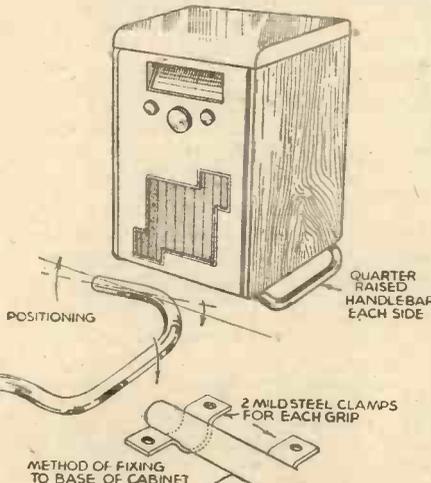
### THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR 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 "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

### SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

top of which two strips of pointed brass are in turn soldered with a halved joint. This gives a spear head, and by soldering an insulated lead to the bell dome I am able to use the cap also as a lightning



A novel method of modernising a radio-gram cabinet.

conductor. The illustrations should make all details clear.—R. D. PATE (Walton).

### Join Newnes' Practical Group!

#### PRACTICAL MOTORIST

The owner-driver's journal which tells you how to repair, overhaul, and obtain the best performance from your car. 3d.—every Friday.

#### PRACTICAL MECHANICS

The only English journal of its type. It deals with every branch of Science, Mechanics, Invention, Model-Making, Chemistry, Astronomy, Photography, Television. 6d.—Every Month.

#### THE CYCLIST

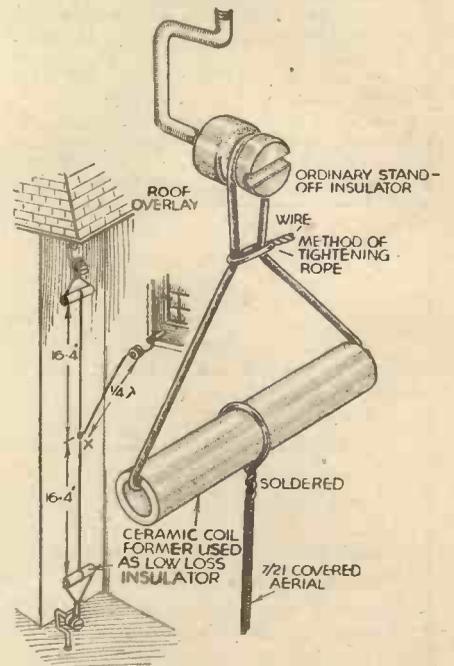
The leading weekly for every Cyclist, Clubman, Utility Cyclist, or Tourist. Join "The Cyclist" Road Club and also take advantage of the FREE Insurance offered. 2d.—Every Wednesday.

### Modernising a Radio-gram Cabinet

TO match my radio-gram cabinet to the modern steel furniture at home, I resorted to using two cycle handle-bars as shown in the accompanying sketches. Whilst I found the quarter-raised type most suitable for my requirements, other readers wishing to put this idea into effect may find that other bends are preferable, and they can purchase chromium tubing to their own requirements. The method of clamping to the base of the cabinet ensures absolute rigidity and freedom from any subsidiary resonance, whilst the balance of the cabinet is in no way influenced. This method reduces floor vibration very appreciably, and the previously over-accentuated bass response is perceptibly reduced.—E. C. BARTON (Enfield).

### Effective Aerial Insulators

IN a ten-metre aerial I have recently erected, the idea of using ceramic coil forms as insulators suggested itself when purchasing a number of these from a well-known miscellaneous stores in London. At first I thought that absorption may result in the close proximity of one end to the ground, so I made the distance between the ground and lower insulator



Ceramic coil-formers are used for these simple but efficient aerial insulators.

1ft. 4ins., this proving adequate on test. As the antenna is of the vertical centre-tapped type, the lead-in was made  $\frac{1}{2}$  and soldered equidistant at the point "X" in the sketch.

The circuit I use is a conventional 3-valve T.R.F.—R. E. BANCROFT (Yarmouth).

# MAKING THE "A"

## Details of a Powerful Accumulator Valve Rectifier. An Output up to 30

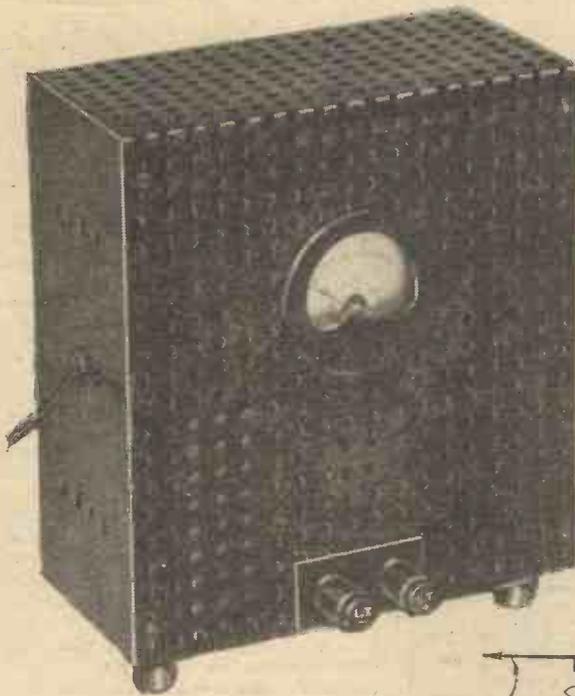


Fig. 1.—The completed charger.

MANY amateurs now use simple trickle chargers for keeping their accumulators in good condition, but the main drawback with this type of charger is the small current output. It is often found necessary to leave the cell on charge for such a long period that listening has to be curtailed, or a visit paid to the charging station to have the cell put into use more rapidly. It is possible, however, to make a charger which will deliver the full current required for normal charging rates

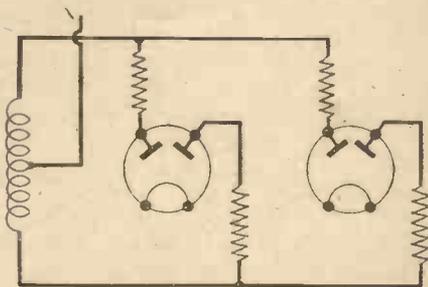


Fig. 3.—If a greater output is desired, valves may be paralleled, but then a separate 5-ohm resistance must be joined in each anode lead as shown here.

with standard accumulators and such a unit is the subject of this article. It will also be found of value to the motorist as it may be used for car battery charging purposes. As designed, the charger may be stood on a bench—rubber feet being provided, or it may be hung on the wall, for which purpose keyhole slots are cut in the back. The circuit is shown in Fig. 2, from which it will be seen that the main requirements are a

transformer, regulating resistances, ammeter and the valve. In addition to these, two output terminals and a suitable mounting block are called for, together with a valveholder and connecting wires.

gives off a considerable heat. For the same reason the transformer and valve should be well separated, whilst the meter should be placed at a fair distance from the valve.

To enable the current output to be regulated we have adopted a combined resistance feed, a fixed component of 5 ohms being joined in series with a variable rheostat of 6 ohms, and this acts as a safeguard and will prevent the valve from being overrun, whilst permitting the current to be reduced when required.

### Construction

The mains transformer must be capable of delivering 1.8 volts at

2.8 amps for the heater of the valve, and the secondary should be capable of delivering 30+30 volts at 1.3 amps. The component specified has been thoroughly tried and tested and will run without overheating and is in all other respects perfectly suitable for this charger. The variable resistance is adjusted by means of a screwdriver, and a hole in the top of our case was enlarged so that a long driver may be placed down through the case and the necessary adjustments made. This is a safeguard which will

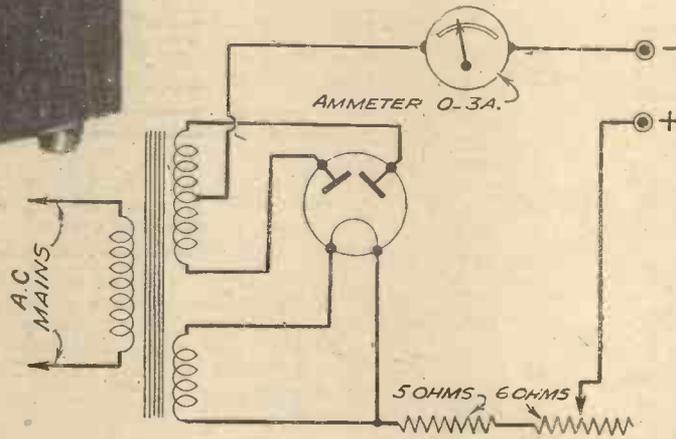


Fig. 2.—Theoretical circuit of the "Argon" Charger.

### Containing Case

The components in our model were assembled in a metal case consisting of a metal sheet bent to form the back and two sides, whilst a sheet of perforated iron was used for the front and top and bottom. This enables the components to be mounted on the lower perforated side and perfect ventilation is thereby provided. Any similar form of assembly may be adopted, but it is important to ensure that air may pass freely from bottom to top as the valve

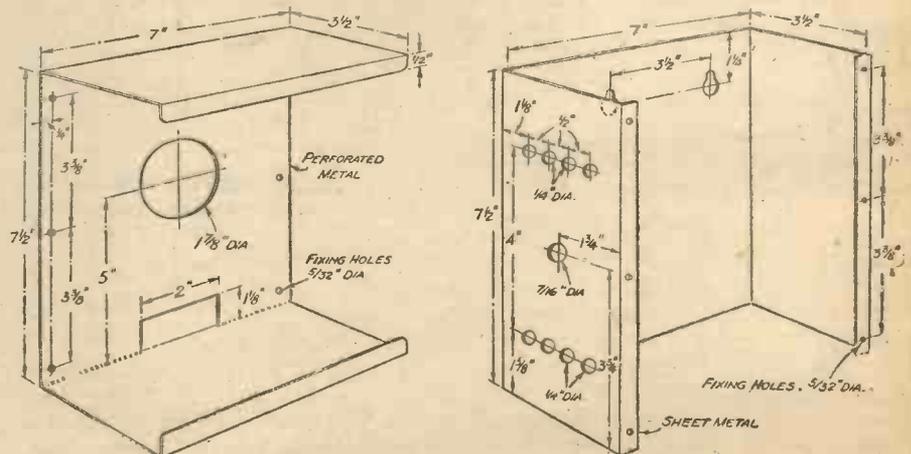


Fig. 4.—Details of the metal containing case.

# ARGON" CHARGER

Charger Incorporating a Special  
 Output Terminals at Over 1 amp is Available

prevent the control from being inadvertently adjusted unknown to the user, which might result in some unforeseen accident. No live parts are accessible in the design, the mains leads being taken out through a rubber grommet and insulated terminals with non-removable heads being used for the output.

The parts should be wired as shown in the wiring diagram, using stout leads where additional wire is

be tied in the flex before it is passed through the grommet and this will take the strain. Alternatively, if a wooden back is fitted for simplicity the wire may be anchored by attaching a small ebonite or wooden

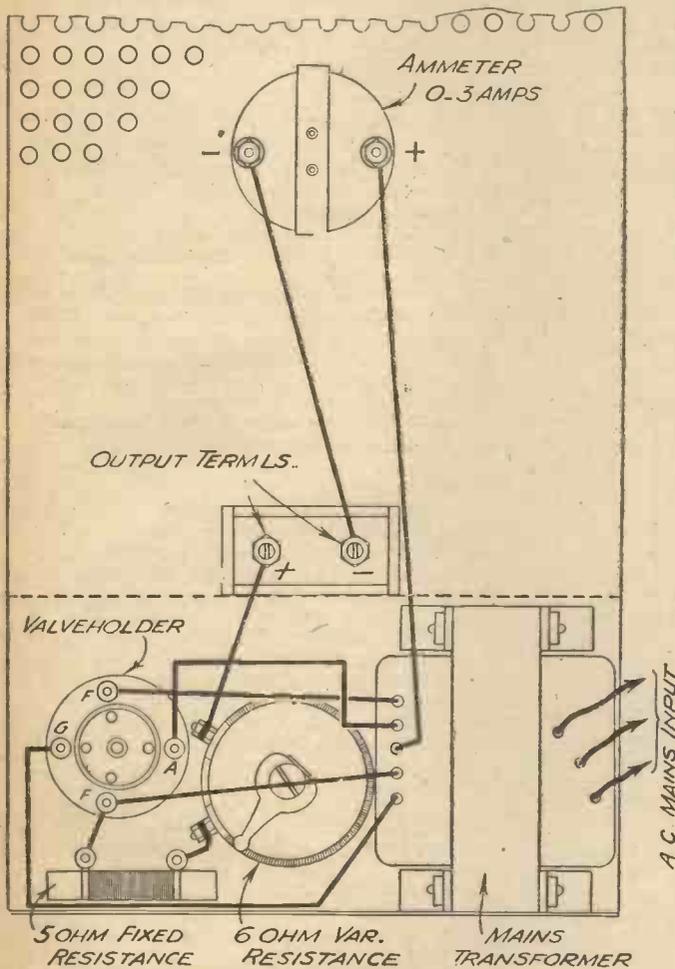


Fig. 5.—Practical wiring diagram of the "Argon" Charger.

required, and cutting off the output leads from the transformer to reach comfortably to the valveholder, etc. Note carefully the connections to the ammeter, and be careful to connect the thick secondary leads to the filaments. To prevent the mains leads from being pulled away from the contacts inside, a knot may

be tied in the flex before it is passed through the grommet and this will take the strain. Alternatively, if a wooden back is fitted for simplicity the wire may be anchored by attaching a small ebonite or wooden

### Greater Outputs

Where it is desired to obtain a greater output another valve may be included in parallel with the existing valve, but to ensure that each valve delivers an equivalent

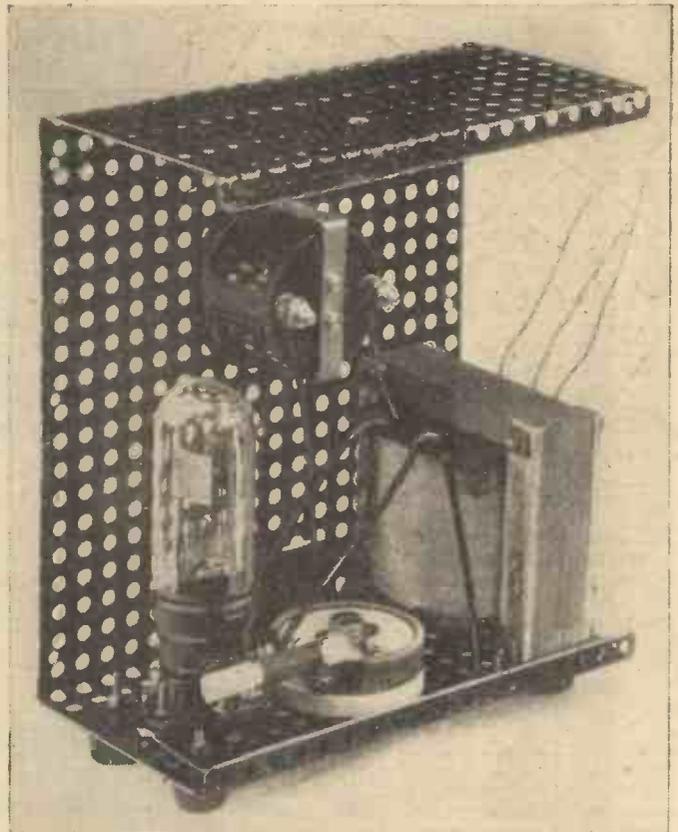


Fig. 6.—View of the internal section, showing arrangement and wiring of the component parts.

load, and to avoid overrunning one valve due to differences in characteristics, a 5-ohm fixed resistance should be included in each anode lead as shown in Fig. 3. The same type of resistance as is already used in the output circuit (Bulgin type A.R.5) should be used.

To use the charger simply connect to the mains, join the accumulator to the L.T. terminals, set the variable resistance to maximum (all in) and switch on. With a screwdriver adjust the variable resistance until the current indication on the meter rises to approximately 1.25 amps. If, of course, the cell is to be left unattended for some considerable time and it is feared that it will be damaged due to overcharging, the rate may be reduced by a simple adjustment of the resistance.

The complication of a separate switch is not called for, and by switching off direct at the mains plug there will be no risk of danger due to the fact that a length of live mains lead may be left permanently in circuit in a place such as a garage.

### LIST OF COMPONENTS FOR THE "ARGON" CHARGER.

- 1 mains transformer, with secondaries: 1.8 v. 2.8 A., 30+30 volts 1.3 A (T. W. Thompson and Co.) (12s. 6d.).
- 1 Argon rectifying valve, Type A.831 (General Electric Co.) (10s. 6d.).
- 1 ammeter (0.3 amps.) (Premier Supply Stores) (5s. 9d.).
- 1 terminal mounting block (Belling Lee) (6d.).
- 2 terminals (L.T.—, L.T.—) (Belling-Lee) (9d.).
- 1 6-ohm pre-set rheostat (Electradix Radios) (1s.).
- 1 4-pin valveholder (VH.19) (Bulgin) (6d.).
- 1 10-watt 5-ohm resistance (A.R.5) (Bulgin) (1s.).
- Wood for baseboard, connecting wire, perforated zinc for cover, screws, etc.



# Absolutely Indispensable To The Practical Amateur!

## THE OUTLINE OF WIRELESS

By RALPH STRANGER

Here is a book which covers the theory and practice of Wireless Reception from A to Z, and makes everything plain even to the most "non-technical" reader. "Step by step, line upon line, precept upon precept, it teaches you everything you want to know about wireless."—WORLD-RADIO. 816 pages: Lavishly Illustrated. 8/6 net (By Post, 9/-).

## WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

By F. J. GAMM

Wireless terms and definitions stated and explained in concise, clear language by one of the best-known and most popular designers and writers on the practical side of wireless construction. Profusely illustrated. A veritable treasure of wireless knowledge. 5/- net (By Post, 5/6).

## THE MATHEMATICS OF WIRELESS

By RALPH STRANGER

This brilliant and experienced writer on Wireless has a happy knack of making even the driest and most abstruse topic interesting—and amusing! He has a characteristic way of handling mathematics which appeals irresistibly to those to whom previously the subject has seemed both difficult and dull. 5/- net (By Post, 5/6).

## NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

By F. J. GAMM

Everything about Drums, Mirror Screws, Scanning Discs and other Scanning Systems, Neon Lamps, the Cathode-Ray Oscillograph. How to Build Short-wave Receivers, How to Build Ultra-short-wave (Receivers, Straight and Superhet types. Fully illustrated. 3/6 net (By Post, 4/-).

## EVERYMAN'S WIRELESS BOOK

By F. J. GAMM

A Radio Consultant for the Listener, Expert and Amateur Constructor, explaining the Operation, Upkeep and Overhaul of all types of Wireless Receivers, with Special Chapters on the Principles of Radio Telephony, Installation and Systematic Fault-finding. With 200 Illustrations and Diagrams. 3/6 net (By Post, 4/-).

## SIXTY TESTED WIRELESS CIRCUITS

By F. J. GAMM

Modern circuits of practically every type from crystal to superhet. Diagrams and instructions for assembling and wiring. Details of components and notes on operation. 2/6 net (By Post, 2/10).

You can keep well-informed with

**WELDING ENGINEER'S POCKET BOOK**  
3/6 net (By Post 3/9)

**ELECTRICAL ENGINEER POCKET BOOK**  
3/6 net (By Post 3/9)

**ELEMENTARY MATHEMATICS FOR ELECTRICAL ENGINEERS**  
By Sir Ambrose Fleming  
5/- net (By Post 5/6)

Available from all booksellers or direct by post from the publishers,

**GEORGE NEWNES, LTD.**  
(BOOK DEPT.)

Tower House, Southampton St., LONDON, W.C.2.

# PETO-SCOTT FOR BETTER SERVICE BETTER VALUE BETTER RADIO

CASH — C.O.D. — EASIWAY

Dependability and good value are synonymous with Peto-Scott... established for 20 years as world's leading suppliers of everything radio by mail. Write or call NOW.

**5-VALVE A.C. ALL-WAVE SUPERHET.** Excellent Radio or Radiogram Chassis 18-2,000 metres. Station-name dial. Automatic Volume Control. 6 tuned stages. Provision for Pick-up. Complete with specially matched Rola mains speaker and 5 Valves. Guaranteed, fully tested. £6 6s. cash or 7/6 down and 17 monthly payments of 8/3. Chassis only, with valves, but less speaker, £4 17s. 6d. or 7/6 down and 18 monthly payments of 7/11. For A.C. Mains only.

7/6 DOWN

**ALL-WAVE AERIAL.** Absolutely essential for present-day good listening. Complete outfit for instant erection with all aerial and lead-in wire, transformer, insulators, and instructions. List value, 37/6. Special Price 17/8 cash or 2/8 down and 7 monthly payments of 2/6.

2/6 DOWN

**AMPLIFIERS.** 6-7 Watt Model for A.C. Mains. Effective sound-range 500 feet. Ideal for home, club and sports meetings and all P.A. work. Assembled and fully tested, ready for immediate attachment to Microphone or Gramophone Pick-up, complete with 4 valves. List value £6 10s. 0d. Special Price £3 10s. 0d. or 5/- down and 11 monthly payments of 6/9.

5/- DOWN

**"TROPHY" SHORT-WAVE SETS.** British—best—and finest: value. The most efficient self-contained Short-wavers ever offered. **WELL WORTH DOUBLE THE PRICE.** Complete in steel cabinet with moving-coil speaker fitted and provision for headphones. Wavering 12-52 metres, but tuners available for 6-500 metres. Battery Model £25 15s. 0d. or 9/6 down and 13 monthly payments of 9/11. A.C. Model, 8 gns. cash or 10/- down and 13 monthly payments of 10/9. Complete specifications on request.

9/6 DOWN

**P.M. MOVING-COIL SPEAKERS.** A few only. Rola, Magnavox and R. and A. 8in. Cone for Power or Pentode output. List value 35/-. OUR PRICE 17/6 cash or 2/6 down and 7 monthly payments of 2/6.

2/6 DOWN

**B.T.S. COMMUNICATION RECEIVER.** The new Trophy 5 is the ideal set for keen short-wave enthusiasts and Transmitters. Wavering 10-550 metres continuous. Mechanical Bandspread. B.F.O. for C.W. reception. A.V.C. on-off switch. Built-in speaker. Phone Jack. Provision for double aerial. For A.C. Mains. Cash or C.O.D. price £9 or 16/- down and 12 monthly payments of 16/-. Complete details on request.

16/- DOWN

**COMMUNICATION RECEIVER.** New Peto-Scott Dual-Purpose Model. Wavering 10-2,000 metres. The ideal set for the short-wave Ham—provides amazing performance on the Medium and Long-waves. Speaker incorporated. Black crackle finish horizontal cabinet. Price 11/ gns. 21/- down and 12 monthly payments of 20/3. Leaflet on request.

21/- DOWN

**DECCA 1938 MODEL 99 A.C. 6-VALVE ALL-WAVE SUPERHET.** Brand New. 12-2,000 metres. Easy-to-read station-name dial. A.V.C. Moving Coil Speaker. Wonderful performance and reproduction. Really beautiful cabinet. Maker's guarantee. In original sealed cartons. Present List Price £14 5s. 6d. OUR PRICE 8 gns. or YOUNG FOLK 10/- down and 18 monthly payments of 12/6.

10/- DOWN

**1-VALVE ALL-WAVE KIT.** 18-2,000 metres. Employing efficient All-wave Tuner, requiring 6 connections only. Provides world-wide headphone reception. Complete kit with valve and drawings. List Value 33/6. Special Price 25/6 or 2/6 down and 11 monthly payments of 3/-.

2/6 DOWN

**PETO-SCOTT MAINS UNITS.** Combined A.C. Model 30 mA output for S.G. Det. and Power—alternative outputs and 1 amp. 2v. trickle charger incorporated. List £2 9s. 6d. Special Price 35/6 cash. A.C. Trickle Charger 1 amp. 2v. model employing metal rectifier, 10/-. D.C. Mains Unit tapped for S.G. Det. and Power outputs up to 25 ma. List 30/-. Special price 18/6 cash, Similar Model, but for A.C. Mains, 32/6 cash.

FROM 19/6 CASH

**BATTERY S.G.3 CHASSIS.** Pentode output. Wide choice British and Continental stations. Engraved dial 290-2,000 metres. Fully tested. 21/- cash or complete with matched B.G. Det. and Pentode valves. 39/9 or 2/6 down and 11 monthly payments of 3/8.

2/6 DOWN

**S.T. 900 BATTERY ALL-WAVER.** Build now this amazing all-wave receiver tuning from Television to 2,000 metres. Kit "A" comprising ALL parts less coils and valves, but with free station-name dial. 55/8 cash or C.O.D. or 5/- down and 11 monthly payments of 5/3.

5/- DOWN

**S.T. 900 COMPLETE KIT.** Including all coils. Station-name dial, less valves. 75/6 cash or C.O.D. (You save 7/-) or 6/- down and 12 monthly payments of 6/8.

6/- DOWN

### SPECIAL OFFER

EXTRACTOR KIT. Amazing Offer of this S.T.900 special selectivity device. List Value 13/6. OUR PRICE 10/6.

## Peto-Scott 1938 ALL-WAVE RADIO



Only Peto-Scott can offer this astounding value! Twenty years' experience in radio-by-mail, supplying direct and cutting out middle profits, enables us to produce guaranteed All-Wave Radio with performance, reliability and value for money nowhere else obtainable. Send for illustrated literature on Peto-Scott 1938 Broadcast and All-Wave Radio. Models from £3 17 : 6 to £18 : 0.

**Peto-Scott ALL-WAVE BATTERY STRAIGHT 3 MODEL 8011**—18-2,000 metres, 3 British Valves, New reacting detector circuit followed by 2 R.C.C. Stages feeding into pentode output valve. Slow-motion tuning. Low H.T. consumption. 7 8in. cone P.M. Moving Coil Speaker. Walnut veneered cabinet. Less batteries. £4 : 15 : 0 only. Cash or C.O.D. Or 5/- down and 18 monthly payments of 5/10.

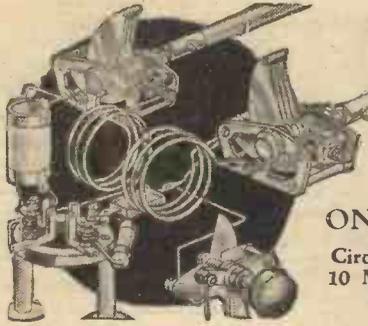
5/- DOWN

If we happen to have missed your particular requirements, write to us now for full detailed lists of receivers, speakers and everything radio. SENT FREE ON REQUEST.

## PETO-SCOTT CO., LTD.

77 (Pr. W.39) City Road, London, E.C.1  
62 (Pr. W.39) High Holborn, London, W.C.1

Clissold 0875 — Holborn 3248  
Send Cheque/P.O. with order, or order C.O.D. Full lists on request.



# Short Wave Section

## ON THE ULTRA-SHORT WAVES

Circuits and Ideas for Use on Wavelengths Below 10 Metres.  
By W. J. DELANEY

As pointed out in our issue dated May 14th last, the recommendations of the Cairo Conference will result in a restriction of the wavelengths used by amateur transmitters, and this will eventually lead to a greater use of wavelengths below 5 metres. The keen amateur, therefore, will be prepared for the many interesting developments on these ultra-short waves, and many details of the performance and effects of these wavelengths yet remain to be worked out. As many know, the original ideas regarding the function of ultra-short waves have had to be revised and the television wavelengths give us a very good idea of the peculiarities of these so-called "optical" wavelengths. The original 25 miles which was thought to be the range of Alexandra Palace is now very wide of the mark, and it has even been found possible for an English viewer in the South of England to pick up the pictures from the Eiffel Tower on a wavelength of 7 metres. The technique of these wavelengths is very different even from ordinary short-wave working, and there are very many details which must receive attention. Firstly, every possible source of loss must be removed. This means that in place of ordinary bakelite, ebonite, and similar materials, ceramic insulation must be employed. One drawback which will be found in time with this material, however, is that, owing to its matt surface it will accumulate dust and this will form a leakage path.

### Losses

A glazed surface would enable dust to be removed quickly, but the surfaces now used will have to be kept clean and a good brush should be used frequently on such components. Similarly, conductivity has to be considered in a different light and any old type of wire will not do for inter-circuit connections. A very heavy gauge should be used, and in all tuning circuits this will have to be kept to a minimum in view of the very small amount of wire needed for the tuning inductances. When we remember that for 5 metres only two or three turns of wire in a coil less than an inch in diameter are needed we can see that leads to the condenser and valve might easily account for more wire than is needed in the coil and thus it will be impossible to tune

low enough. This means that coils will have to be mounted direct on the tuning condensers, and, furthermore, the leads to the grid of the valve and to aerial and earth terminals should similarly be kept to a very minimum. A good idea is to use strips of metal for such connections, mounting the parts on holes drilled in the metallic strips, but, naturally, avoiding overcrowding which might result in a metallised valve surface, for instance, being brought so near to the coil that it

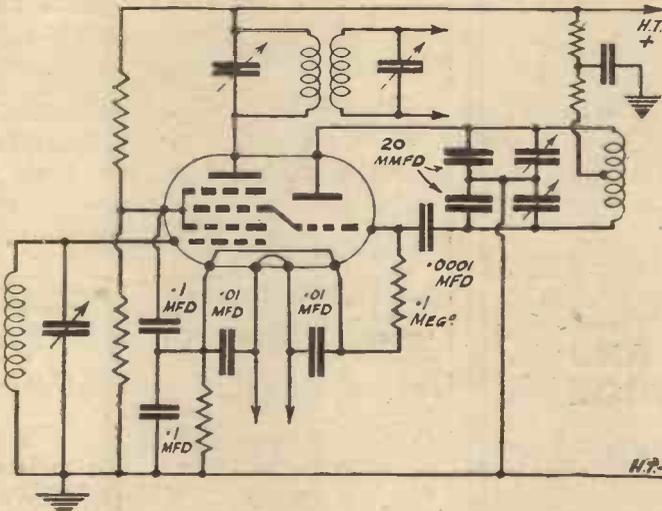


Fig. 1.—A frequency-changing stage which offers scope for experiment below 10 metres.

affects its inductance value. Valves are now obtainable with ceramic bases for use in receivers of the type needed for this range of working, but for wavelengths below 5 metres, which might soon be in common use, it may even pay to remove the base of a valve and make connection direct to the leading-out wires.

### Circuit Choice

The simple detector valve will not prove the most useful when getting down to the region of 2 or 3 metres. It is possible, with careful construction to get a superhet to work on 3 metres, but great care is needed in the design of the frequency-changing stage. A proposed design is shown in Fig. 1, but considerable experimental work may be needed before it will oscillate. A metal baseboard or chassis should not be used unless all components at "high-frequency potential" are supported on insulating pillars well clear of the surface. A battery mixer of this type will not be found satisfactory. The super-regenerative circuit will certainly prove workable, and may eventually prove one of the most useful circuits, although undoubtedly there are new schemes to be tried out which will eventually be found more useful. The slightest friction between moving metallic

parts may also set up noises even although connection is not made through such parts. In experimental apparatus which has been made up, for instance, the friction between the driving mechanism of a slow-motion dial was found to result in noises, no doubt due to the fact that dissimilar metals were in contact, and the noise could not be removed entirely—apparently being picked up by the aerial lead. Similarly, many background noises may be introduced from movement at the lead-in or other parts of the aerial-earth system, although perfectly silent on 5 to 10 metres.

### Components

Many firms can now supply special components which may be relied upon for use on these new wavelengths, and in the Eddystone range, for instance, some ceramic pillar insulators and similar items are now available with a glazed surface to overcome the difficulties previously mentioned. For connection to certain points these pillars will enable high-frequency contacts to be removed clear of the chassis or metal surface, and for connection between the aerial lead-in and the first tuning circuit a really low-capacity condenser will have to be used. The Eddystone neutralising condenser will be found to answer well in this connection, although some circuits may eventually be found to function better with a special twin-feeder aerial input. A long aerial is, at the moment, out of the question, and it yet remains to be seen whether there is not some better scheme than using a short length of stiff wire or tube affixed direct to the aerial terminal, or the end of the tuning circuit. To avoid the difficulty of hand or body-capacity, tuning controls will have to be operated from a distance, and some good and reliable form of extension handle must be employed. Practical layouts cannot be given at the moment in view of the difficulty of knowing exactly what waveband will be explored, but the above details should enable the keen amateur to make a start in experimenting on the wavelengths mentioned, although some difficulty may at the moment be experienced in finding signals upon which the apparatus may be tested. Your local radio club will let you know whether any local amateur transmitter is experimenting on these ultra-short waves, and, no doubt, special arrangements will be made to enable you to listen for their transmissions.

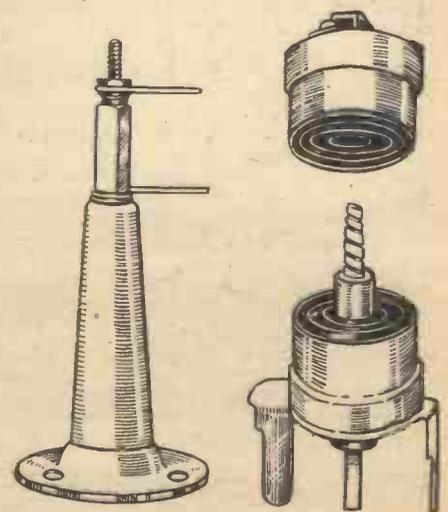


Fig. 2.—Two new Eddystone components which are suitable for ultra-short-wave receivers. On the left is a stand-off plug and socket device, and on the right a miniature trimmer.

## LEAVES FROM A SHORT-WAVE LOG

### Turkey's Projected Short-waver

THE short-wave transmitter which the Ottoman Government proposes to instal in the neighbourhood of the capital, Ankara, will work on two channels, namely, TAP, 31.7 m. (9,465 kc/s) and TAQ, 19.74 m. (15,195 kc/s). The power will be 20 kilowatts.

### The 1940 Olympic Games

Japan has definitely decided to hold the Olympic Games in the vicinity of Tokio during the period September 21st to October 6th, 1940. Special transmissions will be carried out throughout the Japanese medium-wave and short-wave network. In the case of the latter stations the power will be increased to its maximum in order to ensure good reception in Europe.

### Results of the Cairo Conference

When the findings of the World Telecommunications Conference recently held at Heliopolis (Egypt) have been ratified by the respective Governments the following short-wave bands will be available for radio broadcasts: 6.6-2 mc/s (50-48.39 m.); 7.2-7.3 mc/s (41.67-41.1 m.); 9.5-9.7 mc/s (31.58-30.93 m.); 11.7-11.9 mc/s (25.64-25.21 m.); 15.1-15.35 mc/s (19.87-19.54 m.); 17.75-17.85 mc/s (16.88-16.81 m.); 21.45-21.75 mc/s (13.99-13.79 m.). By this allocation the broadcasting band will gain 2 mc/s in the 13 m. band (21.45-21.75 mc/s); 1 mc/s between 9.5-9.7 mc/s (31.58-30.93 m.), and 7.2-7.3 mc/s (41.67-41.1 m.). On the other hand, amateur experimental transmitters will see their exclusive bands slightly decreased. The actual allotment of channels will be discussed and decided upon in respect to the European stations at a further Conference to be held in Switzerland in January next.

### Regular Broadcasts from 12RO5

Rome has been recently using the 12RO5, Prato Smeraldo 25 kW. transmitter operating on 19.78 m. (15.17 mc/s) for broadcasts between G.M.T. 11.30-12.30.

### Celebrating a Tenth Anniversary

TIARRH, Heredia, Costa Rica, during the present month, is celebrating the tenth anniversary of its birthday by special daily programmes broadcast between G.M.T. 02.00-03.00. An artistic QSL card will be sent to all listeners who supply detailed reports of reception, and enclose an International Postal Reply Coupon. The station works on 30.93 m. (9.7 mc/s) although it is actually given in official lists as on 31.02 m. (9.67 mc/s). Address: Señor Armando Cespede Marin, Apartado Postal, 40, Heredia (Costa Rica).

### New Argentinian Transmitter

On 30.96 m. (9.69 mc/s), a new 10-kilowatt station with the call-sign LRA, and located at Buenos Aires (Argentine Republic), may be heard testing nightly from about G.M.T. 21.00. The programmes, so far, consist of a relay of the LRI, *Radio el Mundo* studio, and are simultaneously transmitted through LRX, 31.06 m. (9.66 mc/s).

### League of Nations Broadcast Records

Every Sunday evening the League of Nations (Geneva) offers an entertainment of "canned music" before its talk on the activities of the previous week. The broad-

casts are made through the Prangins stations simultaneously on 44.94 m. (6.675 mc/s), and on 20.64 m. (14.35 mc/s).

### Listen to Ethiopia

A new transmitter which the Italians have installed near Addis Ababa, and which will shortly be officially opened, will work on 31.25 m. (9.6 mc/s) and 80 m. (3.75 mc/s), two channels which were originally allotted to the I2RO Rome short-wave station.

### Extra Frequencies for Rome

For relays of Italian programmes to South America and the Far East the E.I.A.R. now brings into operation two Rome-Torrenova stations, namely, IQA, 20.36 m. (14.736 mc/s) and IRW, 15.37 m. (19.52 mc/s) as well as IQY on 25.21 m. (11.9 mc/s) occasionally. These are in addition to the broadcasts made through Rome I2RO.

### Another Puzzling Harmonic

Just below the 40-metre amateur band, on many evenings you may pick up a fairly powerful transmission in the French language which you might erroneously take for a direct broadcast. It is the eighth harmonic of *Poste Parisien* (Paris) coinciding with 30.01 m. (7.672 mc/s).

### New Spanish Short-wavers

*Radio Nacional AZ* is the call of a temporary transmitter installed in an advance post on the Madrid Front; it broadcasts a news bulletin nightly in several languages from G.M.T. 21.00, on 42.5 m. (7.085 mc/s). The call is: *Emisario Radio Nacional AZ en el Frente de Madrid*. Burgos (FET5) is now on 40.8 m. (7.353 mc/s), and Radio Malaga, which closes down at G.M.T. 22.00 or 22.30, switches over a few minutes later from 41.4 m. (7.245 mc/s) to 20.77 m. (14.445 mc/s).

## New Times Sales Co.

**SELECTED BARGAINS FOR READERS OF "PRACTICAL AND AMATEUR WIRELESS"**  
ALL YOUR RADIO REQUIREMENTS—at the right price! Make your choice NOW.

### New 4-valve BANDSPREAD Battery SHORT-WAVE KIT

List Price £4.17.6 BARGAIN 42/- VALVES FREE



**KIT** comprises every part for assembly including 3 5-pin coils, wiring, and assembly instructions. Cash or C.O.D. Carr. Pl. 42/-, or 2/6 down and 12 monthly payments of 3/-.

\* 1-VALVE SHORT-WAVE KIT. Complete 1-Valve Receiver Kit, including 3 coils; 12-24 metres and pair of super-sensitive headphones, 27/6 cash or 2/6 down and 11 monthly payments of 2/6. VALVE FREE.

R. A. Bolton writes: "The set is working perfectly. I have logged 70 British Amateurs, 10 Americans and quite a number of foreign ones. Last night I was listening to W8XX, which was coming through the 'phones as strong as Zeceen. The performance is equal to many a Superhet."

2/6 DOWN

### A.C. BANDPASS S.G.4 CHASSIS

Wonderful selectivity and sensitivity. 4 British valves. LIST PRICE £6:6:0  
coils, slow-motion tuning. Wave-length dial. Gramo. pick-up sockets. BARGAIN  
3 watts output. Wave range 200-2,000 metres. For A.C. Mains ONLY 200-250 volts 40/80 cycles. Cash or C.O.D. £2:19:6 or 5/- down and 12 monthly payments of 4/-. Or in beautiful walnut veneered cabinet complete with Matched Field Energised Moving-coil Speaker, ready to play. List price 48:3:0. Bargain price, £4:19:6, or 5/- down and 12 monthly payments of 8/9.

5/- DOWN

### COMPONENT BARGAINS

Orders over 5/- sent carriage paid C.O.D. charges extra under 10/-

OUTPUT CHOKES. Benjamin, Universal Class "B" tapped output chokes. List 11/-. Our price, 4/6. Telen tapped Pentode output choke, 2/6.  
TRANSFORMERS. Telsen, 3/1 and 1.75/1, 2/-.  
STEEL CHASSIS. Ready drilled for 1-9 valveholders. Electrolytic and mains transformer, Size 18in. x 9in. x 3in., grey enamel finish. Bargain, 2/- each.  
TRICKLE CHARGER, 2v. 1 amp. Model, Metal Rectifier, 10/-.  
VALVE SCREENS. 3 portion, latest type, 1/- each.  
TUNING CONDENSERS. .0005 mfd. Air-spaced, 1/8.

### Sensational Offer! ★ BARGAIN PARCELS

Value 25-30/-. Bargain, 4/11. post 9d. Exceptional opportunity for "Practical Wireless" readers. Huge stocks must be cleared of components, well-known makes, for Mains and Battery sets, building and repairs, comprising Mains and L.F. Transformers, Tuning condensers and coils, fixed and variable resistances, fixed condensers, switches and chokes, etc. Assorted parcels, our selection—but leave it to N.T.S. to give amazing value, 4/11. post 9d. extra. Order Early.

FREE Send Coupon now for new Giant bargain list reservation.

### NEW ALL-WAVE 3 LIST VALUE £4:15:0 BARGAIN 27/6

Less Coils. VALVES FREE!!



9 to 2,000 metres. A triumph in Receiver design. Two S.G. and Pentode Output Stages. For the enthusiast who requires maximum efficiency and those extra stations on the Short, Medium and Long Waves. 3 Short-wave ranges. Employs 1 m.o.u.s. U.T.S. One-shot inductors or N.T.S. (Type S.T.) 6-pin coils. Slow-motion Tuning. Complete Battery use with steel chassis. 2/6 DOWN

### 3 MATCHED VALVES (Value 35/-) FOR 5/6!

Complete with 3 valveholders, and post free. AN investment for every set owner and constructor. 3 matched, brand new world-famous Philco 2-volt battery-type valves, comprising 2 S.G. H.F.'s and 1 Output Pentode, packed in original cartons. Three different valve types indispensable for modern constructors' circuits (available on request) using any number of valves, invaluable also for replacement purposes. Offered to you at a fraction of manufacturing cost... a real scoop in N.T.S. bargains. Order now while supplies hold out!

FREE! NEW Bargain Lists on request. Lines previously advertised still available.

Please cross P.O.s and register currency. Overseas orders post extra.

**NEW TIMES SALES CO.**  
56 (Pr.W. 66), LUDGATE HILL, LONDON, E.C.4  
Phone: City 5616



# Practical Television

May 28th, 1938. Vol. 3. No. 102.

## A Healthy Discussion

TO be in a position to air various views on technical problems is always a distinct advantage, for at no time must it be regarded that finality is reached in any form of applied science. This is particularly the case with television where technical progress is so rapid, due to the concentrated efforts being made at both the transmitting and receiving ends. Ample evidence of this was forthcoming during the discussion which followed the television papers read recently at the Institution of Electrical Engineers. As was to be expected, Sir Noel Ashbridge was very guarded and conservative in his remarks, but he gave due praise to the reliability associated with modern television receiving sets, stressed their simplicity of operation, hoped that means would be developed for eliminating every form of interference, and indicated that the service range of the present Alexandra Palace station had by no means reached its limit. Picture coverage in its broadest sense is always a controversial subject, but it is no good disguising the fact that present day sensitive receivers in conjunction with a properly designed aerial system to suit the particular site, has enabled good results to be achieved up to 100 miles away in some cases. It must not be inferred that every town and village within such a radius would show first class television pictures; each potential viewing spot has to be treated on its merits, but it is most encouraging to manufacturers to find that their products may be employed over what appears to be an ever widening circle.

## A Compromise

ANOTHER point dealt with at the same meeting centred round the choice of the present standard of definition, namely 405 lines. In effect this was really a compromise between practical limitations and the ideal conditions desired, and it was very unfortunate that America, France and Germany had selected other standards which were so slightly different that an ordinary observer would not recognise any improvement in the resultant received picture. There is no necessity to have varied standards, and their existence acted as an obstacle to the exchange of programmes on an international basis. Again, if sets had to be made to conform to more than one picture definition to give alternative programmes, this would complicate their design, tend to increase their cost, and add to the possibility of breakdown with consequent service calls. Higher standards than that now used by the B.B.C. only became necessary for very large pictures, and this development is one which merits a close consideration for the future. Large pictures viewed at relatively close distances tend to destroy some of their inherent entertainment value and are only suitable for very large rooms, such as a club or hotel lounge or a small hall. Other points of discussion dealt with picture contrast which has to be set in accordance with the type of demonstration being featured. As

a rule, if there is any form of mass viewing then contrast and brightness need to be over-emphasised so that all present obtain a good view. Within the confines of the home, however, especially if there is no external form of illumination in the room, then a softer picture with less intrinsic over-all brilliance is generally found to be preferable. Individual taste comes so much into prominence with these two factors that in almost every set now sold both contrast and brightness controls are provided in an accessible position for customers' use, even if every other control is out of sight or alternatively pre-set by an engineer on installation.



Joe Daniels, late drummer of Harry Roy's band, whose "Hot-Shots" are a popular feature on the radio and records. His spectacular drumming may shortly be seen on the television screen.

## In the Air

THE value of television as applied to aircraft is by no means being lost sight of by those responsible for the development of schemes which can be used in times of war or peace. Although being carried out under the greatest secrecy, it is known that in Germany concentrated effort is being made towards perfecting apparatus which can be installed in an aeroplane both for reception and transmission purposes. In the case of the former the difficulties are not many, provided suitable suppression methods are applied to possible sources of electrical interference. As evidence of this

it is only necessary to recall the press demonstration given by Bairds about twenty months ago, when a standard receiving set was placed in an air liner, and the transmitted pictures from Alexandra Palace watched in comfort by the passengers during the course of the machine's flight. When it comes to transmitting pictures from the air, however, problems of a totally different nature make their appearance. First of all, for reasons of space, and operation, nothing but the simplest type of transmitting equipment can really be considered. Picture definition must be of a reasonable order for ground objects to be recognised, but since movement in the picture itself is negligible, then it is possible to cut down very materially the picture speed without in any way spoiling the results. As against this, however, consideration must be given to the actual speed of flight of the aeroplane itself, otherwise distortion would be present in the pictures as observed at a ground receiving station. It is possible to correct this, however, by forms of compensation in the scanning circuits employed by the particular camera in use. In this way the motional speed of the machine is allowed for, and, to all intents and purposes, the

resultant television pictures are identical with those produced by a stationary camera. The application of this idea has resulted in a material improvement in the pictures obtained by transmissions from aeroplanes, and it is certain that other developments will manifest themselves before long, and so enable pilots and observers to carry out surveys with extreme rapidity as compared to the tedious task of taking a series of still pictures and assembling them carefully at a later date.

## The Reason Why

WHEN examining a modern cathode-ray tube designed for the reconstitution of television pictures, it is surprising how often the question is raised: "What is the metallic-like deposit on the interior of the glass bulb?" This is

seen between the final high potential anode and the screen. Actually, it is a form of conducting deposit made from a graphite emulsion and is electrically connected to the final anode. It carries out different functions, the first being to overcome any spurious light reflections which may occur inside the tube. These would be multiplied and eventually spoil the picture built up by the tracing spot of light on the screen. By being connected to the high-potential anode this deposit serves to screen the electron beam itself from external electrical influences which would otherwise distort the picture.

# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

### Decca

**T**WO interesting records which make their appearance in the Decca Permanent Music series this month are orchestral excerpts from Haydn's "The World on the Moon," played by The Charles Brill Orchestra on *Decca K 877-8*. "The World on the Moon" is unique in that it was the only opera composed by Haydn. Efforts are being made to produce the opera in London provided that the German text can be accurately translated so that none of the subtleties of the "story" are lost.

The first Decca album of jam music was extremely popular, so this company have now produced a successor. The second album, I think, is somewhat more varied than Album No. 1, but I am only a layman as regards jam music. It contains seven records (fourteen titles) and, complete with a descriptive leaflet, costs 17s. 6d.

### Brunswick

**T**HREE famous stars—Bing Crosby, Eddie Cantor and Connie Boswell, in association with Victor Young and his Orchestra, give a remarkable performance of "Alexander's Ragtime Band." On the reverse Bing Crosby and Connie Boswell, again in association with Victor Young, sing "Home on the Range" and "True Confession"—*Brunswick 02572*.

Frances Langford, who appears in the film "Hollywood Hotel," has recorded one of the tunes from the film, "Silhouetted in the Moonlight," on *Brunswick 02583*. On the reverse she sings "Sweet Someone" from the film "Love and Hisses."

The Andrew Sisters, who recently recorded "Bei Mir Bist du Schön" with great success, now present a novelty number created by the authors of "The Music Goes Round and Around." It is called "oooOOOH Boom" and this tune is creating record sales in America at the present moment. The coupling is "Shortnin' Bread" and the record *Brunswick 02582*.

### Rex

**I**N My Little Red Book" looks like developing into a popular number. It is an attractive tune and is splendidly played by Jay Wilbur and his Band on *Rex 9283*. "Souvenir of Love," another popular tune, is featured on the reverse side.

Billy Cotton and his Band present two of the prominent tunes of the moment, "Have you Ever Been in Heaven" and "Thanks for the Memory" on *Rex 9280*. This band also play two comedy numbers, "The Spelling Bee Song" and "I'm Knitting a Singlet for Cecil" on *Rex 9282*.

In strict dance band tempo we have a quickstep, "Me, Myself and I," from the film "Atlantic Flight," and a slow fox-trot, "True Confession," from the film of that name, played by Maxwell Stewart's Ballroom Melody on *Rex 9284*.

### Panachord

Two hill-billy numbers are featured by Tex Ritter on *Panachord 25954*. "I'm Hittin' the Trail for Home," from the film "Hittin' the Trail," and "Out on the Lone Prairie" from the film "The Song of the Gringo." Dance tunes are supplied by Woody Herman and his Orchestra with

"I Double Dare You" and "Why Talk About Love" on *Panachord 25971*, and "My Fine Feathered Friend" coupled with "You're a Sweetheart" on *Panachord 25972*.

### Vocalion

**M**AXINE SULLIVAN makes another fine vocal with "Dark Eyes" and "A Brown Bird Singing" on *Vocalion 5144*, and Mildred Bailey (vocal) and her Orchestra have recorded "Thanks for the Memory" and "If You Ever

Should Leave" on *Vocalion 5148*. "Texas Chatter" and "Song of the Wanderer" is featured by Harry James and his Orchestra on *Vocalion S 146*, and "Tea Time" and "Jeannine, I Dream of Lilac Time" by Red Norvo and his Orchestra on *Vocalion S 143*.

### Swing Music

**B**ENNY GOODMAN, starring in "Hollywood Hotel," plays the hits from this film, "I've Hitched My Wagon to a Star" and "Let That Be a Lesson to You" on *H.M.V. B 8736*, and "Can't Teach My Old Heart New Tricks," coupled with "Silhouetted in the Moonlight," played by the Goodman Trio on *H.M.V. B 8735*. The Quintette of the Hot Club of Paris have recorded this month "Liebestraum No. 3" (Liszt) and "The Sheik of Araby" *H.M.V. B 8737*.



### DO ANY OF THESE SUBJECTS INTEREST YOU?

<ul style="list-style-type: none"> <li>Accountancy Examinations</li> <li>Advertising and Sales Management</li> <li>A.M.Fire E. Exam.</li> <li>Applied Mechanics</li> <li>Army Certificates</li> <li>Auctioneers and Estate Agents</li> <li>Aviation Engineering</li> <li>Banking</li> <li>Boilers</li> <li>Book-keeping, Accountancy and Modern Business Methods</li> <li>B.Sc. (Eng.)</li> <li>B.Sc. (Estate Management)</li> <li>Building, Architecture and Clerk of Works</li> <li>Builders' Quantities</li> <li>Cambridge Senior School Certificate</li> <li>Civil Engineering</li> <li>Civil Service</li> <li>All Commercial Subjects</li> <li>Commercial Art</li> <li>Concrete and Structural Engineering</li> <li>Draughtsmanship, All Branches</li> <li>Engineering, All branches, subjects and examinations</li> <li>General Education</li> <li>G.P.O. Engr. Dept.</li> <li>Heating and Ventilating</li> <li>Industrial Chemistry</li> <li>Insurance</li> <li>Journalism</li> <li>Mathematics</li> <li>Matriculation</li> </ul>	<ul style="list-style-type: none"> <li>Metallurgy</li> <li>Mining, all subjects</li> <li>Mining, Electrical Engineering</li> <li>Motor Engineering</li> <li>Motor Trade</li> <li>Municipal and County Engineers</li> <li>Naval Architecture</li> <li>Novel Writing</li> <li>Pattern Making</li> <li>Play Writing</li> <li>Police, Special Course</li> <li>Preceptors, College of</li> <li>Press Tool Work</li> <li>Pumps and Pumping Machinery</li> <li>Radio Communications</li> <li>Radio Service Engineering</li> <li>Road Making and Maintenance</li> <li>Salesmanship, I.S.M.A.</li> <li>Sanitation</li> <li>Secretarial Exams.</li> <li>Sheet Metal Work</li> <li>Shorthand (Pitman's)</li> <li>Short Story Writing</li> <li>Shipbuilding</li> <li>Structural Engineering</li> <li>Surveying</li> <li>Teachers of Handicrafts</li> <li>Telephony and Telegraphy</li> <li>Transport Inst. Exams.</li> <li>Weights and Measures Inspector</li> <li>Welding</li> <li>Wireless Telegraphy and Telephony</li> <li>Works Managers</li> </ul>
--	--

*If you do not see your own requirements above, write to us on any subject. Full particulars free.*

### STUDY AT HOME IN YOUR SPARE TIME

## JOURNALISM

Short Story, Novel Writing and Play Writing

There is money and pleasure in Journalism and in Story Writing. No apprenticeship, no pupillage, no examinations, no outfit necessary. Writing for newspapers, novels or pictures, is not a gift; it is a science that can be acquired by diligent application and proper guidance. It is the most fascinating way of making pastime profitable. Trained ability only is required, we do the training by post. Let us tell you all about it.

DEPARTMENT OF LITERATURE 104.

EVERY DEPARTMENT IS A COMPLETE COLLEGE; EVERY STUDENT IS A CLASS TO HIMSELF

IF YOU ATTEND TO THIS NOW IT MAY MAKE A WONDERFUL DIFFERENCE TO YOUR FUTURE

### COUPON—CUT THIS OUT

TO DEPT. 104, THE BENNETT COLLEGE LTD., SHEFFIELD.

Please send me (free of charge) Particulars of ..... } (Cross out line which Your private advice about } does not apply)

.....  
PLEASE WRITE IN BLOCK LETTERS

Name .....

Address .....

DEPT. 104, THE BENNETT COLLEGE LTD., SHEFFIELD

# Radio Clubs and Societies

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

## GOLDERS GREEN AND HENDON RADIO SOCIETY

AT the annual general meeting of the above society Mr. E. J. E. Hubbard, B.A., A.M.I.E.E., was elected president. The hon. treasurer, Mr. A. J. Bremner, B.Sc., presented a very favourable balance sheet, and it was agreed that the annual subscription should be reduced in order to increase the scope of the society's activities. The meeting was concluded by a most interesting talk on 4-metre micro-waves by Mr. D. N. Corfield. A transmitter was erected at one end of the hall with a receiver fixed at the other end. The effects on reception of reflectors, directional and other types of aerials were demonstrated.

The first test day for 40-metre direction-finding was held on May 1st. The first 5-metre field day will be organised on June 10th. Particulars of these meetings can be obtained by sending a stamped and addressed envelope to Lt.-Col. H. Ashley Scarlett, 60, Pattisou, N.W.2.

## LONDON TRANSMITTING SOCIETY

THE council of the above society have decided to present a second prize of a radio amateur globe (12in. diameter, full colour, with Continental boundaries) to both AA and full licence competitors in our Challenge Cup competition, which we are holding in June, for the best modulated signal from a full licence station, and best crystal-controlled rig of an AA station. All licence-holders in Great Britain may compete, and all entries must reach headquarters by May 28th. Competitors please apply on QSL card, enclosing stamp, to: National Sec., London Transmitting Society, 40, Raeburn Road, Edgware.

## EDGWARE SHORT-WAVE SOCIETY

OVER half the members of this club attended the R.S.G.B. dinner at Barnet, and one of the members was fortunate enough to win one of the prizes.

On April 27th, Mr. R. Dent gave a lecture on his 5-metre transmitter and receiver; he also answered many questions. Mr. Nixon, of the General Electric Company, gave a film show on May 4th, illustrating the way in which valves are made. He also gave a demonstration of the photo-electric cell and relay. The new pentode and 1in. cathode-ray valves were also shown. Messrs. Belling and Lee, Ltd., and Messrs. Webb's Radio have promised to arrange lectures.

Seven new members have now joined the club in the last fortnight, and we now have four fully licenced and six AA members.

Sec., H. Bell, 118, Colln Crescent, Hondon, N.W.9.

## EASTBOURNE AND DISTRICT RADIO SOCIETY

A LECTURE was given in the Science Room at the Cavendish Senior School, East Street, Eastbourne, on May 9th, 1938, at 7.30 p.m., by Mr. E. Morey, of Belling-Lee, on "General Interference Suppression Work." First of all he demonstrated the well-known Eliminoise Anti-Static Aerial, and showed how it should be erected; also, a small lightning conductor was shown which could be used for this particular type of aerial, etc. He also showed other ways of eliminating interference using spike and frame aerials utilising the Eliminoise Anti-static Transformer.

He then went on to explain mains filters used between a set and the mains, and following this he demonstrated various suppressors which are fitted to electrical appliances.

Full information for joining can be had from the hon. secretary, T. G. R. Dowsett, 48, Grove Road, Eastbourne, Sussex.

## BRADFORD SHORT-WAVE CLUB

THIS club has been granted its full licence, and with the inauguration of an apparatus construction committee, interest is quickly developing. Plans are being discussed with a view to holding our first field day early in June, when experiments will be carried out on a similar basis to last year.

On May 29th a 50mc. Rally is to be held by the Halifax Experimental Society, in which the Bradford Short-wave Club intends to participate. Any person who is interested in the club's activities should write to the hon. sec., S. Fischer, "Edenbank," Highfield Avenue, Idle, Bradford, Yorks.

## BOOTLE AND DISTRICT AMATEUR TRANSMITTING CLUB

THIS club, the first in the district, is open to any radio enthusiasts who are really interested in any of the following subjects:—

1. Amateur transmitting.
2. Short-wave radio reception.
3. Quality and/or high-power amplifiers.
4. General radio engineering.

Lectures and demonstrations and visits to local places of interest are being arranged, and we also hope to hold at least one field day this summer. A radio transmitting course for beginners, including the Morse Code, will also be started.

We have had a good response from our appeal for members, and when we have a few more we shall start on our summer programme.

The subscriptions at the moment are 6d. per week on attendance, plus an initial subscription of 2s. 6d.

You are invited to write to the hon. secretary, Mr. C. E. Cunliffe, 308, Stanley Road, Bootle, Liverpool, 20, for application forms, and any particulars relating to the club.

## KING'S LYNN SHORT-WAVE CLUB

A MEETING of the above club was held on Wednesday, May 4th, at the Adult School, New Conduit Street, King's Lynn. The members inspected a room which, it is hoped, can be acquired as a permanent club-room, a receiver installed, and constructional work undertaken. Rapid progress is being made by the Morse class, which is held at the beginning of each meeting. A demonstration was given on crystal grinding, it being shown how a piece of electric crystal could be ground from a quartz spectacle lens, and how, by using the various formulae, the thickness of the crystal could be calculated for the various amateur wave-bands. The lecturer emphasised that while with patience it was fairly easy to produce crystals in the 1.7 and 3.5 mc/s wave-bands, he did not advise trying 7 mc/s as owing to the extreme thinness it was difficult to grind the crystal by hand.—Hon. Sec., G. Rodgers, 112A, High Street, King's Lynn.

## THE EAST SURREY SHORT-WAVE CLUB

AT the second meeting of this club, an interesting talk was given by one of the transmitting members on "Short-wave coils and how to make them." This newly-formed club has attracted many local amateurs, including some well-known transmitters.

Meetings are held at 8 p.m. every other Thursday, at 111, Station Road, Redhill, the next meeting being on May 26th. Full details can be obtained from the hon. sec., Leslie Knight (G5LK), 13a, Hatchlands Road, Redhill.

## BOOKS RECEIVED

PHOTO-ELECTRIC CELL APPLICATIONS, by R. C. Walker, B.Sc. (Lond.) and T. M. C. Lance, Associate I.R.E. Published by Sir Isaac Pitman and Sons, Ltd. 336 pp. Price 12s. 6d.

The third edition of this authoritative book has been carefully revised and brought completely up to date. It deals fully with the practical development of the photo-electric cell and its application to the solution of various technical and industrial problems. There is a chapter on television in which detailed information is given concerning the principles and working of this all-important subject, particularly with regard to the application of the photocell. Other applications of the photo-electric cell dealt with include counting and timing devices, alarms and indicators, advertising devices, sound reproduction, phototelegraphy, and various scientific instruments. The book is well illustrated with half-tones and line drawings, and the experimenter, as well as the student and engineer, should find this work of great service.

## EVERYMAN'S WIRELESS BOOK

By F. J. CAMM

Wireless Principles and Fault Tracking simply explained.

3/6 or 4/- by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

## IMPORTANT BROADCASTS OF THE WEEK.

**NATIONAL (261.1 m. and 1,500 m.)**  
Wednesday, May 25th.—*Mercenary Mary*, a musical comedy.

Thursday, May 26th.—Dance Band programme.

Friday, May 27th.—London Music Festival, 1938, Third Concert, from the Queen's Hall, London.

Saturday, May 28th.—Palace of Varieties programme.

## REGIONAL (342.1 m.)

Wednesday, May 25th.—*Lohengrin*, act 2, from Covent Garden.

Thursday, May 26th.—Midland Parliament: *Family Allowances*, a round table discussion.

Friday, May 27th.—*In Search of Valour*, a play by Teresa Deevy.

Saturday, May 28th.—*Three Valleys Festival: Third Festival Concert*, from the Pavilion, Mountain Ash.

## MIDLAND (296.2 m.)

Wednesday, May 25th.—Orchestral programme, from the Pump Room, Leamington Spa.

Thursday, May 26th.—*Mercenary Mary*, a musical comedy.

Friday, May 27th.—*Send for Paul Temple*, the eighth and final episode.

Saturday, May 28th.—An eye-witness account of the Open Hill Climb at Shelsley Walsh.

## NORTHERN (449.1 m.)

Wednesday, May 25th.—*Lonesome Like*, a Lancashire play by Harold Brighouse.

Thursday, May 26th.—A running commentary on part of the finals in the British Amateur Dancing Championships, from the Empress Ballroom, Blackpool.

Friday, May 27th.—A recital of Methodist Hymns from Monkgate Methodist Church, York.

Saturday, May 28th.—*Conversations at the Piano: Edward Isaacs*.

## WEST OF ENGLAND (285.7 m.)

Wednesday, May 25th.—*Let us Introduce: Vocal programme*.

Thursday, May 26th.—A Variety programme from the Palace Theatre, Plymouth.

Friday, May 27th.—A visit to the Bath and West Show (recorded).

Saturday, May 28th.—Choral and orchestral concert from the Colston Hall, Bristol.

## WELSH (373.1 m.)

Wednesday, May 25th.—A Singing Festival from Garn Chapel, Aberystwyth.

Thursday, May 26th.—Orchestral programme, from the Pier Pavilion, Llandudno.

Friday, May 27th.—*Master Shakespeare and Glendower*, a dramatic feature programme.

Saturday, May 28th.—*Three Valleys Festival: Third Festival Concert*, from the Pavilion, Mountain Ash.

## SCOTTISH (391.1 m.)

Wednesday, May 25th.—*Scottish Dance Music*.

Thursday, May 26th.—Variety from Kings Theatre, Edinburgh.

Friday, May 27th.—*Gnothach Mor am Baile Beag no Mar a Ghoideadh Muc a' Mhuilleir: Big Doings in a Small Village or The Stealing of the Miller's Pig*.

Saturday, May 28th.—Orchestral Programme.

# LETTERS FROM READERS

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).

## T.R.F. versus the Superhet

SIR,—I was interested to read in your paper letters concerning the use of tuned radio-frequency as against the superhet; one point which is put forward in all these discussions is that it is not possible to attain more than a small fraction of the theoretical amplification of the screen-grid valve. It seems to be taken for granted that there is a comparatively low limit set (although immensely above that of the old triode) by the feed-back which takes place, even with the very small grid to anode capacity of modern H.F. pentodes. To prevent instability, coils of very high efficiency are barred out, and moderately efficient coils, and even these screened, are used.

My argument has been "Why not use with the present valves the old system of neutralising, which was so efficacious with the triodes, thus getting an amplification not approached by any other method?" Let me say at once that, before I tried it, I feared that a considerable increase of amplification might possibly be obtained only at a cost of having a receiver so delicately adjusted and so easily upset that it would only be fit for a laboratory. After a lot of trouble and experimenting, an old set with very efficient coils, unscreened and over 3in. diameter, wound with No. 20 wire for medium range, was completely neutralised and made absolutely stable, working perfectly down to 170 metres with the volume control (variable bias on variable-mu pentode) turned right up. Another set with medium-range coils, wound on 2in. ribbed ebonite formers, and unscreened, was stabilised by the same method, the only screening in the sets being a piece of copper sheet about 8in. by 7in. across the base-board. The H.F. pentodes used in the two sets, which are three-valve (H.F., triode, pentode), were Mullard VP4 and Mazda A.C./VP2, both very efficient valves.

I earn my living at repairing sets, so that I have occasion to handle many different makes, and certainly no commercial three-valve set that I have tried equals these old ones in range and power. In North Wales, on an indifferent inside aerial, Droitwich and North Regional, at about 110 and 70 miles, hopelessly overload the output valve; to a smaller extent the Welsh and the Midland also overload it. On this poor aerial, in daylight, Radio-Normandie and Dublin are easily got, also a good part of the time, at less strength, Radio-Lyons and Bournemouth and Plymouth. I am not here dealing with freak results after dark.

Reaction is hardly used at all, except on the long waves, on which range the neutralising holds good as well as on the medium, and the exceptionally good high-note response shows that the amplification is not associated with cutting of sidebands to any extent. The sets are so robust that I can dismantle them to a great extent and

re-assemble, and get perfectly stable operation again without having to readjust the neutralising condenser. The efficiency and stability of the system have exceeded my anticipations.—A. O. GRIFFITHS (Wrexham).

## Cycle Radio

SIR,—I have been a regular reader of PRACTICAL AND AMATEUR WIRELESS for the last six years, and I find it both helpful and very interesting. I have made various types of sets: all-battery models, all-wave sets, amplifiers, and short-wave receivers. I noticed about two or three weeks ago that you wanted a cycle circuit for a cycle radio. Well, I made one last summer and it was very satisfactory, but I was warned by the police that I needed a licence for it.

This may interest you. I wrote the General Post Office *re* my licence, who replied: "You may use your present radio licence providing it is a self-contained set, e.g., batteries, L.S. and set combined. My set is assembled as follows: Set fitted on carrier of cycle with L.T. battery, H.P. slung under cross tube, and L.S. clipped on the handlebars. For this reason I was told I needed another licence, so I scrapped my cycle radio. I have now decided, however, to build another set, but on a smaller scale. In my first set I used old-fashioned valves, etc., which made the set look big and clumsy.

I enclose the circuit (not reproduced) of my cycle radio, only omitting the number of turns on the aerial and reaction windings, and shall be glad if you can help me by giving me the number of turns required.

Could I add another valve to my present set without much extra weight? I intend to use midget valves and components.—J. W. MADDOCK (Wallasey).

[Another valve could be added, and to reduce weight and risks of instability R.C. coupling should be employed. Very little additional weight would result.—Ed.]

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

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

Copyright in all drawings, photographs and articles published in PRACTICAL AND AMATEUR WIRELESS is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden.

## IMPORTANT VALVE DEVELOPMENT

NEW

# COSSOR

TRIODE HEPTODE  
FREQUENCY CHANGER

220TH



The many problems involved in frequency changing in all-wave Battery Receivers are solved with the introduction of the Cossor 220 TH Triode Heptode (sectional view above). This remarkable new valve will maintain high conversion conductance with complete stability. And, due to an exceptionally low oscillator-section-to-modulator grid capacity it effectively prevents pulling between the signal and oscillator circuits. This important advantage holds good even at very low wavelengths—where oscillation is easily maintained—due to the very high slope of the triode section.

### Characteristics

Fil. volts :	2.0
Fil. current (amps.) :	0.2
Max. Anode volts :	150
Max. Screen volts :	150
Max. Triode Anode volts :	100
Slope (Triode) :	1.8 mA/V
Space Current (approx.) :	2.6 mA

PRICE  
**14/-**

Full details on application to Technical Service Dept., at

A. C. COSSOR LTD.,

Cossor House, Highbury Grove, London, N.5.

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		No. of	Universal £5 Superhet (Three	
CRYSTAL SETS		Date of Issue.	valve)	
Blueprint, 6d.		Blueprint		
1937 Crystal Receiver	0.1.37	PW71	F. J. Camm's A.C. £4 Superhet 4	31.7.37
<b>STRAIGHT SETS. Battery Operated.</b>				
One-valve: Blueprints, 1s. each.			F. J. Camm's Universal £4 Super-	
Beginner's One-valver	19.2.38	PW85	het 4	
Two-valve: Blueprints, 1s. each.			"Qualitone" Universal Four	10.1.87
Four-range Super Mag Two (D, Pen)		PW36B		
The Signet Two (D & LF)	29.8.36	PW76		
Three-valve: Blueprints, 1s. each.				
The Long-range Express Three	24.4.37	PW2		
(SG, D, Pen)				
Selectone Battery Three (D, 2 LF		PW10		
(Trans))				
Sixty Shilling Three (D, 2 LF		PW34A		
(RC & Trans))	22.5.37	PW87		
Leader Three (SG, D, Pow)	29.5.37	PW30		
Summit Three (HF Pen, D, Pen)	12.6.37	PW41		
All Pentode Three (HF Pen, D	16.3.35	PW43		
(Pen, Pen)				
Hall-Mark Three (SG, D, Pow)	13.4.35	PW49		
Hall-Mark Cadet (D, LF, Pen (RC))	June '35	PW1		
F. J. Camm's Silver Souvenir (HF				
Pen, D (Pen), Pen) (All-wave				
Three)	8.6.35	PW51		
Genet Midget (D, 2 LF (Trans))				
Cameo Midget Three (D, 2 LF		PW53		
(Trans))				
1936 Sonotone Three-Four (HF		PW55		
Pen, HF Pen, Westector, Pen)		PW61		
Battery All-Wave Three (D, 2 LF		PW62		
(RC))	14.8.37	PW64		
The Monitor (HF Pen, D, Pen)		PW66		
The Tutor Three (HF Pen, D, Pen)	29.8.36	PW69		
The Centaur Three (SG, D, P)	5.12.36	PW72		
The Gladiator All-Wave Three	4.12.37	PW82		
(HF Pen, D (Pen), Pen)				
F. J. Camm's Record All-Wave	28.8.37	PW78		
Three (HF Pen, D, Pen)				
The "Colt" All-Wave Three (D,	22.1.38	PW84		
2 LF (RC & Trans))				
The "Rapid" Straight 3 (D,	26.3.38	PW87		
2 LF (RC & Trans))				
F. J. Camm's Oracle All-Wave				
Three (HF, Det, Pen)				
1938 "Triband" All-Wave Three				
(HF Pen, D, Pen)				
F. J. Camm's "Sprite" Three				
(HF Pen, D, Det)				
Four-valve: Blueprints, 1s. each.				
Sonotone Four (SG, D, LF, P)	1.5.37	PW4		
Fury Four (SG2, D, Pen)	8.5.37	PW11		
Beta Universal Four (SG, D, LF,		PW17		
Cl. B)				
Nucleon Class B Four (SG, D,	6.1.34	PW34B		
(SG), LF, Cl. B)		PW34C		
Fury Four Super (SG, SG, D, Pen)		PW40		
Battery Hall-Mark 4 (HF, Pen,		PW67		
D, Push-Pull)				
F. J. Camm's "Limit" All-Wave	26.9.36	PW70		
Four (HF Pen, D, LF, P)				
All-Wave "Corona" 4 (HF Pen,	9.10.37	PW70		
D, LF, Pow)				
"Acme" All-Wave 4 (HF Pen, D	12.2.38	PW83		
(Pen), LF, Cl. B)				
<b>Mains Operated.</b>				
Two-valve: Blueprints, 1s. each.				
A.C. Twin (D (Pen), Pen)		PW18		
A.C.-D.C. Two (SG, Pow)		PW31		
Selectone A.C. Radiogram Two		PW10		
(D, Pow)				
Three-valve: Blueprints, 1s. each.				
Double-Diode-Triode Three (HF		PW23		
Pen, DDT, Pen)		PW25		
D.C. Ace Three (D, Pen)		PW29		
A.C. Three (SG, D, Pen)		PW35C		
A.C. Leader (HF Pen, D, Pow)		PW35B		
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW36A		
Ubique (HF Pen, D, (Pen), Pen)	28.7.34			
Armada Mains Three (HF Pen, D,		PW38		
Pen)				
F. J. Camm's A.C. All-Wave Silver	11.5.35	PW50		
Souvenir Three (HF Pen, D,				
Pen)				
"All-Wave" A.C. Three (D, 2		PW54		
LF (RC))				
A.C. 1936 Sonotone (HF Pen, HF		PW56		
Pen, Westector, Pen)				
Mains Record All-Wave 3 (HF	5.12.36	PW70		
Pen, D, Pen)				
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80		
Four-valve: Blueprints, 1s. each.				
A.C. Fury Four (SG, SG, D, Pen)		PW20		
A.C. Fury Four Super (SG, SG, D,		PW31D		
Pen)				
A.C. Hall-Mark (HF Pen, D,	24.7.37	PW45		
Push-Pull)				
Universal Hall-Mark (HF Pen, D,	0.2.35	PW47		
Push-Pull)		PW81		
A.C. All-Wave Corona Four	0.11.37			
<b>SUPERHETS.</b>				
Battery Sets: Blueprints, 1s. each.				
£5 Superhet (Three-valve)	5.6.37	PW40		
F. J. Camm's 2-valve Superhet	13.7.35	PW52		
F. J. Camm's £4 Superhet		PW59		
F. J. Camm's "Vitesse" All-	27.2.37	PW75		
Waver (5-valver)				
Mains Sets: Blueprints, 1s. each.				
A.C. £5 Superhet (Three-valve)		PW43		
D.C. £5 Superhet (Three-valve)	1.12.34	PW42		

These Blueprints are drawn full size. Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the Blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless ... 4d. Post Paid  
 Amateur Wireless ... 4d. " "  
 Practical Mechanics ... 7d. " "  
 Wireless Magazine ... 1s. " "

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, P.M. to Practical Mechanics, W.M. to Wireless Magazine.

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

New Class B Five (2 SG, D, LF, Class B)				
<b>Mains Operated.</b>				
Two-valve: Blueprints, 1s. each.				
Conoelectric Two (D, Pen) A.C.				AW403
Economy A.C. Two (D, Trans) A.C.				WM286
Unicorn A.C.-D.C. Two (D, Pen)				WM394
Three-valve: Blueprints, 1s. each.				
Home-Lover's New All-electric				
Three (SG, D, Trans) A.C.				AW383
S.G. Three (SG, D, Pen) A.C.				AW890
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33			AW399
A.C. Pentaquester (HF Pen, D,			23.6.34	AW439
Pen)				
Mantovani A.C. Three (HF Pen,				WM374
D, Pen)				
£15 15s. 1936 A.C. Radiogram			Jan. '36	WM401
(HF, D, Pen)				
Four-valve: Blueprints, 1s. 6d. each.			July '33	WM326
All-Metal Four (2 SG, D, Pen)				
Harris' Jubilee Radiogram (HF			May '35	WM386
Pen, D, LF, P)				
<b>SUPERHETS.</b>				
Battery Sets: Blueprints, 1s. 6d. each.				
Modern Super Senior			Oct. '35	WM375
Varsity Four			June '36	WM395
The Request All-Waver				WM407
1935 Super Five Battery (Superhet)				WM379
Mains Sets: Blueprints, 1s. 6d. each.				
1934 A.C. Century Super A.C.				AW425
Heptode Super Three A.C.			May '34	WM359
"W.M." Radiogram Super A.C.				WM386
1935 A.C. Stenode			Apr. '35	WM385
<b>PORTABLES.</b>				
Four-valve: Blueprints, 1s. 6d. each.				
Midget Class B Portable (SG, D,			20.5.33	AW380
LF, Class B)				
Holiday Portable (SG, D, LF,				AW393
Class B)				
Family Portable (HF, D, RC,			22.9.34	AW447
Trans)				
Two H.F. Portable (2 SG, D,			June '34	WM363
QP21)				WM367
Tyers Portable (SG, D, 2 Trans)				
<b>SHORT-WAVE SETS—Battery Operated</b>				
One-valve: Blueprints, 1s. each.				
S.W. One-valve converter (Price 6d.)				AW329
S.W. One-valve for America	23.1.37			AW429
Rome Short-Waver				AW452
Two-valve: Blueprints, 1s. each.				
Ultra-short Battery Two (SG det.,			Feb. '36	WM402
Pen)				
Home-made Coil Two (D, Pen)				AW440
Three-valve: Blueprints, 1s. each.				
World-ranger Short-wave 3 (D,				AW355
RC, Trans)				
Experimenter's 5-metre Set (D			30.6.34	AW438
Trans, Super-regen)				
Experimenter's Short-waver (SG,			Jan. 10, '35	AW463
D, Pen)				WM390
The Carrier Short-waver (SG D, P)			July '35	
Four-valve: Blueprints, 1s. 6d. each.				
A.W. Short-wave World-Beater				AW436
(HF Pen, D, RC, Trans)				
Empire Short-Waver (SG, D, RC,				WM313
Trans)				
Standard Four-valver Short-waver			Mar. '35	WM383
(SG, D, LF, P)				
Superhet: Blueprint, 1s. 6d.			Nov. '35	WM397
Simplified Short-waver Super				
<b>Mains Operated.</b>				
Two-valve: Blueprints, 1s. each.				
Two-valve Mains Short-waver (D,				AW453
Pen) A.C.				
"W.M." Band-spread Short-waver				WM369
(D, Pen) A.C.-D.C.				WM380
"W.M." Long-wave Converter				
Three-valve: Blueprint, 1s.				WM396
Emigrator (SG, D, Pen) A.C.				WM352
Four-valve: Blueprint, 1s. 6d.				
Standard Four-valve A.C. Short-			Aug. '35	WM391
waver (SG, D, RC, Trans)				
<b>MISCELLANEOUS.</b>				
Enthusiast's Power Amplifier (1/6)			June '35	WM387
Listeners' 5-watt A.C. Amplifier			Nov. '35	WM398
(1/6)				
Radio Unit (2v) for WM392			Dec. '35	WM399
Harris Electrogram (battery am-				WM403
plifier) (1/-)				
De-Luxe Concert A.C. Electro-			Mar. '36	WM403
gram				
New Style Short-Wave Adapter			June '35	WM388
(1/-)			Jan. 5, '35	AW462
Trickle Charger (6d.)				AW456
Short-wave Adapter (1/-)				AW457
Superhet Converter (1/-)				
B.L.D.L.C. Short-wave Converter			May '36	WM405
(1/-)			June '36	WM406
Wilson Tone Master (1/-)				
The W.M. A.C. Short-Wave Con-				WM403
verter (1/-)				



# QUERIES and ENQUIRIES

## Double Earths

"I have experienced considerable difficulty in cutting out some crackles which occur in my house and which I am unable to trace. When heavy traffic passes or anyone walks through the hall the noise occurs, and I have taken all the switches down and cleaned them and made certain that all lamps fit well in the holders. The set is not responsible as I have banged this and examined all connections.—Can you suggest anything else?"—J. D. (N.W.5).

WE have one previous instance of a trouble of this nature which proved just as difficult to trace. Eventually it was found to be due to a lead-covered electric-light cable coming into contact with a gas pipe beneath the flooring. The cable sagged slightly and just cleared the gas-pipe. When subjected to vibration it just touched the pipe, and although both are earthed effectively the "closed loop" effect which we have before mentioned, apparently caused the noise. The light supply was tested and found to be perfectly free from leakage, but the noise was cured merely by wrapping the pipe with insulation tape. To prevent further movement the two were strapped together with a sheet of wood between them. We suggest you investigate from this point of view.

## Inter-chassis Connection

"I am building a new receiver with separate sections to facilitate experiments. The H.F., Detector, L.F., and mains sections are being built on separate chassis, but I am a little doubtful regarding the best way of making connection between the individual chassis. What would you suggest as the best plan for this particular idea?"—H. M. (Westcliff).

YOU do not indicate how you are arranging the output and input of each unit, and this makes it rather difficult to advise. You would probably find, however, that by fitting an ordinary valveholder and using 5-pin valve base plugs for inter-connection, that this will cover the majority of cases, but you may find it necessary to use a separate two-pin plug and socket scheme for the L.T. heater supply.

## The Corona Receiver

"I have built the Corona four, but am at a loss what detector valve to use. The valves mentioned are Det. 210 Met and 210 plain, but no special make. The power valve I use is super-power and the S.G. 210 VPT. I have several makes of valves of the 210 type. I have tried the Mullard PM.1HL and 2 DX also Cossor 210 RC, 210 Det., 210 HF, Mazda HLa and L2, but they all seem to give the same result. Could you tell me which is the best detector valve to use?"—J. R. (Port Talbot).

THE type 210 Det. is a Cossor reference, and all of the valves specified are of the Cossor type. As you have found, there is very little difference in the detector stage when using valves of the medium impedance type and although an R.C.

valve has been tried and fails to give greater amplification (in spite of the increased amplification factor), this is due to the fact that the anode load resistance is not high enough to give good matching of the valve. You should, therefore, retain the Cossor 210 Det. valve, which you have by you for this stage. The metallised valve is used in the detector stage and the plain valve in the L.F. stage, V.3.

## Transformer Response

"I have a small L.F. transformer but note that the bass falls off rapidly and I should like to improve this. I am using the transformer direct-coupled and am uncertain regarding parallel feeding it as I have only a limited H.T. voltage available. I wonder whether you can suggest any way of improv-

### RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newman, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

ing the bass response in this particular case."—E. P. (Scarborough).

THE bass response depends upon the current flowing through the primary and thus if you do not wish to cut out the current entirely, by parallel-feeding the transformer, the only way you can improve things is to reduce the existing current. This will obviously reduce the H.T. applied to the valve and thus you will not obtain the same volume, but we imagine that you are more concerned with quality than volume at this stage and therefore this is the improvement to make.

## Tapping a Coil

"I am building an experimental short-wave set but am doubtful regarding the method of using a coil. I want to experiment with different degrees of aerial coupling, for which I understand it is in order to use a tapping clip on the grid coil. As, however, I also wish to experiment with the reaction circuit in the same manner with a clip on the grid coil I wonder if the coil will work in three separate sections in this way."—M. T. D. (Llandudno).

IT is quite in order to use the idea proposed, and this is, in fact, quite a common method of using experimental apparatus, especially in transmitting equipment. Care must, of course, be taken to make cer-

tain that the tapping clips do not short adjacent turns, and remember that the clips should fit tightly or background noises will be produced if the coil is subjected to vibration.

## The Imp Portable

"I wish to make a small portable for outdoor use and the Imp looks from the pictures as though it would meet my requirements. I have never built a receiver, not even a simple crystal set and I wonder, therefore, whether this set is suitable for a raw amateur to attempt. If it is not, can you suggest any other set of a similar type which I could undertake?"—I. A. B. (Hastings).

THE receiver could be constructed by you, although naturally, you would find it necessary to proceed with care from stage to stage. All the necessary constructional details are given in the issues and a full-size blueprint is available upon which will be found the coil-winding details. A complete kit of the parts may be obtained from Messrs. Peto-Scott to simplify ordering from various sources, and the coil may also be obtained ready-made if desired.

## G.B. Battery Life

"I have just bought the first H.T. battery for my set which was supplied ready fitted, and am very disappointed that the tone is not now nearly so good as it was before I took out the old battery. I have put the plugs in the right sockets and should be glad if you could explain why the tone is not so good now."—H. E. (Glasgow).

YOU have probably overlooked the fact that the grid bias battery also may need replacement. If, of course, the set has automatic grid bias this point will not arise, and there is a possibility then that the valves are faulty or that some trouble has been caused in changing the battery. The most likely reason is, however, that when the H.T. battery was getting low the bias applied was suitable, but in the original setting you were using too little bias. Have the G.B. battery tested, and we think you will find that this is the trouble.



The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

J. F. (Kildimo, I.F.S.). Your receiver may not be suitable for the particular unit and we suggest you get into touch with the makers regarding this point.

F. G. (W.C.1). The trouble is often experienced on the short waves and we can only suggest that you use a separate feed to the detector stage, with its own smoothing choke and extensive decoupling. Chokes may be necessary in the filament leads. We cannot trace any previous queries from you.

R. G. (Bridport). The coils in question are not suitable for modern designs. Use the coil specified.

T. E. (Gloucester). The choke should be removed and in place of it the primary of the H.F. transformer should be connected. The remaining connections are left as at present.

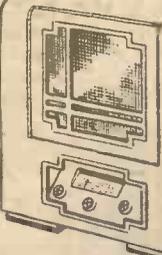
A. M. (S.E.6). Either receiver may be used, but the superhet may be relied upon to give better selectivity.

L. E. A. (Dover). The interference cannot be removed and we suggest that you try an alternative wavelength.

M. E. R. (Torquay). At least three valves should be used and if possible variable-mu control should be fitted. The Class B stage will give greater volume but you may prefer the tone of a single output stage.

The coupon on page iii of Cover must be attached to every query.

Keep your Set at its BEST!



with the **AVOMATOR**  
Regd. Trade Mark  
ELECTRICAL MEASURING INSTRUMENT

Use the D.C. Avomator periodically to check up valve performance, batteries and power output. Thus you'll always keep your set in good trim. A 13-range precision-built instrument, it tells you all you need to know, and enables you to locate speedily the seat of any trouble. Direct readings. No calculations. Complete in case with instruction book, leads, test prods and crocodile clips.

**13 METERS IN ONE**

CURRENT	VOLTAGE
0-6 milliamps	0-6 volts
0-30 "	0-12 "
0-120 "	0-120 "
	0-240 "
	0-300 "
	0-600 "

**45/-**  
Deferred terms if desired.

**RESISTANCE**

0-10,000 ohms
0-60,000 "
0-1,200,000 "
0-5 megohms

Sole Proprietors & Manufacturers:  
**The Automatic Coil Winder & Electrical Equipment Co., Ltd.,**  
Winder House,  
Douglas St., S.W.1  
Telephone: Victoria 3404/7

**ELECTRADIX**

**SIGNAL KEYS.** Royal Air Force model, balanced action, all solid brass bar, tungsten contacts, indicator lamp. Type K88L, a gullkey for 7/6. Other keys from 4/8 to 50/-. Special Illustrated Key List.

**WIND DYNAMOS.** Start generating at 800 revs/810 amps, ball bearing, enclosed type, 35/-.  
**LUCAS AERO,** 9/12 volts, 160 watts D.C. with enclosed Automatic Cut-Out. As used on Aircraft wireless. Cost £15. Sale 20/-.  
**DYNAMO HT, DUAL** 600 volts for H.T. 100 ma. and L.T. 6 volts 5 amps. Sale 25/-.

**A BARGAIN IN DYNAMOS.** Type "V." Our latest for Lighting or Cell Charging. 140 watts. Enclosed Dynamo. 12-20 v. 12 amps. Ball Bearings. Vee Pulley, 35/-. Set with Marine Type Switchboard with Ammeter, maximum and minimum Auto Cut-out Main Switch and Fuses, Field Regulator, 65/-.

**ELECTRIC PUMPS,** for A.C. or D.C., 12 v. to 230 v. Centrifugal all-bronze pump, throws 120 galls. per hour. For 6ft. fountain, Caravans, Bungalows and Boats, 97/6. Larger pumps quoted for.

**AIR COMPRESSORS,** for Paint Spraying, Set Cleaning, Inflation, etc. Foot operated, 37/6. Electric, No. 1 size, 55/18/- No. 2 Twin-cyl., £7,10/-.

A few S.H. in good order, cheap.

**CAR CHARGERS.** From A.C. mains for 5 amps. D.C., £4,17/6. Smaller Model for 2 amps. charge, 75/-.

**WESTINGHOUSE Metal Rect. Units.** 110 volts 1 amp., 35/- 55 volts 1 amp., 37/6. 20 volts 2 amp., 40/- 9 volts 2 amp., 28/-.

**ELECTRIC SOLDERING IRONS.** Heavy workshop type, 125 watt. 220/250 volts. 8/6. Big 220v. Alarm Bell, 10' long, 39/-.

**220 VOLT FOOTWARMER** Electric Mats, covered fibre, 7/6. Bed-warmers Blanket Pads, 220 volts, 12/6. Some 110 volts, 10/6.

**SHORT-WAVE BATTERY KITS** with oak cabinet ready for wiring, 18 x 7 x 6in., 15/-.

**PUSH BUTTON TUNING.** 6-way Gang Push, metal cover, 1/6. Multiple Cord, 6d.

**CRYSTAL SETS** are popular for clear, quiet reception. Cheap and need no battery. Mahog. case Model B, 9" x 9", 7/6. Hegd-phones, 2/6 and 4/6.

**FIXED CONDENSERS** for odd smoothing jobs, 5,000 Mansbridge 1 mfd. Condensers to clear at 2/- doz., 20/- gross. Large range of H.T. Condensers up to 8,000 volts.

**GRAMO-MOTORS.**—UNIVERSAL Gramo. Recording Motors with 12in. turntable. 200/250 volts, £3/10/-. Standard A.C. Gramo-motors, and turntable, 25/-.

**2 VOLTS TO H.T. UNIT.** Vibrator type with metal rectifier for 2 v D.C. to 80 v D.C., 37/6.

**SPEAKER BARGAINS.**—Moving-coil, energised Qin. cone, scilced, but good, famous makers, 4/6 only.

**P.A. AMPLIFIERS.**—For all purposes where sound amplification is wanted. Complete and cases. Special Bargains in List.

**P.A. SPEAKERS** by Tannoy, Prism and Vitavox, cheap.

**PARCELS** of experimental odd coils, magnets, wire, chokes, switches, terminals, etc., post free: 10 lbs., 7/- 7 lbs., 5/-.

**JUNE BARGAIN LIST "N" FREE ON REQUEST.**

**ELECTRADIX RADIOS,**  
218, UPPER THAMES STREET, LONDON, E.C.4  
Phone: Central 4611.

# PREMIER SUPPLY STORES

**POST ORDERS**  
"Jubilee Works"  
167, Lower Clapton Rd., London, E.5. Amherst 4723.

**CALLERS**  
can now obtain their requirements at "Jubilee Works," as well as—  
165 & 165a, Fleet Street, E.C.4 Central 2833, and  
50, High Street, Clapham, S.W.4. Macaulay 2381.

Premier 90 Page Giant Illustrated Catalogue, Handbook, and Valve Manual. Now Ready, Price 6d.

**SPECIAL OFFER ROLA SPEAKERS.**  
8" P.M.'s, 15/-; 10" P.M.'s, 19/11; G.12 12" High Fidelity P.M., 79/6; G.12, Mains Energised, 57/6.

**SPECIAL STOCKTAKING OFFERS.** There are only a few of each item, and they will be speedily sold out, so get your bargain now!

**MAGNAVOX** 6 1/2" Moving Coil Speakers—2,500, 6,500 and 10,000 ohm fields—with transformers—3/11 each.

**MAGNAVOX** 8" Moving Coil Speakers—2,500 and 6,500 ohm fields with transformers—4/11 each.

**MAGNAVOX** 8" 1,500 ohm field, no transformer, 3/3 each.

**B.T.H.** 8" 7,500 ohm field, no transformer, 2/11 each.

**110 K.C. I.F. Transformers,** 1/3.

**LISSEN** Power Packs in aluminium cases, 150v., 25 m.a., with 6.3v. L.T., 100-250v. mains, 10/6, with Rectifier.

**METAL RECTIFIERS,** 250v., 60 m.a. output, 4/6 each.

**Telsen** Slow Motion Drives, 9d. each. Telsen Twin H.F. Chokes, 6d. each. Telsen Variable Condensers, .0001 or .00075 bakelite, Dielectric, 6d. each.

**Phillips** Wet Electrolytics 4mf. or 8mf., 320v. working for universal sets, 10d. each.

**T.C.C.** 15mf., 100v., Dry Electrolytics, 4d. each.

**Cossor** 1+1mf. Condensers, 3d. each.

**2-Gang .00016** all brass shortwave statite based Condensers, 2/11 each.

**Potentiometers,** 1/- each. [10,000, 25,000, 250,000, 500,000, 1 meg., 2 meg., with switch, 1/3 each, 10,000, 20,000, 250,000, 500,000.

**MAINS TRANSFORMERS.** Primary 200-250 v. Secondaries, 350-0-350v., 00 m.a., 4v., 2a., 4v., 5a., 4/6. Primary 230v.-250v. only. Secondary 250-0-250v., 60 m.a., 4v., 2a., 13v., 1a., 3/6.

**3-Gang Condenser .0005,** shielded with trimmers and slow-motion dial, 3/11.

**AMERICAN TYPE VALVES.** All the following types at 2 for 3/-: 45, 46, 6C8, 71A, 2A6, 58, 57, 33, 42, 41, 12Z3, 56, 53, 85, 6A7, 50, 12A, 2A3, 2B7, 55, 2(50), 78, 2A7, 77, 24, 2(81), 35/51, 2(10).

**BATTERY VALVES,** 2 volts, H.F., L.F., 2/3. Power, Super-Power, 2/9. Var-mu-S.G., 4- or 5-pin Pentodes, H.F. Pens., V-mu-H.F. Pens, 5/- Class B, 5/- Freq. Changers, 7/6.

**EUROPA MAINS VALVES.** 4v. A.C. Types, A.C./H.L., A.C./L., A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P., and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens. I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. Changers, 8/6; Double Diode Triodes, 7/6; Triode Hex. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 3 1/2 watt, D.H. Triode, 7/6.

**UNIVERSAL TYPES.** 20v. 18a, S.G., Var-mu, S.G. Power, H.F. Pen., Var-mu, H.F. Pen, 4/6 each.

**13v. 2a. Gen. Purpose Triodes,** 5/6; H.F. Pens and Var-mu. H.F. Pens. Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

**PREMIER 5 VALVE ALL-WAVE SUPERHET CHASSIS,** 16.5/2100, A.V.C. Over 4 watts output. 200/250 volt A.C. mains. With American Octal valves and moving coil speaker, £5/19/6.

**PREMIER "TROLITUL" Short-Wave CONDENSERS.** Certified superior to Ceramic. All-brass Construction, 15 mmfd., 1/6, 40 mmfd., 1/9, 100 mmfd., 2/-, 160 mmfd., 2/3, 250 mmfd., 2/6, Double Spaced 15 mmfd., 2/9, 40 mmfd., 3/6; S.W.H.F. Chokes, 9d.; screened 1/8. All-Brass S.W. Condensers with integral slow-motion .00015 Tuning, 4/3; 00015 Reaction, 3/9. UTILITY 4" MICRO-CURSORS DIALS. Direct and 100:1 ratio, 3/9 each.

**SHORT-WAVE COILS,** 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. coil, 11-25. 19-43, 38-86 metres. Suitable any type circuit, 2/6.

**COIL FORMERS,** 4- or 6-pin low-loss, 1/- each.

## Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

**RECEIVERS, COMPONENTS AND ACCESSORIES**  
Surplus, Clearance or Secondhand, etc.

# RADIOMART

THE SHORT-WAVE SPECIALISTS

We carry large stocks of British and American Short-wave Apparatus and Components. Our latest S/W Catalogue has many new lines illustrated and fully described. Send 1d. stamp for a copy; post free.

**A SPECIAL BARGAIN**  
W.B. 8" Permanent Magnet Speakers.  
Extension Type 7/6 Standard Type (no Transformer) (with Transformer) 12/6

**G5NI 66-PAGE MANUAL** for all 7 1/2 D. Post short-wave fans 2 Free

# RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

**V. VAUXHALL.**—Polar Midget condensers, 2-gang, 6s. 8d.; 3-gang, 8s. 9d.; 4-gang, 13s. 6d. Polar full vision horizontal drives, 5s.

**V. VAUXHALL.** Hivac valves, entire range, full discounts. Polar station-named scales for horizontal drives, 1s.

**V. VAUXHALL.** T.C.C. electrolytic condensers, 8 mfd. and 4 mfd. 500 volt, 2s. 6d.; 50 mfd. 50 volt, 1s. 6d.

**V. VAUXHALL.** Iron-cored coils, 3-gang, on base, with circuit, 17s. J.B. drives with station-named scale, 5s. 6d.

**V. VAUXHALL.** Rola P.M. speakers, 7in. cone, 14s. 9d.; 10in. cone, 19s. 6d. Energised models, 2,500 field coils, 7in., 12s. 6d.; 10in., 17s. 6d.

**V. VAUXHALL UTILITIES,** 163a, Strand, W.C.2. Temple Bar 9338. Send postcard for free list. Post paid 2s. 6d. and over, or C.O.D.

**CONVERSION UNITS** for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components.

**W. WARD,** 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

**1938 RADIO** at 50 per cent. Discount. Components, Speakers, Receivers, etc. 4d. stamp.—**COULPHONE, ORMSKIRK.**

**BANKRUPT BARGAINS.**—List free. All new goods. Decca 1938 A.C./D.C. 5v. all-wave transportable superhets, £5. Philco 1938 all-wave battery sets, £4. Brunswick 6v. 4-band 1938 superhets, 7gns. Altham 3v. all-wave battery sets, 57/6. 50 others; also valves and accessories. State requirements.—Butlin, 6, Stanford Avenue, Brighton.

## VALVES

**A** MERICAN Valves in Sealed Cartons, all types, 5/6, post paid.—Valves, 661/3, Harrow Road, N.W.10.

## LOUDSPEAKER REPAIRS

**L** OUDSPEAKER repairs, British, American, any make. 24-hour service, moderate prices.—Sinclair Speakers, Alma Grove, Copenhagen Street, London, N.1.

**R** EPAIRS In Moving Coil Speakers, Cones and Coils fitted and Rewound. Fields altered. Prices Quoted including Eliminators. Loudspeakers Repaired, 4/-; L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction, Prompt Service, Estimates Free.—L.B. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

# A Selection for the Modern Handyman

"THE HOME MECHANIC" SERIES—

## ACCUMULATORS

MOTOR UPKEEP AND OVERHAUL

THE HOME WOODWORKER. MODEL AEROPLANES AND AIRSHIPS

25 SIMPLE WORKING MODELS THE HANDYMAN'S ENQUIRE WITHIN

SIMPLE ELECTRICAL APPARATUS AND EXPERIMENTS

MODEL BOAT BUILDING TOY MAKING FOR AMATEURS

LATHE WORK FOR AMATEURS

HOUSE DECORATING AND PAINTING

POWER DRIVEN MODEL AIRCRAFT

THE HOME ELECTRICIAN

This series of practical handbooks is designed to answer the questions of the amateur mechanic or craftsman. Each volume is clearly written by an expert and profusely illustrated with photographs and diagrams.

From all Booksellers 1/- net each Or by post 1/2 from the Publishers

GEORGE NEWNES, LTD. (BOOK DEPT.),

TOWER HOUSE, SOUTHAMPTON STREET, LONDON, W.C.2.

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

### RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1. Holborn 4631.

**RADIO CLEARANCE announce another SPECTACULAR purchase.** Following closely our recent Clearance of the whole of the Radio Stocks of Messrs. Gambrells, we now offer 100 only, **PHILIPS 5-Valve plus Magic Eye, A.C. All Wave Superhet Chassis, fitted complete with 5 Mullard Valves, Speaker and special Matching Transformer.** A conventional and proved Superhet Circuit is used, Valve sequence as follows: FC4, VP4B, TDD4, Pen 4 DD, Philips 1821 Rectifier, plus Magic Eye Tuning Indicator. The Chassis is a typical Philips product, beautifully finished, Controls twin type, Tone and Volume, Tuning and Wave Change. Magnificent plate glass Dial, Edge Illumination, Handsomely Engraved. Magic Eye for accurate and easy tuning, Coloured Wave Change Indicator. Price complete with Valves and Speaker, £4 19s. 6d.

A limited quantity of Heavy Walnut Radiogram type Cabinets for above, slightly soiled, 25/- each. These Cabinets are constructed throughout of Heavy Timber, and, in conjunction with the above Chassis, form an Ideal Radiogram Combination.

Still Available limited quantity of Gambrell 7-Valve All-Wave, All Stage Chassis, as previously advertised. Fitted latest Harries All Stage Valves (one valve for all positions, etc.). Four Wave Bands, Provision for Pick-up and Extension Speaker. £4 9s. 6d., complete with Valves. Chassis, complete with Valves and Celestion 10" Speaker, £4 19s. 6d. each. As above, but fitted in Handsome Table piano finish Walnut Cabinet, complete with Valves and Speaker, £5 10s. each. Carriage 2s. extra. As above, but fitted in Handsome piano finish Walnut Console Cabinet, complete with Valves and Speaker, £6 6s. each. Carriage and Crating, 5s. extra.

Hunt's 1,000 mfd. Cardboard Electrolytics, Wire Ends Peak Voltage, 12 volts, 2/- each. Special offer in 1/2 gross lots only, T.C.C. 0.1 Wire End, Tumulars, 15/- per half gross.

Polar N.S.F. Resistances, Our Selection, 1/2, 1, 2 and 3 watt, 4/- gross.

Tubular Condensers, our selection, 1/- dozen. Dubilier 1 meg. Volume Controls, with Switch, standard model, very compact, 1/6 each.

H.T. Type Rectifiers (skeleton type). A really splendid job, 4/6 each. 6 Bank 4 Position Vaxley Type Switches, beautifully finished. Each Bank 5 Contact Type, plus Common. 5/- each.

Visual Tuning Indicator, m/a type, complete with mounting Bracket, 1/3 each.

3-gang, .0005 Straight Condensers. A precision instrument with Ceramic Insulation, suitable for all Circuits, including All-wave, 3/- each.

Dials for above, 2-Spool type, 9" Long, 5" Wide. Station Marked for 4 Wave Bands, Two Short, Medium and Long, 4/6 each.

455 I.F.s. Iron Cored, with Trimmers, 2/6 each. Plessey Can Type Condensers (Electrolytics), complete with Fixing Clamp, 8 plus 16 Mfd. 8 Mfd., working voltage 350, 16 Mfd., working voltage 350. 2/- each.

Plessey 16 Mfd., 150 volt working, 1/3 each. Special offer Mains Transformers, 350-0-350, 120 m.a. 15 volts C/T at 4 amp., 4 volts C/T at 2.5 amp. Mains Input Adjustable 200-250 volts. Heavily Shrouded, 4/6 each. Postage 1/-.

**SPECIAL SUMMER OFFER AEROBILLO AIR BEDS.** Ideal for the Garden, River and Sea. Take one with you on your Holiday, easily inflated, listed 22s. 6d. Our price, 9s. 6d. each., plus 9d. postage.

All orders 5s. or over Post Free. Orders under 5s. must be accompanied by a reasonable amount for postage. C.O.D. orders under 5s. cannot be accepted. Hours of business 9 a.m. to 7 p.m. week-days, 9 a.m. to 1 p.m. Saturdays. Enquiries cannot be dealt with unless 14d. stamp enclosed.

**RADIO CLEARANCE, 63, High Holborn, W.C.1. Holborn 4631.**

### NEW RECEIVERS AND CHASSIS

ARMSTRONG Company pioneer firm supplying all British Radio receivers in chassis form, announce several new models as under:

ARMSTRONG Model 3NBP/T, 7v. (including Cathode Ray), all-wave radiogram chassis, complete with moving coil speaker, £7/18/6.

ARMSTRONG Model RF73/T; this 8-valve chassis has been designed in answer to many requests for a luxury chassis with smaller output.

ARMSTRONG Model RF94/T 10-valve Radiogram Chassis, with 10 watts push-pull output; £13/13.

ARMSTRONG Latest Catalogue Contains Illustrated Technical Data of Model 3NBP/T; also many new models.

ARMSTRONG Chassis Carry Generous Guarantee, no charges for material, labour, or carriage for 12 months.

ARMSTRONG Chassis Sent on 7 Days' Trial, packing and carriage free.

ARMSTRONG Co., 100, King's Road, Camden Town, N.W.1, Gulliver 3105.

## EVERYTHING RADIO

SUPPLIED FOR CASH OR ON EASY TERMS

ITEM	Cash Price	With Order	Monthly Payment
S.T.900 Complete Kit	5 15 3	10/-	11 of 10/7
W.B. Stentorian Senior 388	2 2 0	2/6	11 of 4/-
Garrard A.C.6 Radiogram Unit	3 15 0	5/6	11 of 7/-
Garrard A.C.6 Motor only	2 2 6	4/-	10 of 4/3
Bothermel Piczo - Electric Pick-up	2 2 0	4/-	10 of 4/3
Avonmor Test Meter	2 5 0	5/-	10 of 4/6
Goodman's L.S. Twin-Coax Unit	3 10 0	6/6	11 of 6/5

### CASH or C.O.D.

ORDERS DELIVERED BY RETURN OF POST. We can guarantee such prompt delivery only because we carry large stocks and, being placed so favourably, we are able to secure anything Radio or Electrical immediately.

Write us your requirements — we will quote best terms by return.

3 MINUTES FROM ST. PAULS



**LONDON RADIO SUPPLY**  
ESTD. COMPANY 1925  
11, OAT LANE, NOBLE ST. LONDON, E.C.2.  
Phone: NATIONAL 6828-9

## ENGINEERING OPPORTUNITIES

268 PAGES

**Free!**

This unique Handbook shows the easy way to secure A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.R., A.M.I.A.E., A.M.I.W.T., A.M.I.R.E., and similar qualifications. WE GUARANTEE—NO PASS NO FEE. Details are given of over 150 Diploma Courses in all branches of Civil, Mech., Elec., Motor, Aero, Radio and Television Engineering, Building, Government Employment, etc. Write for this enlightening Handbook to-day FREE and post free.

British Institute of Engineering Technology, 469, Shakespeare House, 17, 18, 19, Stratford Pl., W.1

## ARGON CHARGER

Use the MAINS TRANSFORMER SELECTED and SPECIFIED by the DESIGNERS of this most efficient L.T. Charger. Built and Guaranteed by Electrical Engineers of 40 Years' Experience. Post FREE 12/6 or with OSRAM VALVE 23/- SEND FOR FREE LIST of Extensive Range of METERS at BARGAIN PRICES.

T. W. THOMPSON & CO., 39, LONDON STREET, GREENWICH, S.E.10

### SITUATIONS VACANT

**D RAUGHTSMEN.**—Numerous vacancies in Engineering, Building, G.P.O., etc., for men age 17-40. Exp. unnecessary if willing to learn. Details of openings, salaries, etc., FREE on application to N.I.E. (Dept. 37J), Staple Inn Bldgs., W.C.1.

**WANTED**—ambitious young men to prepare for well-paid posts in TELEVISION, the great career of the future. Apply for free booklet from BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 18P, Stratford Place, W.1.

### TUITION

"R.T.I."—established 1929—still lead. Get Television courses; postal and private.—Radio Training Institute, 40a, Earl's Court Road, London.

### MISCELLANEOUS

5-Valve Universal Superhet, all-wave, £10. No callers, please; delivered free to most parts of London.—St. John, 5, Ennismore Gardens, S.W.7.

### FREE ADVICE BUREAU COUPON

This coupon is available until June 4th, 1938, and must accompany all Queries and Wrinkles.  
PRACTICAL AND AMATEUR WIRELESS, 28/5/38.

The Best of  
The Month's  
Fact, Fiction, and  
Humour

# Galaxy

## No. 2 JUST OUT

EVERY month, in convenient pocket size, GALAXY gathers together the cream of the contents of many magazines and periodicals—the most striking stories, articles and humour.

In No. 2, just out, you will find contributions on a wide variety of subjects, specially selected by the Editor for one reason and one reason only—that they are of exceptional interest.

You will find GALAXY eminently satisfying. For busy men and women who wish to make the most of their limited reading time GALAXY is ideal.

Buy No. 2 to-day and enjoy for the modest price of 6d. a digest of the month's best reading—you will not be disappointed!

6d.

GALAXY

### Contents

ELLALINE TERRISS	Sir Seymour Hicks	PAGE	5
PUTTING BRITAIN ON THE MAP	W. J. Seymour	11	
TEACHING GERMAN TROOPS TO LAUGH	The Hon. Theodora Benson	19	
DEATH COLUMN	Marghanita Laski	23	
IT LOOKS EASY	Popular Flying	27	
OLD MAN BROCK	Men Only	29	
THE JOKE THAT WENT WRONG	Wide World Magazine	35	
TRAVEL TIPS	Modern Home	41	
FIRST HOUR IN HOLLYWOOD	W. J. Makin	43	
BENNY JUMPS A FENCE	Edward Higgins	47	
DOES THE HORSE THINK?	Riding	57	
ZOOS WANT THIS ANIMAL	E. G. Boulenger	61	
IMPORTANT QUESTIONS	Catherine, Countess of Westmorland	65	
£20,000,000 FORTRESS	Pearson's Weekly	67	
FOR WIVES AND OTHERWISE	Modern Woman	72	
COMMON SENSE IN FURNISHING	Homes and Gardens	73	
BOAT FOR SALE	David Brooks	75	
DON'T OUTLAW YOUR IN-LAWS!	Marisel Segal	79	
CHOOSING A CAR	Practical Motorist	83	
MY IDEAL WIFE	Miss Modern	87	
MONSTERS COME TO BRITAIN	Oliver G. Pike	89	
1,000 CIGARETTES A MINUTE	F.Z.S.	91	
THE FUR-SEAL MIGRATION	Newnes' Practical Mechanics	97	
BE HANDSOME	N. de Bertrand	97	
	Lugrin	101	
	Berla Ruck	101	

IN THE POPULAR  
POCKET SIZE

June Number of all Newsagents and Bookstalls, or by post 7½d. from The Publisher, C. Arthur Pearson, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

6d. MONTHLY

C. Arthur Pearson, Ltd.

Published every Wednesday 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. Practical and Amateur Wireless can be sent to any part of the World, post free, for 17s. 8d. per annum, six months, 8s. 10d. Registered at the General Post Office as a newspaper and for the Canadian Magazine Post.