

# BUILDING A CONTRAST EXPANDER— See Page 171

# Practical and Amateur Wireless

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

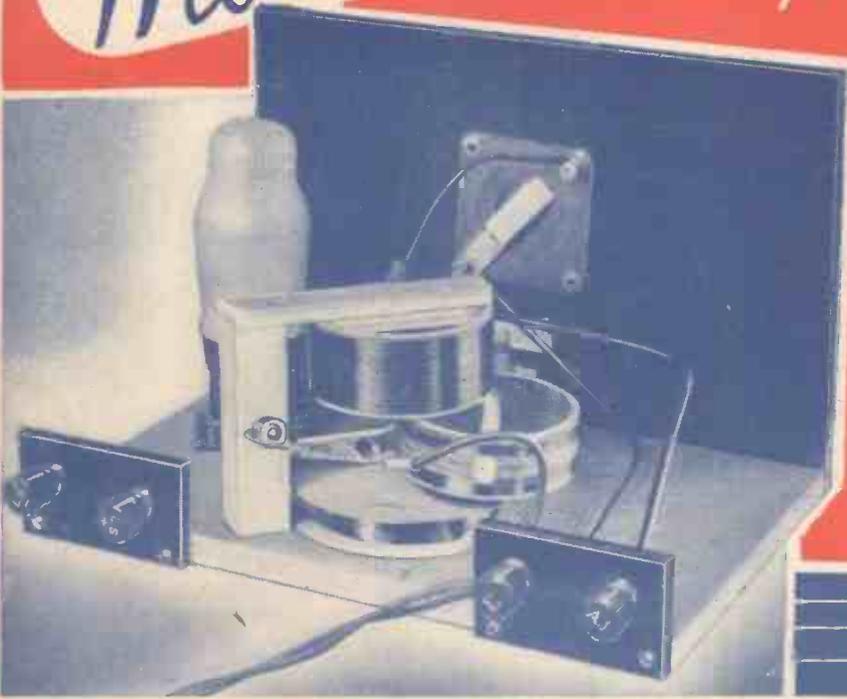
Edited by F.J. CAMM

GEORGE  
NEWNES  
Publication

Vol. 14. No. 343.  
May 6th, 1939.

AND PRACTICAL TELEVISION

More about *My* **S.S.**  
**ONE-**  
**VALVER**



Go out NOW—and get the **EDDYSTONE SHORT WAVE MANUAL**

Compiled by experts—enthusiasts—for Short Wave amateurs, the Eddystone Short Wave Manual has got the right atmosphere on every page. And you'll agree it's one of the best shillingsworth you've ever had. It goes thoroughly into the matter of modern Short-Wave Practice, providing intensely interesting constructional explanations of how to build various Short-Wave Receivers, low and medium Power Transmitters, Amateur Communication Pre-selector, Cathode-Ray Oscilloscope, etc., etc., etc. Illustrated with 30 photographs and nearly three dozen diagrams. Alive and exceedingly informative—just the book to have at your elbow. If you haven't already got a copy—go out now and get one.

**PRICE 1/-** From W. H. SMITH, or RADIO DEALERS, or 1/2 POST FREE from **STRATTON & CO., LTD., EDDYSTONE WORKS, BROMSGROVE ST., BIRMINGHAM. 5**



# TROUBLE? Find it with an AVOMINOR

Regd. Trade Mark

**The D.C. AVOMINOR**

measures

**CURRENT**

- 0-6 millamps
- 0-30 "
- 0-120 "

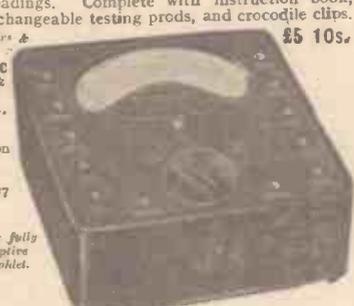
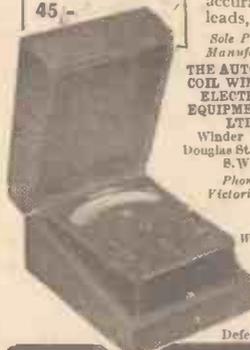
**VOLTAGE**

- 0-6 volts
- 0-12 "
- 0-120 "
- 0-240 "
- 0-300 "
- 0-600 "

**RESISTANCE**

- 0-10,000 ohms
- 0-40,000 "
- 0-100,000 "
- 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 3404/7

Write for fully descriptive pamphlet.

Deferred terms if desired.

BRITISH MADE.

£5 10s.

## Standard Wireless Books for the Serious Amateur

### EVERYMAN'S WIRELESS BOOK

By F. J. CAMM

A Radio Consultant for the Listener, Expert and Amateur Constructor, with Special Chapters on the Principles of Radio Telephony, Installation and Systematic Fault-finding. With 200 illustrations and Diagrams. General Principles of Wireless Receivers. Testing. Special Remedies for local conditions. Noises, their Cause and Remedy. Equipment Troubles. Short-Wave Troubles. Improving the Quality of Reproduction. Accumulators, and Batteries, etc. **3/6 net. (By post 4/-)**

### SIXTY TESTED WIRELESS CIRCUITS

By F. J. CAMM

Modern circuits of every type. Diagrams and instructions for assembling and wiring. Details of components and notes on operation. Including Chapters on Circuits for Battery and Mains-Operated Receivers, Adaptors, Units, Portables, Short-Wave Receivers, All-Wave Receivers, Amplifiers, and a Room-to-Room Communicator. **2/6 net. (By post 2/10)**

Available from all booksellers or by post direct from the publishers

**GEORGE NEWNES LTD. (Book Dept.),**  
Tower House, Southampton St., Strand, London, W.C.2

# GREAT NEW PRACTICAL PART WORK MOTOR REPAIR and OVERHAULING

**T**HIS authoritative new part work is absolutely essential to Garage Proprietors and Mechanics, and all who have a practical interest in mechanical transport. Providing in convenient form all the time-saving repair methods applicable to the leading makes of cars and motor vehicles, it ensures that every job taken in will be carried out expeditiously and to the satisfaction of the customer! It is no exaggeration to say that **MOTOR REPAIR AND OVERHAULING** will quickly prove itself worth its weight in gold as a garage mechanic's standard reference work.

**FIRST PARTS NOW ON SALE**

TO BE COMPLETED IN ABOUT 36 WEEKLY PARTS

# MOTOR REPAIR and OVERHAULING

PRICE **1/-** PART **1**

WRITTEN BY EXPERTS  
INDISPENSABLE TO MOTOR ENGINEERS, MOTOR MECHANICS AND OWNERS OF GARAGES AND SERVICE STATIONS

A COMPREHENSIVE AND PRACTICAL GUIDE FOR REPAIR MEN AND GARAGE PROPRIETORS

DEALING WITH UP-TO-DATE REPAIR METHODS AND EQUIPMENT FOR ALL THE CHIEF MAKES OF CARS AND COMMERCIAL VEHICLES

(INCLUDING COMPRESSION-IGNITION TYPE ENGINES)

GEORGE NEWNES LIMITED

**FREE**

Every part throughout the work will include a Quick Check-Over Data Sheet. In this way over 200 models will be dealt with.

In Part 1 **2 FREE CHARTS** are given: **QUICK CHECK-OVER DATA SHEET** and **TROUBLE-TRACING CHART** for car and components.

To be completed in 4 Volumes: **WEEKLY PARTS**

- Vol. 1. Standard Motor Components and Repair Methods.
- Vol. 2. Engine, Clutch and Gear Box Units.
- Vol. 3. Body, Chassis and Frame Repair.
- Vol. 4. Electrical and Accessory Equipment.

Written by highly skilled engineers and mechanics. Illustrated by clear photographs of actual service operations, and with many useful charts and tables.

**OVER 1,500 ILLUSTRATIONS.**

## GET YOUR COPIES NOW

Of All Newsagents and Bookstalls

George Newnes, Ltd.

# SAFETY FIRST HINTS—See page 177



# 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. XIV. No. 346 May 6th, 1939.

## ROUND *the* WORLD of WIRELESS

### Beginners Experiments

MANY newcomers to radio are intrigued to hear of the results which used to be obtained in the early days. Unfortunately, in these days of high-powered apparatus and multi-valve receivers, many of the original fields of experiment have become lost to the amateur, and lack of components has resulted in many amateurs failing to explore some of the many different types of receiver which can be made up easily at home. In the early days it was customary to use large diameter coils, and the efficiency of these is, of course, much greater than the smaller modern coil, but with the increased efficiency of modern valves it became unnecessary to use the older type of coil, and, in fact, it would be detrimental to use these in many circuits on account of the difficulty of stabilising or preventing interaction. This is because the large coils have an extensive field and screening reduces efficiency. However, to enable newcomers to obtain some idea of the results obtainable with the older type of component we describe in this issue a one-valver with home-made coil, and next week will describe a crystal receiver with a 4in. diameter air-spaced coil. If sufficient interest is shown we shall describe similar apparatus, using different types of coil from time to time.

### Aircraft D.F. Station

AT Renfrew Airport a new direction-finding station has been completed, and is staffed by Air Ministry operators. The service area will extend to Stranraer and Berwick in the south, and Fort William, Pitlochry and Montrose in the north. The approximate cost of the station is stated to be £3,000.

### Wireless Licences

AT the end of March the approximate number of wireless receiving licences in force was 8,968,600—compared with 8,588,676 at the end of March, 1938. The increase since January 1st was 59,700.

### Military Sunday at York

THE Military Sunday Service at York Minster will be broadcast in the National programme on Sunday next (May 7th). Among those taking part will be the bands of the 15/19th the King's Royal Hussars, the 1st Batt. the King's Own

Yorkshire Light Infantry, and the 1st Batt. The York and Lancaster Regiment. The Archbishop of York is to give the address at the service. Military Sunday is a great day of pageantry and parade in York every year.

### Rumanian Independence Day

IN honour of Rumania's National Day, a programme of works by modern Rumanian composers will be broadcast on May 10th by the B.B.C. Orchestra, conducted by Clarence Raybould.

### ON OTHER PAGES

Contrast Expander and Tone Control Unit	171
A Wind-driven Charger	173
Simple Inductance Measurements	174
On Your Wavelength	175
Safety First Hints	177
Readers' Wrinkles	179
Hotting-up the S.S. One-Valver	180
"What I Would do with Crooners"	182
Practical Television	184
Short-wave Section	186
Practical Letters	190
Queries and Enquiries	191

### The Montreux Plan

THE European Wavelength Conference just ended at Montreux has re-allocated the wavelengths to European long and medium-wave broadcasting stations.

The table below shows the wavelengths which will be operative from March 4th, 1940, when the Montreux plan becomes effective:

	kc/s	metres
Droitwich (National)	198.5	1,511
Moorside Edge (North Regional)	671	447.1
Westerglen (Scottish Regional)	789	380.2
Burghead		

	kc/s	metres
Washford (Welsh Regional)	871	344.4
Penmon		
Brookmans Park (London Regional)	916	327.5
Lisnagarvey (Northern Ireland Regional)	1,051	285.4
Droitwich (Midland Regional)	1,087	276.0
Brookmans Park (London National)		
Moorside Edge (North National)	1,141	262.9
Westerglen (Scottish National)		
Stagshaw	1,186	253.0
Start Point (West Regional)	1,222	245.5
Aberdeen	1,411	212.6
Clevedon	1,465	204.8

Until June next, when Start Point and Clevedon stations come into service, the wavelength of 285.7 metres (1,050 kc/s) will continue to be used by the West Regional transmitter at Washford, and the Bournemouth and Plymouth stations will continue to work on 203.5 metres (1,474 kc/s). In June, the West Regional transmitter at Washford and the low-power stations at Bournemouth and Plymouth will close down.

### Broadcast English: Family Names

THE B.B.C. announces that Professor A. Lloyd James has collected for the B.B.C. Advisory Committee on Spoken English recommendations regarding the pronunciation of some British family names and titles. A booklet containing these names is now on sale, price 1s. 6d., or 1s. 8d. by post, and can be obtained on application to the B.B.C. Publications Department, 35, Marylebone High Street, London, W.1, or to any B.B.C. Regional office.

A booklet to guide announcers in the pronunciation of British family names has been long overdue—as nobody knows better than they—and this publication is designed to help them in their task.

### Salisbury Silver Band

THE Salisbury City Silver Band, conducted by J. C. Dyson, will broadcast a programme of light music on May 4th. The Band was formed in 1934, when Sir Dan Godfrey became the President.

# ROUND the WORLD of WIRELESS (Continued)

## Proposed Moves of U.S.A. Transmitters

FOLLOWING a survey which has lasted three years, the National Broadcasting Company of America has decided to move the WEAF, New York, station to Port Washington, Long Island. In the same manner, KDKA, Pittsburgh (Pa.), will transfer its existing transmitter from Saxonburg (Pa.) to a new site at Allison

## INTERESTING and TOPICAL NEWS and NOTES

Marconi's Wireless Telegraph Co., Ltd., for the supply of two transmitters to replace the present 70-kilowatt Regional transmitters at Brookmans Park (London Regional), and Moorside Edge (North



Radio amateur transmitters have found new scope for their work in the newly-formed Civilian Wireless Volunteer Reserve. Morse Code practice and military procedure lessons are transmitted from certain Air Force stations, and the members thus receive training in their homes on their own apparatus. Members are allotted special wavelengths for their transmitters in which they carry out exercises with each other. A number of South Wales amateurs have joined. Our illustration shows Mr. R. Arnott, of Monmouth, Deputy Controller for S. Wales area, at work.

Park in Alleghany county. For the new installation a 718-foot steel mast will be erected on a hill some 1,200ft. high.

## The Thin Red Line

THE feature programme in the series entitled "The Thin Red Line" dealing with the Royal Welch Fusiliers, which was broadcast on March 26th in the Regional and Welsh programmes, was recorded at the time, and will be re-broadcast on May 11th. The programme was written by P. H. Burton and produced by T. Rowland Hughes. This famous regiment celebrated its 250th anniversary in March. Some of the many illustrious chapters in its history are recalled in the programme.

## "Cabarette"

"CABARETTE" will be presented by Leslie Bridgmont on May 9th, when the artists will be: Compton Evans and Ray Monelle, in original songs at the piano; Stan and Jan, "Two Devonshire Rustics," and Reginald Williams' Swing Quartet. This broadcast will be given in the Western and Regional programme.

## Higher Power for London and North Regional Transmitters

WE are informed by the B.B.C. that a contract has been placed with

Regional) stations. The new transmitters will each be capable of supplying an aerial power of 120 kilowatts, the maximum allowed by the provisions of the European Broadcasting Convention recently concluded at Montreux. It is expected that the new equipment will be ready for service and will come on the air by the spring of 1940.

## Midland Magazine

THE May number of "Midland Magazine," which has now been re-named "Light Listening" (incorporating "Midland Magazine") will be broadcast on May 8th. John Moore, of Tewkesbury, and Tristram Beresford are the joint Editors. It will include special topical articles, a countryside contribution, John Day's comments on news, and a short story. The programme will be repeated for Regional listeners on May 10th.

## Music from Sweden

A PROGRAMME of music from Sweden, to be broadcast on May 10th in the National programme, will consist of the Rhapsody "Midsommarvaka," based on Swedish Folk-songs, by the contemporary Swedish composer, Hugo Alfvén, musical director of Upsala University. It will be played by the Orchestra of the Swedish Broadcasting Station, under the direction of the composer.

## Variety from Morecambe

MORECAMBE'S Winter Gardens theatre will be on the air on Friday, May 12th—twice in the Regional programme. Soon after noon, listeners will hear something of the rehearsal for the evening's programme and the broadcast, which will be on the air for half an hour from 7.30; both relays will, of course, be direct from the theatre stage. In these "Rehearsal" programmes, which Victor Smythe arranges, the microphone is, as it were, an eavesdropper, enabling listeners to overhear B.B.C. producers, the theatre's own executives and the musical director of the theatre making their arrangements while some of the variety acts are carried out in rehearsal.

## Clipstone Colliery Band

J. BODDICE will conduct the Clipstone Colliery Band in a programme of popular music on May 13th. This Nottinghamshire band was formed in 1930, has done well in contests, and has broadcast on several previous occasions.

## "Saturday Concert Hall"

THE North Region's regular music feature, "Saturday Concert Hall," continues to present many special occasions. On May 13th the feature will bring a full hour's programme of music by Arthur Bliss, and the composer himself will conduct the B.B.C. Northern Orchestra, a section of the Hallé chorus, and Doris Gambell, soprano, as soloist.

## Norwegian Radio Reserve

IT is announced that members of the Norwegian radio amateur organisation have been invited to co-operate with the army, and any member who joins for the spring manoeuvres will be given free uniform, billeting and pay equal to 5s. per day.

# SOLVE THIS!

## PROBLEM No. 346

Lester built a D.C. three-valve and when tested out failed to obtain any signals. After one or two provisional tests he decided that the H.F. stage may have been faulty and to prove this he transferred the aerial connection to the anode of the H.F. valve. Instead of obtaining signals all that happened was that the set immediately commenced to smoke and he switched off quickly, not, however, before the H.F. choke had burnt out. What was wrong? Three books will be awarded for the first three correct solutions opened. Entries should be addressed 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. 346 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 8th, 1939.

## Solution to Problem No. 345

When Masters wired his receiver he made connections to the heater circuit and intended to obtain the return via chassis. He omitted to wire the heater terminals of the valveholders to the chassis, however, and thus the heater circuit was not completed until he joined the metallised surface to chassis, the metallising being joined inside the valve to the heater.

The following three readers successfully solved Problem No. 344 and books have accordingly been forwarded to them: M. S. Crothall, 4, Chart Road, Folkestone. B. J. P. Howlett, 89, Honkham's Avenue, Woodford Green, Essex. F. Hoyle, 20, East View, Whitwood Mere, Castleford, Yorks.

# CONTRAST EXPANDER AND TONE CONTROL UNIT

In this Article Full Constructional Details of this Novel Unit are given, Together with an Explanation of the Method of Using It

By W. J. DELANEY

**A**LL the main details of the unit have been explained and all that now remains is to cover the constructional work, which will not be found difficult and should be within the scope of any average constructor. The chassis used in the original model was of stout aluminium measuring 12in. by 9in., with runners round all sides 2½ins. deep. These runners were turned down and bolted by the suppliers and thus the eight bolts required are not included in the number specified for the remaining constructional work. The panel should be of similar gauge material, 16 or 18 S.W.G. is suitable, and the panel is attached to the front runner by the four bolts used to hold down the front runner. The lower five components are attached to both runner and panel and the holes must therefore line up accurately. If the panel is marked carefully from the rear (to avoid disfiguring the front) and ¼in. pilot holes are drilled at every point where a hole is needed this will facilitate drilling without difficulty and without spoiling the front appearance. Make these pilot holes, therefore, and open out the fixing holes for the bolts, using as a template the holes made in the front runner. Now bolt on the panel and with the same ¼in. drill drive pilots through the front runner for the five lower controls. These 10 holes may now be opened to the required sizes.

### Avoiding Burrs

The reason for specifying this method of cutting the holes is that if any attempt is made to cut the ¼in. or ⅜in. holes through the panel and runner whilst they are bolted together, it will be found that the burr which is forced on the rear of the panel may drive the drill over and prevent accurate alignment, and in any case the two will afterwards have to be separated in order to remove that burr and thus allow panel and chassis to be mounted flush. Whilst the panel is removed from the chassis cut all the remaining holes and attach the socket strips, noting that a soldering tag is to be attached to the lower fixing bolt of each of these strips. Mount the two switches and two upper controls before attaching the panel and solder on the inter-connecting leads between these switches, controls and socket strips to facilitate the work of wiring. These points will not be found very readily accessible when the panel and other parts are assembled.

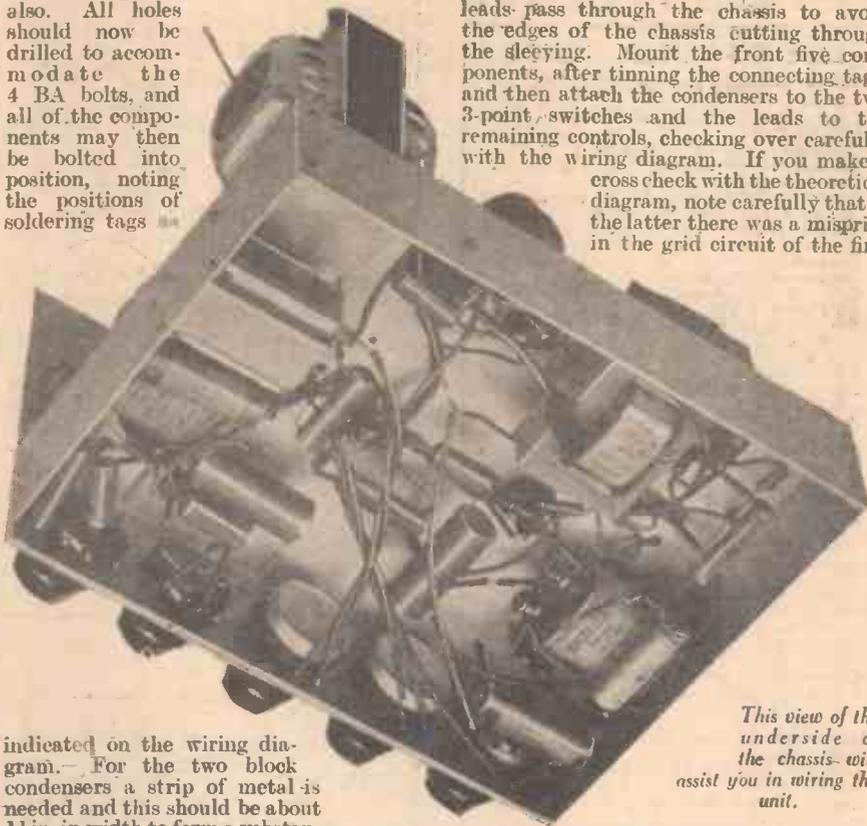
The chassis may now be drilled, noting that 1in. diameter holes are needed for all valveholders with the exception of V1, for which a 1½in. hole is needed. (This is the 7-pin hexode valve.) A rectangular opening is required for one of the block condensers, and a wide slot for the leads from the mains transformer, and the shape and position of these may be seen from the wiring diagram on page 172. Place the valveholders and mains transformer in position and carefully mark the positions of the fixing holes, making certain that the valveholders are so placed that the pins

are not in contact with the edges of the clearance holes already drilled.

### Underchassis Components

Next turn the chassis over and place the chokes and oil condensers in the positions indicated in the wiring diagram, and mark the positions of these fixing holes also. All holes should now be drilled to accommodate the 4 BA bolts, and all of the components may then be bolted into position, noting the positions of soldering tags

first to put in after the heaters have been wired, as this chain lies near the chassis surface and components are placed over them, thus rendering it difficult to get at them if they are not seen to at first. Insulated sleeving has been used in the original model to avoid the risk of short-circuits, and care should be taken where the leads pass through the chassis to avoid the edges of the chassis cutting through the sleeving. Mount the front five components, after tinning the connecting tags, and then attach the condensers to the two 3-point switches and the leads to the remaining controls, checking over carefully with the wiring diagram. If you make a cross check with the theoretical diagram, note carefully that in the latter there was a misprint in the grid circuit of the first



This view of the underside of the chassis will assist you in wiring the unit.

indicated on the wiring diagram.— For the two block condensers a strip of metal is needed and this should be about 1½in. in width to form a substantial anchor, bending it to conform to the outline of the two condensers. Pass the flexible leads through the holes in the chassis, and bolt down the retaining strip, using the 1in. bolt to hold down the strip at the point nearest the rear of the chassis. This point is used as an anchor for the H.T. positive leads. For this a small strip of paxolin about 1in. long by ⅜in. wide is employed and a short 4 B.A. bolt is attached to it, with a soldering tag on the nut side of the bolt. Over the projecting 1in. bolt a few washers or a spare nut is passed so that when the paxolin strip is dropped over this the head of the other bolt will not foul the chassis. Watch this point very carefully when assembling to avoid trouble later on.

### Wiring Up and Testing

The wiring may now be commenced, noting that the wire ends of most of the resistors and condensers are used and cut down as required for neatness. The chain of resistors from the double-diode is the

valve. The wiring diagram is correct—the grid leak is joined direct to the grid, not to the arm of the potentiometer as shown in the theoretical diagram. Note also the polarity of the two tubular electrolytic condensers under the chassis. That on the L.F. side, that is, the one lying on the tone-control choke, has the negative side joined to chassis (earth), but the condenser mounted on the expander control has the positive earthed.

When wiring is complete the circuit should be given a final check before connecting to the mains. When satisfied that all is in order the unit is ready for use and the mains should be joined to the transformer at the socket indicating your mains voltage. Connect the pick-up to the input sockets and join the output sockets to the amplifier with which the unit is to be used. It will be assumed that two sockets are provided on the amplifier and that one of these is joined to the earth line. Take

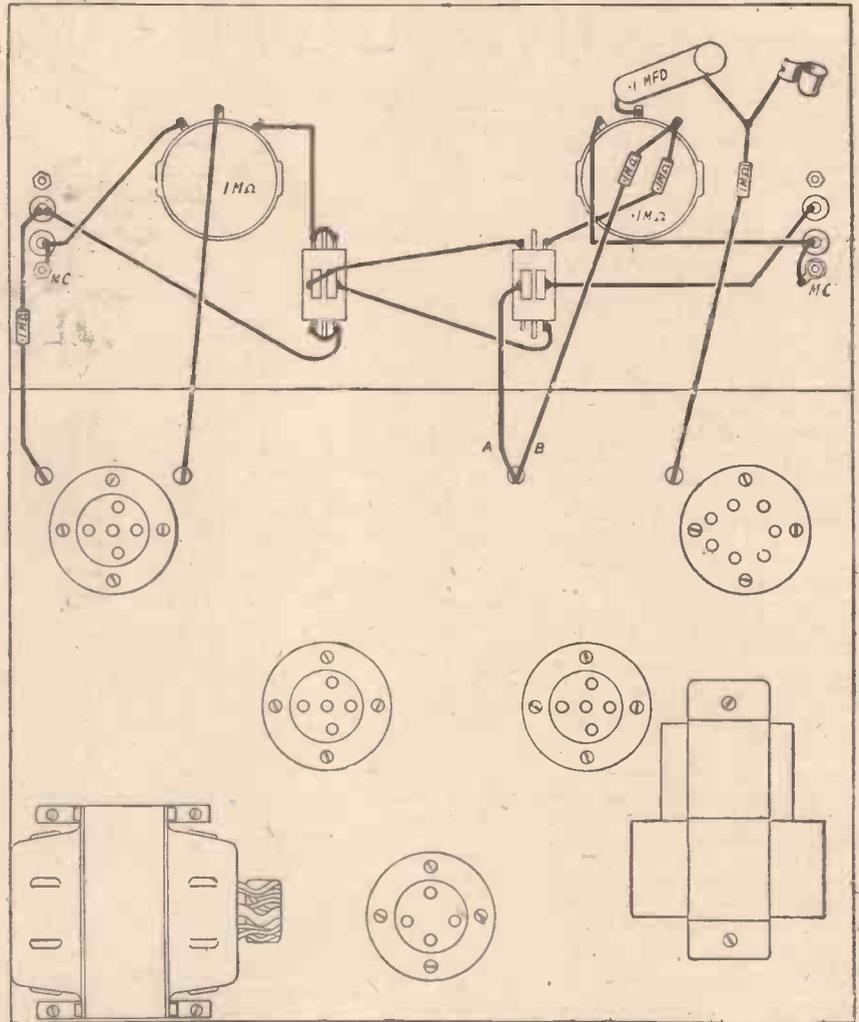
(Continued on next page)

**CONTRAST EXPANDER AND TONE CONTROL UNIT**

*(Continued from previous page.)*

care to get this to agree with the lower socket on the output strip of the unit, or no signals will be obtained. If you only have one input socket on your amplifier, the lower output socket may be joined direct to earth. Switch on both unit and amplifier and place the pick-up on a record, pressing both switches on the unit down. Signals should be received in the usual way, and the unit is out of circuit. Note the signal strength and general results and then switch in the expander by raising the left-hand switch. If the upper left-hand control is at minimum (maximum position anti-clockwise) no signals will be heard. For first tests turn this about half-way on and signals should then be heard through the amplifier. There is a slight loss of volume when the expander is in circuit and if the lower left-hand control is at minimum the strength of signals should be constant, that is, there is no

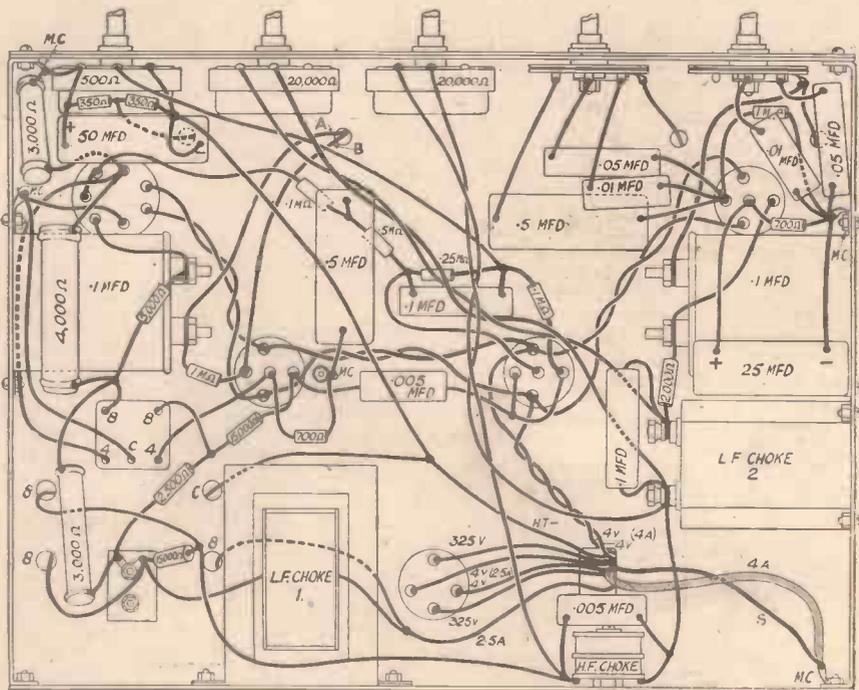
**Wiring Diagram of the Contrast Expander and Tone Control Unit**



**LIST OF COMPONENTS**

- One mains transformer, type EP.36 (Varley), 22s. 6d.
- Three chassis type 5-pin valveholders, type V1 (Clix), 1s. 6d.
- One four-pin valveholder, type V1 (Clix), 5d.
- One seven-pin valveholder, type V2 (Clix), 9d.
- Two two-pin socket strips (Clix), 1s.
- One type L.F.14.S choke (Bulgin), 9s. 6d.
- One type L.F.16 choke (Bulgin), 8s. 6d.
- One type H.F.8.S choke (Bulgin), 2s.
- Two type S.117 switches (Bulgin), 2s. 6d.
- Two type S.98 switches (Bulgin), 5s.
- Two type K.16 knobs (Bulgin), 9d.
- One 500 ohm potentiometer, type TW/p. (Reliance), 4s. 6d.
- Two 20,000 ohm potentiometers, type TW/p. (Reliance), 9s.
- One 100,000 ohm potentiometer, type SG/p. (Reliance), 4s. 9d.
- One 1 megohm potentiometer, type SG/p. (Reliance), 4s. 9d.
- Two .005 mfd. fixed condensers, type 4601/S. (Dubilier), 2s.
- Two .05 mfd. fixed condensers, type 4602/S. (Dubilier), 2s. 6d.
- Two .01 mfd. fixed condensers, type 4601/S. (Dubilier), 2s.
- Three .1 mfd. fixed condensers, type 4603/S. (Dubilier), 4s.
- Two .5 mfd. fixed condensers, type 4608/S. (Dubilier), 4s.
- Two .1 mfd. oil condensers, type 950A (Dubilier), 8s. 6d.
- One 25 mfd. electrolytic condenser, type 3016 (Dubilier), 1s. 6d.
- One 50 mfd. electrolytic condenser, type 3016 (Dubilier), 1s. 6d.
- One 8-8-8 block condenser, type 312 (Dubilier), 7s. 6d.
- One 8-8-4-4 block condenser, type 317 (Dubilier), 7s.
- Two 350 ohm 1/2-watt resistors, type RMA9. (Erie), 6d.
- One 700 ohm 1/2-watt resistor, type RMA9. (Erie), 3d.
- One 750 ohm 1/2-watt resistor, type RMA9. (Erie), 3d.
- Five 100,000 ohm 1/2-watt resistors, type RMA9. (Erie), 1s. 3d.
- One 250,000 ohm 1/2-watt resistor, type RMA9. (Erie), 3d.
- One 500,000 ohm 1/2-watt resistor, type RMA9. (Erie), 3d.
- Three 1 megohm 1/2-watt resistors, type RMA9. (Erie), 9d.
- One 2,500 ohm 1-watt resistor, type RMA8. (Erie), 6d.
- One 2,000 ohm 1-watt resistor, type RMA8. (Erie), 6d.
- One 5,000 ohm 1-watt resistor, type RMA8. (Erie), 6d.
- Two 15,000 ohm 1-watt resistors, type RMA8. (Erie), 1s.
- Two 3,000 ohm 3-watt resistors, type RMA1. (Erie), 3s.
- One 4,000 ohm 5-watt resistor, type RMA0. (Erie), 2s. 6d.
- One MX40 valve (Osram), 11s. 6d.
- One D41 valve (Osram), 5s. 6d.
- Two MH4 valves (Osram), 15s.
- One MU.12/14 valve (Osram), 9s.
- Thirty-one 1/2-in. 4BA bolts with nuts.
- One 1in. 4BA bolt with nut.
- Eight soldering tags.
- Insulated sleeving wire.
- Chassis, 12in. x 9in. x 2 1/2in. (runners all round).
- Panel 12in. x 8in.

*(Continued on page 174)*



# A Wind-driven Charging Plant

## An Efficient Unit Suitable for Charging and Lighting Purposes

SEVERAL readers have recently asked for information concerning wind-driven generators suitable for charging small accumulators. In response to these requests we have pleasure in publishing the following description and illustrations of a compact wind-driven plant made and erected by a reader, and which is suitable for charging wireless batteries, and also for house lighting.

### Constructional Details

This plant, which works at six volts, comprises a Lucas 12-volt dynamo, taken from an old motor-car lighting set, and a six-volt cut-out. The casting on which the dynamo is mounted is an old gas engine valve guide inverted into a horizontal position, the spindle being arranged to fit into a bush in the end of the mast, and resting on the thrust race. The spindle which carries the propeller is an old model Ford camshaft, with the cams turned off. This spindle is fitted with two ball bearings, and also a race to take the thrust of the propeller. The timing gear, which is retained on the camshaft, acts as an oil splash which lubricates the propeller shaft driving end of dynamo and coupling, which connects the shaft to the dynamo.

This coupling is taken from an old motor-cycle gear-box; one half is screwed on the camshaft outside the timing gear instead of a nut, and the other half is fixed to the dynamo spindle. It

is possible to remove the dynamo from the casting by loosening the dynamo from the casting and the clip, which can be seen in the illustrations. This clip was used to keep the magneto in position, as the couplings only push into each other. It is possible to remove the dynamo without disturbing the propeller or tail.

### Connections

The cable which operates the tail passes along the casting under the dynamo, and down through the mast until below the level of the propeller, as indicated in Fig. 2. A propeller about

4ft. long and 4ins. wide gives satisfactory results on this machine, but as there is no governor, it would be

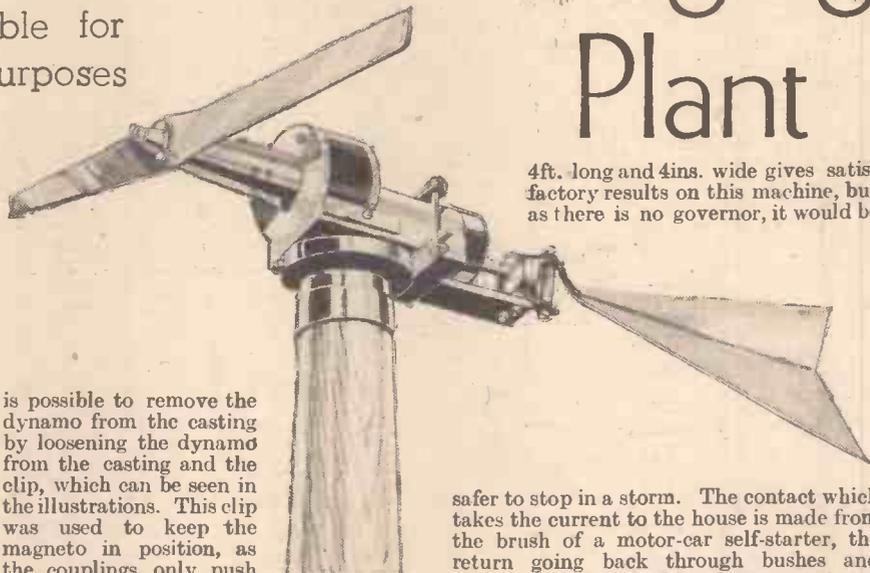


Fig. 1.—A general view of the wind-driven charging plant described in the text.

safer to stop in a storm. The contact which takes the current to the house is made from the brush of a motor-car self-starter, the return going back through bushes and spindle to the casting, where negative of dynamo is earthed. The wiring connections for cut-out, ammeter, fuses, etc., are given in Fig. 3. This machine has been working quite a long time without giving any trouble.

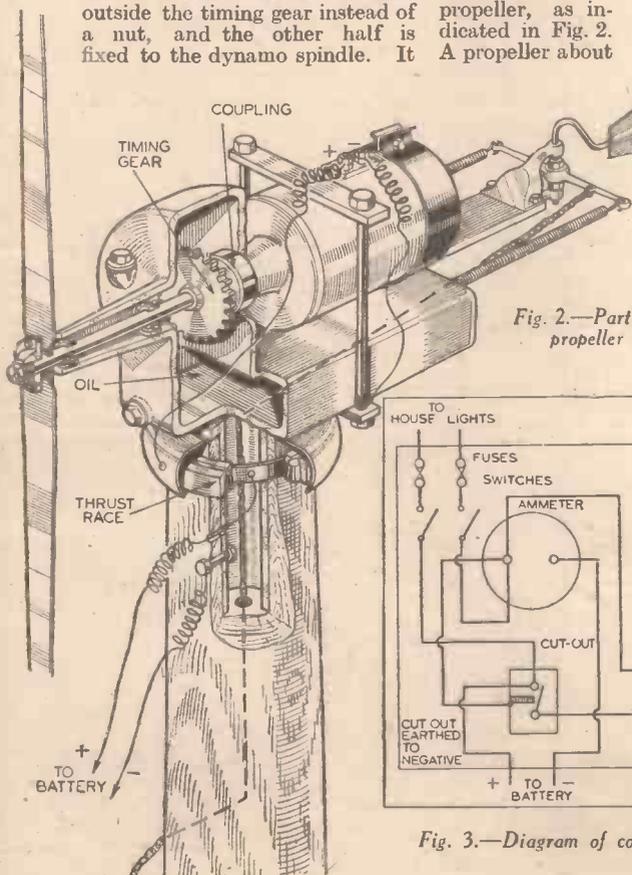


Fig. 2.—Part-sectional view showing the propeller shaft and thrust race.

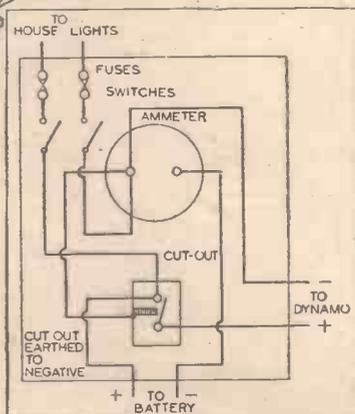


Fig. 3.—Diagram of connections.

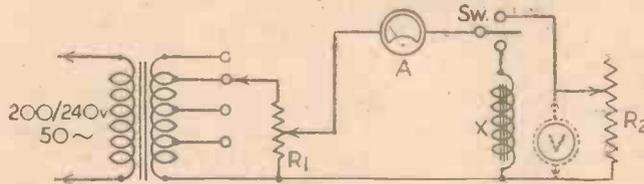
## TELEVISION PICTURE FOCUS

THERE are many well-known reasons which can be advanced for lack of correct overall focus in a received television picture, but cases arise where the trouble is found to be due to effects which are not always so obvious except to the service engineer, who day in and day out is called upon to keep receivers in a first-class condition. For example, in a magnetically-operated cathode-ray tube it is sometimes found that the line scan focus can be improved very materially by the simple expedient of reversing the focus coil connection, and then re-aligning the coil in order that the picture is central with the mask provided. If the highlights of a picture give evidence of defocusing, then this can sometimes be traced to a low cathode-current due to a defective resistance control in the cathode supply circuit. Another good idea which has been proved satisfactory in practice is to twist the line coils slightly, with the frame scan circuit inoperative, and in this way secure a good circular shaped spot where an elliptical one existed before. Any abnormal mains voltage fluctuation will bring about imperfect focus, while with a fluorescent screen of too thin a texture each line will tend to be woolly edged instead of sharp. It is quite a common practice among some engineers to make the focus adjustment the final one in a set, and in this connection it is essential to remember that the coil requires more current fed into it when it is near the anode, than is the case when it is farther along the tube axis. Axial adjustment should always be watched, therefore, and when positioning a picture correctly within its mask, endeavour to carry out the adjustments with a picture on the screen as the test bars do not always give the right black-out ratio.

# SIMPLE INDUCTANCE MEASUREMENTS

FROM time to time articles have appeared describing how the amateur can make simple measuring instruments for servicing and component checking, but little has been said about measuring inductance.

The circuit shown in the accompanying illustration shows a simple way in which inductance can be calculated; it is accurate enough for constructors' use. It is useful for checking such things as whether an unmarked choke is a 20H or 40H, finding the impedance of intervalve transformers, and also for detecting short-circuited sections of windings.



A simple circuit for calculating inductance values.

The components required consist of an A.C. voltmeter, a low-reading milliammeter, two potentiometers, and a source of low voltage alternating current.

The switch "SW" is of the change-over type, and should make good contact;  $R_2$  is 25,000Ω for inductances up to 100H.

The milliammeter is of a low-reading type, as it is usual to measure inductance with one milliampere flowing, since the inductance will vary considerably with higher current. The potentiometer  $R_1$  is 2,000Ω, and serves the purpose of adjusting the alternating current applied to the component at X.

The low voltage supply is about 40 volts, obtained through a transformer which will have to be specially wound. Tappings are taken out at suitable intervals to obtain

lower voltages, as for lower values of inductance the adjustments would be rather too sudden if 40 volts were used.

### Transformer Construction

The transformer can easily be constructed by improvising an old discarded component, and, if not to hand, one can be picked up quite cheaply. Make sure that the primary is O.K. The easiest way to provide space for the new secondary is to remove one or more of the L.T. windings, counting the number of turns as you do so, for this will give the number of turns per volt to which the transformer was wound.

Articles have appeared in previous issues of PRACTICAL AND AMATEUR WIRELESS describing how to wind transformers, but for new readers the procedure will be briefly described. Having counted the number of turns you have taken off the L.T. winding, for example, 33 turns, then if the L.T. was of the 4 volt type, dividing 33 by 4 gives 8 turns per volt to the nearest whole number. You now require to wind a secondary which will give a total of 40 volts, therefore the number of turns which will be required is  $40 \times 8$ , which is 320 turns.

When winding the secondary, taps should be taken every 10 volts which will be at 80, 160 and 240 turns. The winding may consist of a small gauge wire; about 30 S.W.G. will be quite suitable, since it has only to carry a small current.

All that remains is to reassemble the core and then connect up as shown, with the component to be tested connected at X, and the switch set to bring it into circuit.

Starting with the lowest tap on the transformer, and with  $R_1$  set at a minimum, the mains can then be switched on, and  $R_1$  adjusted until 1 milliampere flows, as read on the meter, changing to another tap if required, first seeing that  $R_1$  is returned to a minimum.

### Operating Notes

Now with  $R_2$  at a maximum, the switch is thrown over to bring it into circuit;  $R_2$  being adjusted until 1 milliampere again flows. The resistance of  $R_2$  in circuit can be measured by means of a voltmeter, and applying Ohm's Law.

The inductance is found from the formula  $Z = 2\pi fL$  where Z is the reactance of the component under test, in ohms, f is the frequency of the mains supply, and L the inductance in henries.

If the supply is 50c/s this is equivalent to dividing the resistance of  $R_2$  in circuit by 314 to find the inductance in henries.

The following example will make the working quite clear:

Suppose the voltage measured across  $R_2$  with 1 milliampere flowing was 12.5 volts.

$$\text{Thus the resistance} = \frac{E \times 1000}{\text{milliamps}} = \frac{12.5 \times 1000}{1} = 12500$$

Now from the above the inductance is calculated:

$$Z = 2\pi fL = 12500 = 2\pi \times 50 \times L$$

Therefore inductance

$$L = \frac{12500}{2\pi \times 50} = \frac{12500}{314} = 40H$$

Finally, it might be added that this simple method cannot be used to measure the inductance of air cored coils and chokes

## CONTRAST EXPANDER AND TONE CONTROL UNIT

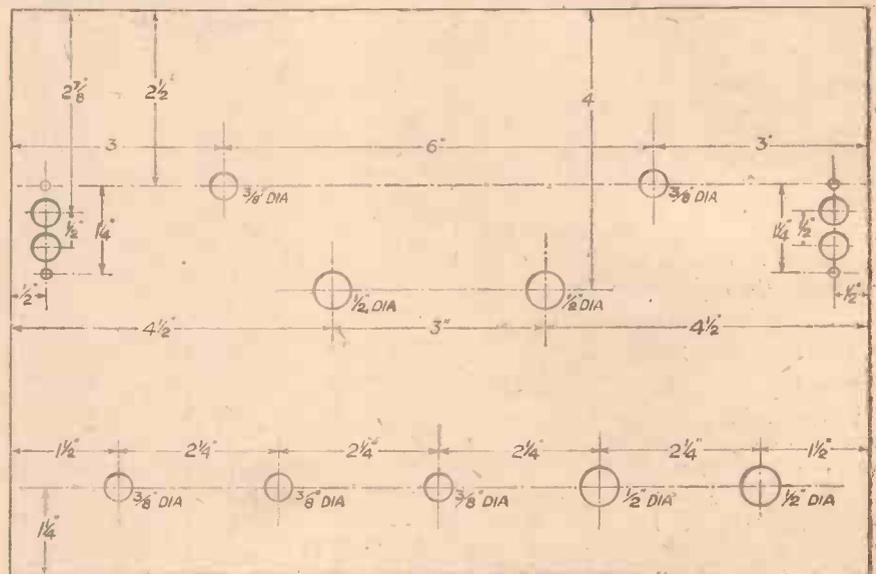
(Continued from page 172)

expansion effect. Now turn this control to maximum, and if you have a suitable record on you will immediately note the accentuated contrast, and with a good orchestral record this will be found to be too severe with the control at maximum. For most purposes a position about three-quarters of the way on is most suitable. The upper left-hand control should not be set to maximum with most records as this overloads the first valve and prevents effective expansion and also introduces slight distortion, but when a suitable position has been found for the pick-up in use it need not be touched again unless a new pick-up is used.

When the effect of the expansion has been found, the right-hand switch may be raised and this brings in the tone control circuit. Again, the upper control may be set to give a desired level and left alone. The effects of the lower controls may then be tried, their functions being shown on the diagram published last week. They give such a complete action that it will be found worth while to use them whilst a good record is being played through, giving greatly added realism to a symphony record, for instance.

### Seeing the Results

If you are interested to see how the unit is working, you can unsolder the lead at the point indicated by an X on the



Panel drilling dimensions for the Expander and Tone Control Unit.

theoretical diagram and include there a milliammeter. When switched on without a record in use the current will rise to a certain steady value. Adjustment of the expansion control will result in a variation of the control. Set the control to maximum, and then place a record on. As the signal

strength varies you will see the needle rise and fall, at the quietest parts the current falling back almost to zero. A good record for test purposes with this unit—for both expansion and tone—is the "Ritual Fire Dance" by the Boston Promenade Orchestra, H.M.V. C.2955 (12in.).

# ON YOUR WAVELENGTH



By *Thermion*

## R.M.A. Appoint Publicist

THE Radio Manufacturers Association has appointed as publicity officer Mr. A. J. Dannhorn, whose principal job it will be to publicise Radiolympia, which this year will be held from August 23rd to September 2nd. He will work from the R.M.A. offices where he may be consulted on Tuesday, Wednesday and Thursday mornings of each week.

The manufacturers this year are determined to profit by their previous experiences and to eliminate the cackle and misleading ballyhoo which has appeared in the daily papers regarding previous Shows. I know that they have already made up their minds that the nonsensical style of poster which they have issued on previous occasions (last year's effort looked like a fried egg slung against a blackboard) is to cease. They want nothing futuristic, but something which reflects the present. I am very pleased that they have made this move for I have not been too happy about previous Shows. I have seen them miss many valuable opportunities. The new publicist will, no doubt, see that the newspapers are fed with the right material, and that nonsense about "output for the next five years sold within an hour of the Show opening," does not appear. Such statements do not mislead members of the public, for they all know that the manufacturer who makes such an announcement may be jobbing off his sets at half-price half-way through the season.

## The Television Drive

THE move to force the B.B.C. to develop television throughout the country grows apace. Mr. A. H. Whiteley, of W.B., recently called a meeting of retailers in Nottingham. Although the first intention is that a television station should be erected at Birmingham, moves are going on throughout the country, and propaganda officers have been appointed in the following districts: Bristol, Birmingham, Cheshire, Glasgow, Manchester, Middlesbrough, Nottingham, Norwich, Plymouth, Sheffield and Weymouth.

## The Wavelength Shuffle

MARCH 3rd, 1940, which happens to be a Saturday, will see the end of the Lucerne Plan and the present order of wavelengths. The Montreux Plan will take its place, and although some of the wavelength changes are slight, they will certainly benefit Great Britain, particularly on the long waves where interference has been chronic, and station separation less in some cases than 6-kilocycles. In this new plan two stations have been removed from the long-wave band and transferred to the medium-wave band, namely, Hilversum, in Holland, and Kaunas, in Lithuania. Of course, this is provided that the dictators have not done a bit more land grabbing in the meantime. London Regional comes down from 342.1 metres to 327.8 metres, whilst the London National ascends from 261.1 to 262.9 metres. Northern Regional descends from 449.1 to 447.1 metres, which wavelength it will share with Istanbul instead of Jerusalem, but, of course, it is a long time between now and 1940, and anything may happen to alter existing plans.

## Sponsored Programmes Feeling the Pinch

NOW that the B.B.C. is really getting into British homes on a Sunday, I understand that foreign stations putting over sponsored programmes in English are feeling the pinch and are finding it difficult to fill their programme times. The Sunday Games idea seems to have caught on, and is certainly an improvement on the nonsensical spelling bees. In these difficult times it seems to me that English manufacturers would be better advised to spend their money in this country than abroad, so that

they can contribute to the prosperity of the land from which they draw their profits. It always strikes me as a monstrous idea that a British manufacturer should spend money abroad to encourage sales in this country, when the means exist in this country of achieving the same result at a tithe of the cost. A few of the smart Alecs who have bought a book, probably published in America, on the principles of publicity, or market research (high sounding Yankee titles which mean nothing), seem to have got hold of some of our radio manufacturers, and are putting across Yankee ballyhoo on "successful marketing methods." Some of these young publicity managers have never had a works training, know very little of commercial methods, and yet find themselves in jobs where they are spending hundreds of thousands of pounds of shareholders' money. Publicity is a job for an expert, not for quacks, and unfortunately the radio trade has employed too many quacks in the past. I have been to luncheons and listened to some of these bright-eyed, overgrown schoolboys endeavouring to preach the precepts they have learned from a series of lectures on successful salesmanship. Rather like teaching one's grandmother to suck eggs! There is more nonsense spoken and written about publicity than any other branch of commerce. Each of these bright-eyed, overpaid, and underworked publicity managers claims to understand "what the public wants." Many of them have risen from obscurity to important positions, and their idea of salesmanship is to embark upon some stunt and to advise the production manager to introduce some silly gadget as a "selling point." We can all call to mind examples of that. I hope the industry will now purge itself of these parasitic appendages who seem to have battened themselves like barnacles on to the radio trade. I am glad to note that a move in that direction is already taking place.

## A Magazine for Men

IT has always seemed strange to me that there are so few monthly magazines published for men. Men are probably as avid readers as

women, and in these days in particular they are certainly more interested in facts and what is going on in the world than ever before. I have just seen the new *Pearson's Magazine* which is certainly a magnificent shillingsworth, and although its contents still bear a certain resemblance to the old "Pearson's," with its yellow and black cover, this new style is certainly in 1939 tradition. I have enjoyed reading it and shall take it regularly. It is a fine, big but handy size, with a most amusing cover and a lot of colour inside. The fiction is first-rate and there are some amazingly interesting articles and picture features. "How Other People Live," is the first of a new series and deals with life in the States to-day. "Fighting Bulls with Bare Hands," is another. Then there is a brilliant life story of Sir Patrick Hastings, the famous K.C., describing his rise to fame from humble beginnings and his most famous cases.

#### Start Point and Clevedon Transmitters

I AM informed that the Right Hon. the Earl Fortescue, Lord Lieutenant of Devonshire, will open the new transmitting stations of the B.B.C. at Start Point and Clevedon on June 14th, 1939, at 3.0 p.m.

These stations will radiate the Western programme from that date. The West Regional transmitter at Washford and the low-power stations at Bournemouth and Plymouth will then be closed down.

The station at Start Point, South Devon, will use a power of 100 kilowatts and the wavelength of 285.7 metres (1,050 kilocycles per second) freed by the closing of the transmitter at Washford. Start Point is intended to serve coastal districts from the south-west of Cornwall to Sussex, as well as Dorset and the southern parts of Cornwall, Devonshire, Somerset, Hampshire and Wiltshire.

The station at Clevedon will use a power of 20 kilowatts and the wavelength of 203.5 metres (1,474 kilocycles per second) at present shared by the transmitters at Plymouth and Bournemouth. Clevedon will serve the area around Bristol and the northern half of Somerset which cannot be covered by Start Point.

#### B.B.C. Foreign News Broadcasts

IT is interesting to note that from now on the B.B.C. news bulletins in French and German on medium wavelengths will be broadcast on week-days between 10.0 and 10.45 p.m., B.S.T., and not from 7.0 to 7.45 p.m., G.M.T., as before. The news bulletin in French will be read

## Notes from the Test Bench

### I.F. Transformer Trimming

IN the majority of I.F. transformers two holes are provided in the top of the screening can through which pre-set condensers across primary and secondary are adjusted for trimming purposes. A reader points out that recently when trying to trim one of these components he got flashes from the screwdriver to the screen and asks if this is in order. The primary winding of the I.F. transformer is joined in the anode circuit of the valve and thus one side of the trimmer condenser on the primary is joined to the anode of the valve and the other is joined to the H.T. positive line. As the screen is in contact with the chassis (earth or H.T.—) it is obvious that it is in some cases possible to short the H.T. supply—depending which plate of the pre-set condenser is joined to the H.T. positive line. Whilst this is not normally of much consequence—especially if an insulated trimming tool is employed, there is a risk if the short is allowed to remain when trimming, of damaging the rectifying valve due to overload.

### H.F. Valve Bias

IN some old pattern battery receivers a straight H.F. stage is employed with either an S.G. or an H.P. pentode valve. In some cases selectivity is not all that could be desired and usually attempts to alter the circuit do not meet with much success. It should be remembered, however, that the application of a small bias voltage will often prove worth while, a value of 1.5 or 3 volts usually sufficient. Sensitivity will be affected, but the improvement in performance is often well worth the slight additional cost of the small cell which will, of course, last for a considerable time. The best position in the circuit must be found on trial.

### D.C. Meters

IT is important to remember that some types of D.C. meter are useless for measuring A.C. outputs, and in some cases will not even allow an approximation to be made. A case was recently reported where a reader had used a most expensive D.C. multi-range meter to try and ascertain the output of an A.C. mains transformer, and on all ranges of voltage on the meter the needle merely vibrated slightly just round the zero point. Some D.C. meters may give an indication slightly below the exact output, the needle vibrating continuously and showing the effect of the alternating current. For exact readings, of course, a proper A.C. meter must be used.

at 10.0 p.m. and that in German at 10.15 p.m., B.S.T. The short German news bulletin will continue to be broadcast at 10.45 p.m. on Sundays only.

For satisfactory reception of medium-wave transmitting stations at the considerable distances of many European listeners the path between the transmitter and the listener's receiving aerial should be in darkness. So throughout the summer the time for foreign bulletins is postponed to an hour when night has fallen.

For European listeners these medium-wave broadcasts are transmitted by five regional stations: London Regional (342.1 metres), Midland Regional (296.2 metres), North Regional (449.1 metres), West of England Regional (285.7 metres) and Stagshaw (267.4 metres). Listeners in most parts of Europe should be able to receive at least one of these stations clear of interference from any local medium-wave transmitter.

In addition, the bulletins will be broadcast from the Empire short-wave station at Daventry. The wavelength until further notice will be GSB—9.51 mc/s, 31.54 metres.

On weekdays, the Second News for home listeners will again be broadcast from all Regional transmitters at 7.0 p.m., except on Saturdays, and the Fourth News will be read from the same stations at 10.45 p.m.

As a result of these changes, which have been made to provide the best reception of the Foreign News broadcasts, the late dance music will necessarily be curtailed to make room for this service of national importance.

The late dance music will start at about 11.5 p.m., which is half-an-hour later than usual, and will continue until midnight. The alternative programme to be provided on the National wavelength during the reading of foreign bulletins will not be confined to any one type and will be designed to appeal to a wide range of tastes.

## 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 Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

# Some "Safety First" Hints for the Constructor

Replacing Seven-pin Valves : Mounting Wire-ended Components : Components on Metal Panels : Use and Choice of Fuses : D.C. Earthing : Hints on the Use of Flex : : By "The Experimenters"

It is probably true that "familiarity breeds contempt." When you start radio experimenting you are always careful to make a check of every inch of wiring and of every connection before switching on; after a time you become rather blasé about this kind of thing, believing that everything must be right. At any rate, we made a few sparks fly the other evening by putting about 120 volts on the metallising of an indirectly-heated screened pentode and earthing the oscillator anode of the frequency-changer.

A bit of careless wiring you might say, but it wasn't. The fact was that the

of tags. If the connections are made to the tags, cutting the surplus wire from the components, there is little danger of trouble.

Care must be taken in soldering, however, if the connecting wires are cut down to any appreciable extent, because there is a risk of loosening a wire attached to the end cap of a resistor or passing through the pitch seal into a tubular condenser. The main thing is to have the soldering iron hot, and to apply it to the joint for only a couple of seconds. Any difficulty in this direction can be obviated by using what is known as a skeleton group board in which there is a series of holes through which the wire ends can be threaded. Both types of group board are illustrated.

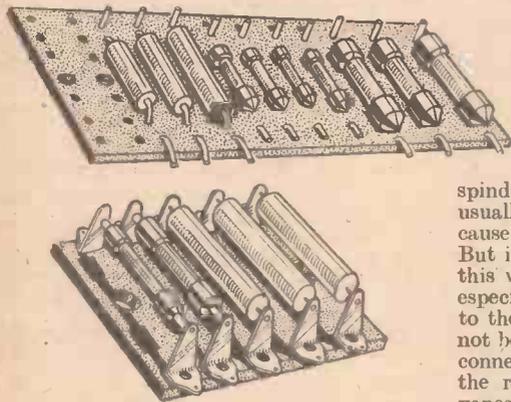
### Using a Metal Panel

Another case where trouble can be caused by a little lack of forethought is in mounting components on a metal panel. The bush or spindle of a variable tuning condenser usually be in contact with the panel, because it is earth-connected in any case. But if a reaction condenser is mounted in this way there is a possibility of trouble, especially if the moving vanes are connected to the anode of the detector; they should not be so connected, for it is always best to connect the condenser on the earth side of the reaction winding, taking the moving vanes to earth. This is not always convenient, though. Besides, with some reaction condensers, chiefly of the older types, the fixed vanes might also be in contact with the panel if the bush is fixed directly to it. If any doubt exists it is better to use a pair of insulating bushes in mounting the component. This sometimes also applies to volume controls and push-pull switches. With regard to switches, though, the result would generally be simply that the switch would be short-circuited.

When using a metallised chassis, the "control" components being mounted on angle brackets, insulation can conveniently be provided by scraping away the metallising round the base of the bracket.

### Be Liberal with Fuses

Most constructors have now cultivated the good habit of inserting a fuse in the H.T.—circuit, but it is sometimes overlooked that valve filaments might be burned out by the grid-bias voltage, especially in an experimental set. For that reason it is often worth while to include a fuse in the G.B.+ lead. A similar point arises when two or more H.T.+ tappings are used, and when a fairly high voltage difference exists between two of them. An extra fuse and holder costs only a few pence, and might save several shillings!

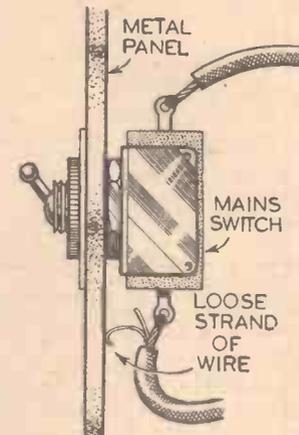


Short-circuits between the connections of wire-ended condensers and resistors can be prevented by the use of a group board of one of the two types shown here.

receiver was correctly wired and had been in use for several weeks, when we decided to give it a minor overhaul. This done, the valves were replaced. But foolishly we put the frequency-changer in the I.F. holder and the I.F. valve in the F.C. holder. In the case of the former valve, pin number one is joined to the oscillator anode and pin number two to the oscillator grid; with the H.F. pentode, pin number one goes to the metallising and pin number two to the anode. Some similar cases of mix-up can occur when other pairs of valves are reversed.

### Wire-ended Components

It is a long time since we learned our lesson in connection with the use of wire-ended resistors and condensers in compact receivers built on metal chassis. These components are so convenient to use that one is inclined to sling them in the wiring. Nine times out of ten, all is well, but on the tenth occasion one end of one of these components touches the chassis or the terminal of a valveholder, and then trouble starts, and you begin to learn sense. That is why now we always make a practice of using group boards for these small components. As you are probably aware, these usually consist of a strip of bakelite or paxolin with a number of pairs



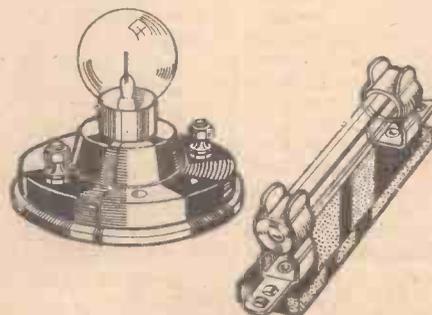
Loose strands of wire in flex can cause short-circuits in an example such as that illustrated.

In a mains receiver of the experimental type it pays to make liberal use of fuses. It is not sufficient to include one in each mains lead of an A.C. set. One should also be fitted in the output from the mains transformer, so that in the unlikely event of a short-circuit the rectifier will not suffer damage. It is generally sufficient to insert the fuse between the H.T. secondary winding and the metal or valve rectifier, but protection is provided if the fuse is between the rectifier-filament winding and the smoothing choke, when a valve is employed.

### Correct Fuse Rating

The choice of fuse value is not always properly understood. Many constructors work on the principle of fitting a fuse with a rating slightly higher than the current it has to carry. Thus, if the total H.T. were 50 mA, a 60 mA fuse would be fitted. Whilst this does afford full protection, it is probable that the fuse will require to be replaced at frequent intervals. This is because of the current "surge" which takes place when the set is first switched on. The "surge" is occasioned by the extra current taken to charge up the various condensers in the H.T. circuit, as well as to the slight inductive effect of the wiring and components.

A good fuse will "blow" when the current passed through it is about 50 per cent.



A flash-lamp-bulb type of fuse is satisfactory in a battery set, but a long cartridge-type fuse should be used in mains receivers.

## SOME "SAFETY FIRST" HINTS

(Continued from previous page)

above the rated value; thus, a 100 mA fuse would "blow" when the peak current was in the region of 150 mA. And it is probable that no harm would be done to valve filaments or other components if the current were anything less than 300 mA. In that case it would be most satisfactory to use a fuse rated at about 200 mA or rather less. As an example, if a four-valve battery set took a normal L.T. current of .5 amp. (500 mA), it would be just as safe to use a fuse rated at 250 mA, as one rated at 60 mA.

Notwithstanding the above, it is usually perfectly good practice in a battery set to use an H.T.— fuse, rated at 100 mA, when the normal current to be passed by it is probably no more than 20 mA at most.

The "surge" is far greater in a mains set, and it is for that reason that one-amp. fuses are generally fitted as standard in the primary winding to the mains transformer, despite the fact that the normal current passed is no more than a quarter of this. A fuse connected between the H.T. secondary winding and a rectifier should normally be rated at four times the average rectifier output for a voltage-doubler circuit or at about twice the current for a half-wave metal or full-wave valve rectifier.

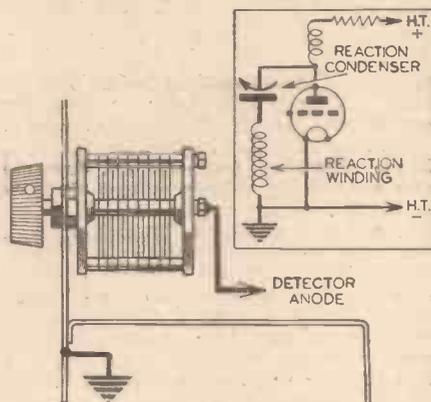
## Fuse Types

Fuses of the flash-lamp bulb type (but specially made to act as fuses and not as lights) are perfectly satisfactory in a battery set, but should not be used in a mains receiver. If they were, there would be a danger of "flash-over" or arcing between the filament mounts or even between the contacts of the holder, so that current

might continue to pass after the filament had burnt out. For a mains receiver—more particularly an A.C. one—the cartridge-type fuses employed should be at least an inch long. Shorter fuses should be confined to use in battery sets, trickle chargers or when the voltage is comparatively low.

## D.C. Precautions

In spite of the many warnings that have been given in these pages, instances still come to light of shocks and short-circuits with D.C. apparatus. To be on the safe side it is always wise to include a fixed



If a reaction condenser is mounted on a metal chassis without insulating washers a short-circuit of the H.T. supply might occur, as shown above.

condenser of not less than 250 volts working between H.T.— and earth, and between the aerial coil and the aerial terminal. The condensers may have values of about 2 mfd. and .0003-mfd., respectively. If the condensers are omitted

and the positive side of the mains is earthed, a short-circuit would be produced by the earth lead, and a nasty shock might be received if the aerial terminal were touched. Even with negative earthing there is sometimes a possibility of there being a small potential difference between the wireless earth and the earthing of the mains.

Another possible cause of serious short-circuits is by careless mounting of valveholders on metal or metallised chassis, so that one of the sockets makes contact with the earthed chassis. Similar trouble might arise if an insulated coil lead is nipped between the two parts of the coil screen; the insulation is scraped away from the wire.

## Use Good Flex

When making flexible-lead connections, great care should always be taken to avoid loose strands of flex, which can easily make contact with other terminals, components or parts of the chassis. This is especially important when wiring to a mains transformer, mains switch or the heater terminals of valveholders.

A last warning. When using a long mains lead to the set do not "economise" by using cheap flex. Use only first-grade material, giving preference to the flat type, rather than to twisted flex, which is not as well protected. Take care also that a good earth lead is properly attached to the set. When an earth cannot conveniently be provided, use can be made of the (large diameter) earthed socket of the mains power plug. By using three-core cable for the mains connection, the third lead can carry the earth-return from the set to the power point. This arrangement is, of course, impossible when the old-type two-pin power points are fitted.

## IMPORTANT BROADCASTS OF THE WEEK

**NATIONAL (261.1 m. and 1,500 m.)**  
Wednesday, May 3rd.—London Music Festival, 1939: Beethoven Concert—1, from Queen's Hall, London.

Thursday, May 4th.—Lucky Dip, 15th edition: a weekly magazine programme.

Friday, May 5th.—Cupid and Death (Gibbons and Locke): Orchestral and choral programme.

Saturday, May 6th.—Rugby League Cup Final: a commentary on the match from the Empire Stadium, Wembley (by courtesy of the Rugby League Council).

**REGIONAL (342.1 m.)**

Wednesday, May 3rd.—Roundabout: A regional variety programme from Wales, West, Scotland, Midland, Northern Ireland, London and North.

Thursday, May 4th.—Unflinching: a tale of heroism in the Wastes of Canada, based on the diary of Edgar Christian.

Friday, May 5th.—Van Phillips programme.

Saturday, May 6th.—Master of Balliol, feature programme.

**MIDLAND (297.2 m.)**

Wednesday, May 3rd.—Humour in Music-Making, with illustrations.

Thursday, May 4th.—Orchestral programme from the Town Hall, Cheltenham.

Friday, May 5th.—Sportsman's Diary.

Saturday, May 6th.—Orchestral programme

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

Wednesday, May 3rd.—Death in the Hand, a radio thriller by Douglas Cleverdon,

based on an idea by Max Beerbohm (recording of programme broadcast on May 2nd).

Thursday, May 4th.—For Young Farmers: Why I do not belong to a Young Farmers' Club, a debate.

Friday, May 5th.—Western Alphabet: a summer magazine for listeners in the West.

Saturday, May 6th.—Lawn Tennis: Hard Court Championships of Great Britain; a commentary during one of the final

matches from Melville Park, Bournemouth.

**WELSH (373.1 m.)**

Wednesday, May 3rd.—Songs by Grace Williams, sung by Margaret Rees (soprano).

Thursday, May 4th.—Unflinching: A tale of heroism in the Wastes of Canada, based on the diary of Edgar Christian.

Friday, May 5th.—National Service Rally, from the Brangwyn Hall, Swansea.

Saturday, May 6th.—Wrth y Burdd: Table Talk: a conversation between two Welshmen.

**NORTHERN (449.1 m.)**

Thursday, May 4th.—Slices of Life—Beginner's Luck, by Wilfrid Parkin.

Friday, May 5th.—Excerpts from productions of first three British Drama League play-contest Finalists.

Saturday, May 6th.—A programme of Hebridean and Scottish Songs.

**SCOTTISH (391.1 m.)**

Wednesday, May 3rd.—Variety from the Palladium Theatre, Edinburgh.

Thursday, May 4th.—National Service: Volunteers at Work.

Friday, May 5th.—Concert Party programme, from the Beach Pavilion, Aberdeen.

Saturday, May 6th.—Find the Flaws: a radio diversion.

**The King to Broadcast Empire Day Message from Canada**

**H.M.** the King will broadcast an Empire Day message from Winnipeg on May 24th at 8 p.m. (B.S.T.). His Majesty's speech will provide the climax to a "Round the Empire" programme, which is in course of preparation by the Canadian Broadcasting Corporation. This will be the only occasion during the Canadian tour that a speech by His Majesty will be relayed outside the Dominion.

Their Majesties' departure from Portsmouth on May 6th will be described by the B.B.C. and broadcast to the Empire. The Canadian Broadcasting Corporation is also making arrangements to relay to British listeners a description of Their Majesties' arrival at Quebec on May 15th and, later in the tour, their departure from Halifax for Newfoundland.

A PAGE OF PRACTICAL HINTS

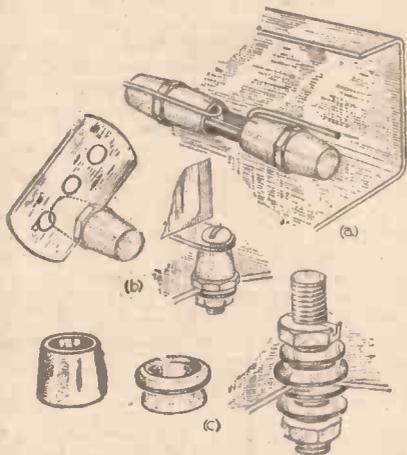
SUBMIT  
YOUR  
IDEA

READERS  
WRINKLES

THE  
HALF-  
GUINEA  
PAGE

Novel Use for Pencil Rubber Caps

I HAVE found that pencil rubber caps, of the type illustrated in the accompanying sketches, make admirable insulators for metal ended resistors in compact chassis assemblies, vibration absorbers for variable condenser mounting or loud-speaker fixture, and large insulated bushes or grummetts for isolating outside terminals from chassis. For insulating metal ended resistors, it is only necessary to bend the connecting wires back and slip the caps over



Some novel uses of pencil rubber caps for wiring and terminal insulators.

both resistor ends and wire, as shown at (a). For use as absorbers, the caps should be cut through with a penknife or more simply, a razor blade, as depicted at (b), the solid part or end of each cap being bored through with a paper gouge, or other similar implement, for the fixing bolts. The remaining rubber tubular ends can be used for the large grummetts, turning over the periphery after working into a suitably large hole in the chassis, and finally fixing the terminal with intermediate "flattening" washers each side; this is clearly illustrated in the sketch (c).—D. L. SMYTH (Aylsham).

A Novel "Strip-jack" Meter Mount

TO facilitate anode current measuring, and to maintain the symmetry of the receiver on transmitter front panel, I have devised the slot action jack, or key system, shown in the sketches. For the meter mount I used two strips of heavy-gauge brass, the strip in which is recessed the ebonite insulating piece, being of slightly thicker gauge to permit this recessing. I used an electrician's switch mounting block for the assembly, but any other suitable block of wood will do just as well, bevelling the edges down for smartness. The milliammeter is slot-mounted to the supporting strips.

As will be seen in the inset diagrams, contact packs are positioned immediately

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.

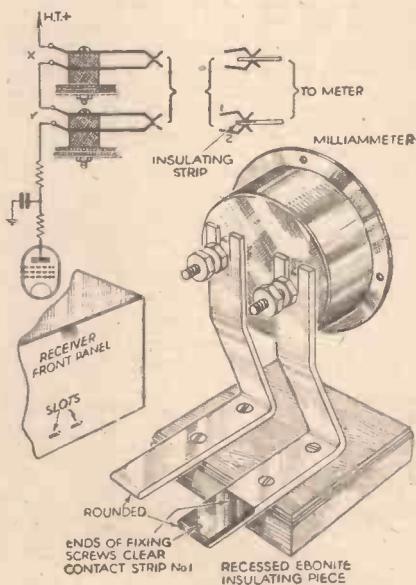
SPECIAL NOTICE

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

behind the slots in the front panel, these contacts which are "closed" when the "jack" is removed, are series wired in the H.T. side of the anode circuits.

When the jack strips are inserted, the bare strip maintains the circuit continuity of the "X" contacts, the H.T. flowing to the "Y" contact assembly. The "Y" circuit is immediately interrupted when the insulated jack strip is inserted, contact No. 1 now resting on the ebonite insulation piece, whilst the lower contact No. 2 engages electrically with the "bare" underside of the jack strip. The anode circuit now includes the meter, the whole principle being the same as that of the ordinary plug and jack.

It is important to ensure that the screws (in this model  $\frac{1}{16}$  in. 6 BA csk. filed down after fitment) which are secured by tapped holes in the ebonite, clear the contact

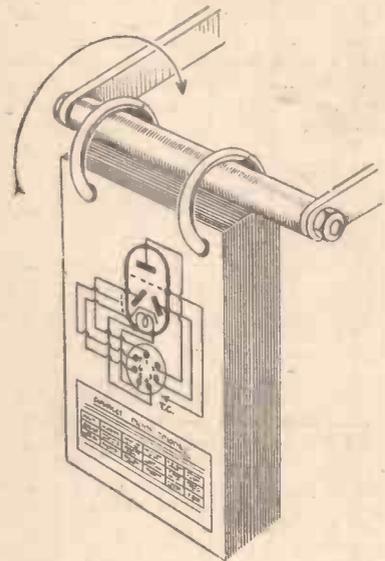


A "strip-jack" method of mounting a meter.

No. 1 when the jack is fully "home"; this is depicted in the illustration, otherwise the meter will be shorted out and the normal H.T. circuit restored.—A. C. LONGSTAFFE (Stoke-on-Trent).

Filing Data Sheets

AS a serviceman, I have been continually harassed by having to hunt up textbooks and other data for valve information when in the middle of a job, so I devised the following:



A handy filing device for data sheets.

First, I obtained some stiff white cardboard and cut it into pieces about 6ins. by 4 $\frac{1}{2}$ ins. On each of these I drew a pair of circles, one theoretically representing the electrode assembly (when completed), and the other depicting the valve base pins, numbered, and connected to the appropriate electrodes in the top circle. Then underneath I tabulated the data relating to the valve shown, and as many of its equivalents as I could get on the card. After marking all the cards in a similar manner, but for different valve types, I hung them by means of two 1 $\frac{1}{2}$ in. curtain rings from a length of  $\frac{1}{4}$ in. brass rod, secured by two large angle brackets on the wall above my bench at eye level. The sketch explains the idea clearly.—C. COBLEY (Warrington).

WORKSHOP CALCULATIONS  
TABLES AND FORMULÆ

3/6, by post 3/10 from

George Newnes, Ltd.,  
Tower House, Southampton St., Strand, W.C.2.

THE receiver described in last week's issue took the simplest possible form for a one-valver, utilising the minimum number of components, but in spite of this it is capable of giving very satisfactory results on the medium and long wavebands. It is only natural, however, that many will wish to elaborate on the circuit and make it even more efficient, especially if a few more components are available from the spares box. Before describing suitable additions and modifications to achieve that object, a few more details concerning the home-made coil will not be amiss, in case any difficulties have been experienced with its winding or connections.

The sketch, Fig. 1, should make all points quite clear. It should be noted that all windings are wound in the same direction. The top of the medium-wave section is connected to the fixed vanes of the .0005 mfd. tuning condenser and one side of the grid condenser. Twelve turns down from the top end a tapping point is made, and that is connected to the aerial terminal.

The bottom end of this section is joined to the start of the long-wave winding after fixing the coil former to the baseboard by means of a spot of adhesive. Take care to see that it is fixed the right way up, i.e., so that its turns follow the same direction, as those of the medium-wave coil. When making the connection between the two sections, bare the wires for at least one inch so that a good twisted or soldered joint can be made sufficiently strong to form a contact to which the wave-change crocodile clip can be fixed.

The bottom end of the long-wave coil is joined to the earth terminal and a short length of flexible wire, to which is fixed the clip mentioned above.

The reaction coil, which is fastened to the pivoted strip of wood, must be free to swing between the two other coils. Before finally fixing it in position, anchor its two leads to the wooden strip by means of a little insulating tape or a few turns of thin twine. This is clearly depicted in the illustrations in last week's article.

One end of the coil is taken direct to the anode of the valve, and the other to one of the telephonic terminals. If no reaction is obtained, reverse the connections.

### Hotting-up the Circuit

In certain areas it may be noticed that the selectivity is not sufficient to allow clear

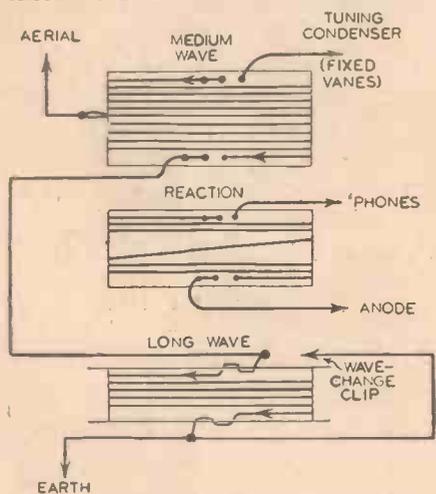


Fig. 1.—Showing the direction of winding each section of the coil, and the correct connections.

# Hotting-up the

## Many Will Wish to Obtain the Utmost Efficiency from Modifications to Increase Selectivity and Tone. Details to Increase Volume

separation of all receivable transmissions. The simplest and quickest way of improving such matters is to include between the aerial terminal and the coil tapping point a small condenser, say, one having a value of .0001 mfd. The value is not super-critical, though it will be found that the smaller the capacity the sharper will be the tuning, but the signal strength will decrease correspondingly. It is better, therefore, to

having the same resistance values and connect them in series.

### Wave-change Switch

To avoid having to reach inside the set, when it is required to change from medium to long waves, to remove or fix the crocodile clip, a simple panel mounting switch of the "on-off" type can be fitted to the panel and connected as follows. One side of the switch to the earth end of the long-wave coil, and the other side to junction formed by the connecting wire between the medium and long-wave coils. The flexible wire and crocodile clip must, of course, be removed completely.

### Battery Switching

No "on-off" switch for the batteries was shown last week, but as it is probable that

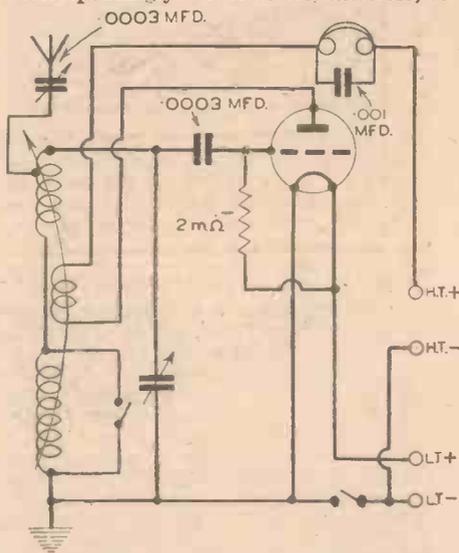


Fig. 2.—The original circuit modified according to the details given in the article.

use a variable condenser, in which case the maximum value can be in the neighbourhood of .0003 mfd. If a component of this type is used, it can be mounted on the left-hand side of the panel, so that easy control can be obtained. Another way of improving the selectivity is by lowering the aerial tapping point on the medium-wave section down the coil, but as this would mean increasing the total number of turns on the coil, so that it would cover the same wave-range, it is not advisable in this instance. There is no reason, however, why those wishing to progress with their knowledge should not carry out experiments in this direction, making up a separate coil on a longer former for such purposes.

### The Anode Circuit

The anode circuit in the original arrangement is perfectly plain, the signal and existing H.F. currents passing through the reaction before reaching the headphones. It will be found, therefore, that the quality of reproduction and the smoothness of reaction will be improved by the simple addition of a small by-pass condenser across the phones. A value of .001 mfd. will be satisfactory, but other capacities can be tried and their effect noted.

If it is desired to use two or more pairs of headphones, it is advisable to select those

that item will be required by many, the following alterations can be made.

With a switch of the same type as used for the wave-changing, only mounted on the opposite side of the panel so as to balance the layout, connect one of its terminals to the flexible leads from the negative sides of the H.T. and L.T. batteries after removing them from the earth terminal, as shown in the original circuit.

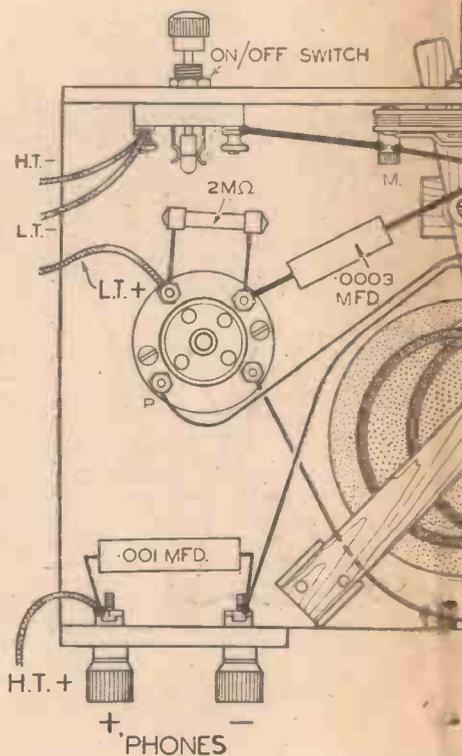


Fig. 3.—The modified layout, showing where the components are connected.

# S.S. One-valver

the Circuit Described last week, by Making Simple are also given for the Addition of Another Valve  
By L. O. SPARKS

The other terminal of the switch is then connected to the earth terminal so that when the switch contacts are closed the batteries are actually connected to their original point.

### Dial and Tuning Condenser

Although a variable condenser of the "solid" dielectric type is specified for the S.S. One-valver, there is no reason why any standard type of air dielectric kind should not be used, provided it has the same capacity, namely, .0005 mfd. On actual test it will no doubt be found that a greater efficiency will be obtained with a condenser of the latter kind, but if it is decided to use one, it should be remembered that the coil unit might have to be moved more to the rear of the baseboard. The general appearance of the set will be improved with the

time when he hankers after more volume. There are generally two reasons for this. It is either desired to work a loudspeaker on the more powerful stations, or it is a question of wanting just a little more volume on the headphones when receiving the more distant transmissions.

To avoid queries in the future, therefore,

care must be taken not to increase it too much otherwise all top-note response will be lost and the resultant tone will be very woofy and lifeless.

### General Notes

With the original circuit much depends upon the valve, the adjustment of the reaction control, and the value of the applied H.T. With any given valve, tests should be made to determine the most satisfactory H.T. voltage to secure smooth reaction with maximum signal strength and stability. After one has got used to the touch of the reaction control it will be found that quite a number of stations can be received and that selectivity is better than at first appeared.

### Aerial and Earth

Unless the receiver is being used, say, 30 or 40 miles from the transmitting station, don't use a long aerial with the idea of increasing signal strength. Such an arrangement will tend to reduce the selectivity of the circuit. Therefore keep the overall length of the aerial down to something in the neighbourhood of 50ft. For those in flats or who intend using the set on the second or third storeys of their house, a good indoor aerial will prove quite satisfactory providing, of course, that reception in the area is normal.

A good earth connection is an important factor, so every attempt should be made to see that this part of the installation is as efficient as possible. Failing an earth plate in the ground, a water-pipe is the next best. Don't use a gas supply pipe. See that the pipe is thoroughly cleaned where a contact is to be made and secure the earth wire to the pipe by means of one of the special clips obtainable for a few pence. A faulty earth connection can cause most unsatisfactory results, many of which may prove of an erratic nature difficult to trace.

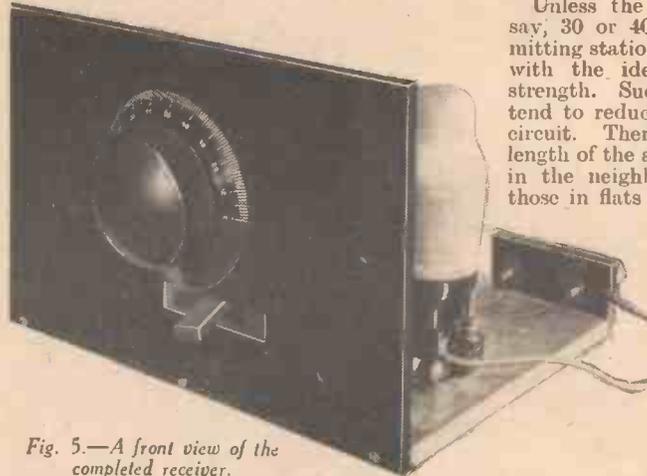
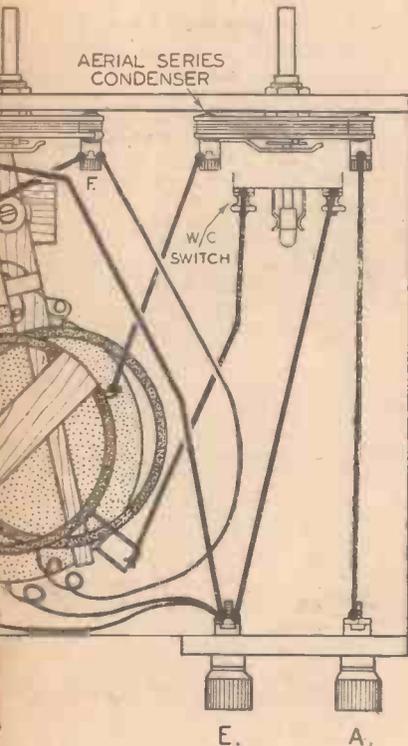


Fig. 5.—A front view of the completed receiver.



The additional components are fitted and how connected.

fitting of a slow-motion dial, though I would not advise the use of one having station names marked on it, unless one is prepared to experiment with the coils to obtain accurate settings of the dial pointer.

### Increasing the Volume

However satisfied the user of a one-valver may be with the performance of his receiver, there always appears to come a

the layout for a two-valve S.S. receiver is given in Fig. 4. It will be seen that an L.F. transformer has been used for the coupling between the detector and output, and that its ratio can be anything between 3:1 and 7:1. Resistance-capacity coupling could be used, but it will be found that the transformer will give a greater overall amplification in signal strength.

A pentode valve is shown for the output; if one does not mind sacrificing a little volume, a power valve can be employed, in which case the fifth connection to the second valvholder will not be required.

If it is intended in the first place to make the receiver a two-valver it will be advisable to move the coil assembly lin. to the left or, better still, use a larger baseboard to avoid excessive cramping of the components.

The fixed condenser between pentode anode and the common negative line can be varied in capacity to suit individual taste. For example, if it is desired to give the reproduction a lower tone a larger capacity should be used, but

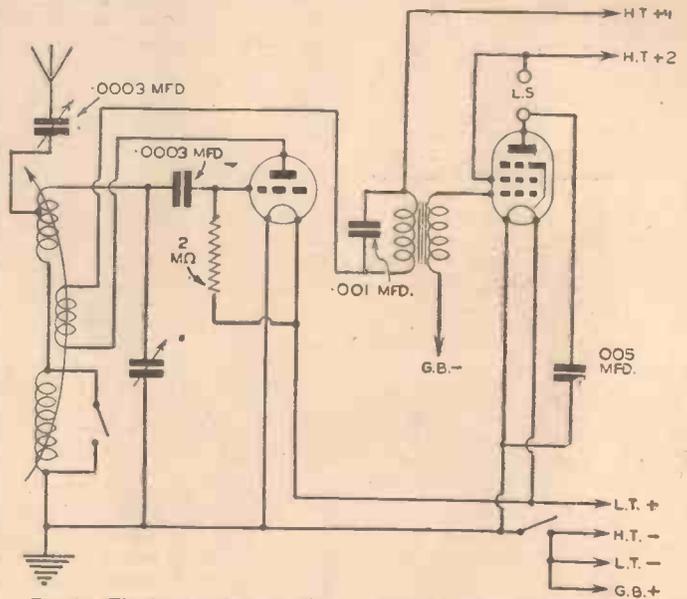


Fig. 4.—The theoretical circuit of the suggested two-valve arrangement.

# "What I Would Do With Crooners"

Prize-winning Entries in Thermion's Recent Competition

IN the recent competition set by Thermion a number of facetious entries were received, and although six prizes were offered for the best entries, there were only four which could be considered as worthy of a prize. These are given below, and it will be noted that of these, three were definitely anti-crooner, whilst one was a considered attack on those who do not like this form of entertainment.

\* \* \* \* \*

"According to the laws of this country a man who inflicts mental pain on another is guilty of a crime, and is accordingly punished. But what of the crooner who inflicts mental pain, alas, he goes scot-free! So for the time being I shall adopt the rôle of Public Prosecutor and devise some sort of punishment for Public Enemy No. 1. What punishment can be meted out to him with justice? I cannot order him to be hung, though no doubt with his low, monotonous, inarticulate sounds like a baby (dic. def.) he has sent many a poor soul to a living death, with nerves, etc.; I cannot pass capital punishment for that. No, I think on second thoughts the best punishment to fit the crime would be as follows. Public Enemy No. 1 to be forced to make a record, after this he is to be placed in a soundproof studio with, say, a nice little PA with an output of 50 watts, with pick-up, motor and record changer complete. The latter would have to be a special one as it would have to change the record for 24 hours a day for seven days. There would be no need to fit volume control on PA as crooner must hear every item on record; of course, P. E. No. 1 would have to be tied hand and foot to prevent him kicking front of PA in. During the above seven days in company with Inspector Scornley (this one has never been on the radio), I would locate Thermion's place of abode. The prisoner would be released, say, about 1 a.m. on the last day of his sentence, and would be conveyed in a 'Black Maria' to the doorstep of the above abode and commanded to croon, until the aforesaid gentleman was awakened, prisoner to be left to his fate."

F. G. SADLER.

\* \* \* \* \*

This is J. H. Laughton's solution to the crooner problem:—

- (1) Sentence all crooners to a season at the "Proms" and symphony concerts.
- (2) To hear all Gilbert and Sullivan operas.
- (3) To hear Peter Dawson give a couple of hours songs.
- (4) To hear 100 favourite old songs sung by appropriate artists.

The sentences to run consecutively on low dict.

If at the end of their sentences crooners still persisted in crooning, I would put them in a mental institution with a stage and an audience of love-sick girls, boys and disappointed spinsters, for life!

\* \* \* \* \*

I have not yet had the misfortune of meeting a crooner in the flesh, but should this event come to pass I would take full advantage of it.

When I meet one of these degenerates in the street, I will push him into a dark alley-way, chloroform him, transport him to the nearest doctor, and have his vocal

cords removed. After this humanitarian operation has been performed, he will be allowed to go away, vainly trying to produce the particular sound waves characteristic of his profession, if it can be called such.

There is another class of this pest which frequents drawing-rooms as well as Broadcasting House. This type should be removed to the nearest piece of waste land and there conveniently tied to a stake with his mouth padlocked, and so left to languish.

The female of the species has to be dealt with by guile, and the following recipe may be found effective: one spoonful of arsenic mixed with a cocktail which the offender will drink forthwith, remarking on the original taste of the refreshment. The cocktail itself, if my knowledge is correct, would neutralise the arsenic after its effect, thus avoiding detection.

These ideas cover the whole field of research and their use is highly recommended.

[This entrant failed to give his name and address. Will he please write us so that the prize may be forwarded to him?—Ed.]

Before I say I, at least, know what you would do with them, I think you are grossly unjust in saying what you did about them. Admitted different people have different tastes, but not so much as to compare a crooner's voice with cat-calls, etc. I can't think for one moment what gives you the bad impression about them. A crooner will always put his heart and soul (it sounds more like liver and kidneys—Thermion) into the song, especially if it is the least bit sentimental, which can't be said about, say, opera singers, who just sing their piece, and that is as much feeling as they put into it. So far as my opinion goes I would like to see them become more popular, especially in the eyes, or should I say ears, of the listeners (including Mr. Thermion), than the so-called better class music, e.g., chamber music.

I did not write this only with the idea of trying to win a prize, but I just could not bear to see your awful criticisms go by unheeded. So as a staunch supporter of your excellent paper, I will close this little episode and go and listen to some crooning.

ALEX DICK.

## THE EDISWAN LAMP MUSEUM

A NEW section, containing specimens of many of the most famous inventions of early lamp-makers, has been added to the Ediswan Collection of Historic lamps, housed on the Company's premises at 155, Charing Cross Road.

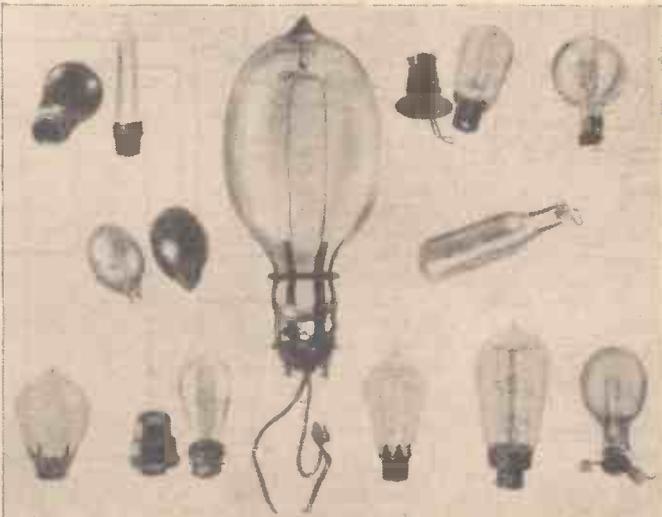
It will be remembered that when this Collection was inaugurated, on November 14th last year, it was comprised of Edison and Swan lamps dating from 1878 (when Sir Joseph Swan made the first practical incandescent lamp) to 1938. It was stated at the time that it was the Company's intention not to stop at this. Although the history of Ediswan is virtually the history of incandescent electric lighting, and with the exhibits of that Company alone the story can be completely told, interest is heightened, and the picture of the early days made clearer, by the incorporation of these specimens from other makers.

The new section, though at present limited to less than twenty specimens, has cost much in time and money to get together. The task of identifying the old lamps and compiling accurate facts was at times laborious work. Several names long since forgotten by even the oldest members of the industry are here revived—names once prominent in Electrical Science.

Although every effort is still being made to acquire lamps by other manufacturers and inventors, of many early lamps not a trace can remain since no more than one or two specimens were made, and no commercial venture ensued. These have, no doubt, long since been broken up. But records of every one of them exist still, and from such records Ediswan intend to compile a "Roll of Honour," giving the names of the inventors, a brief specification and, where possible, a sketch of the lamp

as it would have appeared. In this way every lamp ever patented in Great Britain will be represented in the Museum.

Among the lamps included in the case at the present are specimens of The Metropolitan Brush Co., Woodhouse and Rawson, "Sunbeam," Weston, Maxim, Crookes, Lane Fox, Cruto and "Tantalum." Of these, the Cruto lamps (3) and the Crookes lamp (1) are of outstanding interest. The Cruto lamps are three of the five believed to be the only examples of this inventor's work now in existence.



Specimens from the new section of the Ediswan collection of historic lamps devoted to the work of the early lamp makers.

# 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

Headquarters: 72A, North End Road, West Kensington, W.14.

Meetings: Friday evenings at 8.15 p.m.  
Hon. Sec.: C. W. Edmans, 15, Cambridge Road, North Harrow, Middlesex.

At a meeting of the society held on Friday, April 21st, a representative of Messrs. Partridge, Wilson and Co., Ltd., lectured on "Rectifying Equipment". The lecturer brought with him a great deal of apparatus ranging from a small charger for car batteries to a large mercury-arc rectifier. After describing briefly the three main types of rectifiers in use to-day—namely the Vacuum Valve, the Gas-filled Valve, and the Metal Rectifier, the lecturer went on to explain their relative advantages and disadvantages.

Meetings of the society are held every Friday evening at 8.15 at 72A, North End Road, West Kensington, London, W.14. Further particulars may be obtained from the hon. secretary, C. W. Edmans, at the headquarters of the society.



New aerial system installed at the International Short-wave Club (London Chapter), R.A.C.S. Hall, Wandsworth Road, S.W.8. Provision is made for television, also for short-wave transmission and reception. The television feeder comprises some hundred feet of Telcon A.S.S.C. cable.

## INTERNATIONAL SHORT-WAVE CLUB (LONDON)

Headquarters: R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8.

European and Colonial Representative: Arthur E. Bear, 100, Adams Gardens Estate, London, S.E.16.

The accompanying illustration shows the new aerial system installed at the London Chapter of this organisation.

The mast is a wooden structure, some 50ft. high, erected on the roof of the R.A.C.S. Hall, Wandsworth Road, S.W.8. Provision is made for a television dipole, and also for short-wave reception and transmission. Experiments in radio are at present carried out on a closed aerial circuit with the call 2CLR, prior to going on the air.

Quite a large audience attended the meeting of the London Chapter held at the R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8, on the evening of Friday, April 21st, for the special television lecture and demonstration arranged by Baird Television, Ltd. The receiver excelled for television performance, the picture being practically black and white, and rock steady. The quality of the sound was very noticeable. Readers of PRACTICAL AND AMATEUR WIRELESS are always welcome at the meetings held on Friday evenings.

## BETHNAL GREEN RADIO CLUB

Meetings: Tuesdays and Thursdays, 8 to 10 p.m.  
Hon. Secretary: Mr. L. Burd, c/o The Institute, 224, Bethnal Green Road, E.2.

The club, which meets at Bethnal Green Institute at the above address, has been in existence several years.

Tuesdays are devoted to the theoretical side of Radio Engineering, accompanied by a demonstration of apparatus to illustrate the lectures.

Thursdays are given over to practical work, the popularity of which is shown by the number of U.S.W. adapters, superhets, and transmitting apparatus which are being constructed. On these evenings a beginners' Morse class is progressing favourably.

Any persons who are interested, and wish to join the club, should apply at the Institute on one of the club nights or communicate with the hon. secretary, who will be glad to supply them with further information.

## SALE AND DISTRICT RADIO SOCIETY

Meetings: St. Mary's School, Barker's Lane, Sale, every Thursday evening.

Secretary: Mr. C. Allen, Emeraldale Drive, Sale.

MEMBERS of the society include three holders of artificial aerial licences. Prior to the business meeting Morse tuition is given. An attractive programme of lectures on the "Fundamentals of Radio" has been arranged, and it is proposed to devote a short time to dealing with various technical problems encountered by members.

At the last meeting a resolution was passed calling for an extension of the Television service to include the Manchester area. Copies of the resolution are being forwarded to local Members of Parliament. New members will be welcomed.

## BRITISH SOUND RECORDING ASSOCIATION

Hon. Gen. Sec.: F. J. Chinn, "The Nutshell," 14, Tirlmont Road, South Croydon, Surrey.

A LARGE party of B.S.R.A. members was entertained by Mr. H. L. Sheridan at the Imperial Sound Studios, 84, Wardour Street, W.1., on Thursday, April 13th. This visit was eagerly antici-

pated by members, for practically every short film made in Great Britain for general release has its sound-track recorded by Imperial Sound Studios.

Prior to showing members the equipment in the recording room, Mr. Sheridan gave an interesting talk on the beginnings of the sound-film industry and the many problems encountered, which he illustrated by anecdotes from his own long experience in the trade.

In the recording room, looking on to the studio through a glass window, the sound-cameras for standard 35-mm. film recording, the associated amplifiers, the patching bays, and mixing panel were described. A complete channel for direct recording on 16-mm. film stock is also available. Both the 35-mm. and 16-mm. systems have been designed by Mr. Sheridan and the quality on both sizes of film stock is guaranteed. Facilities for "dubbing" and re-recording tracks for broadcasting are provided.

Full details of B.S.R.A. membership are obtainable from the hon. sec. at the address above.

## ALDERSHOT AND DISTRICT RADIO SOCIETY

Hon. Sec.: H. Atthill (G8CV), Ardvorney, Heath End, Farnham, Surrey.

The society held its first general meeting on April 6th. The evening opened with a junk sale which caused great interest, and amusement! The business side of the meeting then followed.

Morse practice is in full swing, and members are being individually instructed at the local meetings. Also, three stations belonging to members are giving slow-morse on the 5, 10, and 160 metre bands on Monday, Wednesday, and Friday evenings. At a future date a visit is to be arranged for the club to view the apparatus at a local cinema, and the local telephone exchange. It is likely that an outdoor field day will be held, and this will probably include operation of transmitting apparatus.

The society regrets the resignation of Mr. Ward (G5NF) and Mr. Devaney (2FYG) from the position of treasurer.

## PROPOSED CLUB FOR PLYMOUTH.

Will any readers who are members of the B.L.D.L.C., residing in or near Plymouth, who would be interested in the formation of a listeners club (long distance) please get in touch with the undersigned: S. F. V. King, 47, Stanlake Terrace, Prince Rock, Plymouth, Devon.

## COXHOE AMATEUR RADIO SOCIETY (Proposed)

A RADIO and Physics Class is to commence in conjunction with the above society at Cornforth Lane Connel School (Science Building), Coxhoe. The Electrical Instructor is Mr. Soulsby, B.Sc. Anyone interested is invited to apply for particulars to Mr. R. Bowes (2DTA), 10, Blackgate, Coxhoe. A list of 24 names has been compiled to date.

# New! 100% increased short-wave EFFICIENCY



## TROPHY PRESELECTOR

New ALL-BRITISH Low-priced Short-wave Unit for all receivers

- ★ 2 stages using EF8 valves.
- ★ 5 Bands—7 to 550 metres.
- ★ S/M tuning—800° in 1° steps.
- ★ Frequency calibrated scale.
- ★ Self-powered for A.C. 200/250 volts.
- ★ TROPHY 12 months' guarantee which includes valves.

For use with any TROPHY receiver or in front of any mains or battery superhet or straight instrument. Two low-noise R.F. pentodes are employed, giving increased range, selectivity, signal strength and considerable image suppression, factors of sufficient importance to merit the use of the TROPHY PRESELECTOR with any existing receiving gear. 3 controls—combined R.F. Gain, On-Off Switch, Band Switch and Tuning. Complete in black crackle finish steel cabinet size 11 x 9 x 9ins., ready for use.

**£6:15**

THIS AMAZING UNIT is yours for 11/9 down and 12 monthly payments of 11/7.

## TROPHY COMMUNICATION RECEIVERS

Hear all those important and thrilling broadcasts between 6 and 550 metres.

<b>NEW TROPHY 6</b> New junior A.C. communication model. 6 valves—all octal types. 10-550 metres, complete coverage. Two-dial electrical bandspreading. Switched AVC and BFO. Pitch control. Send-Receive switch. Built-In Speaker. Phone jack. Amazing performance, amazing value. TERMS: 12/6 down and 18 monthly payments of 12/3. <b>£9 19 6</b>	<b>TROPHY 3</b> A.C. and Battery 3-valves for operation on 6 to 550 metres using self-locating inductors. Metre calibrated scale. Built-in speaker. Phone jack. Supplied complete in cabinet with coils for 12-52 metres. BATTERY model, £5.15.0, or 7/- down and 18 monthly payments of 7/-. A.C. model 6 Gns., or 7/6 down and 18 payments of 7/9. Extra coils for complete coverage add 16/9 to cash prices. <b>£5 15 0</b>
<b>TROPHY 5</b> A firm favourite. 5 valves and continuous wave range of 10-550 metres. All essential refinements for efficient DX operation. Bandspread tuning. Frequency or Metre calibrated scale. Built-in speaker. Phone jack. Unbeatable value. Yours for 10/9 down and 18 monthly payments of 10/9. <b>£9</b>	<b>TROPHY 8</b> A super 8-valve A.C. communication model for serious short wave work. Bandspreading and all essential refinements. Wave-range 7-550 metres. Complete in pleasing cabinet ready for use with separate P.M. speaker. This amazing set is yours for 15/6 down and 18 monthly payments of 15/6. <b>£12 gns.</b>

TIME YOU REPLACED your aerial with a Peto-Scott ALL-WAVE OUTFIT. Complete with all instructions, 17/6 cash or C.O.D., or 2/6 down and 7 monthly payments of 2/6.  
77, (P38) City Rd., London, E.C.1. Tel. CLISSOLD 9875  
**PETO-SCOTT CO., LTD.** 41, (P38) High Holborn, W.C.1. Tel. HOLBORN 3248  
SEND FOR COMPLETE RADIO LISTS



May 6th, 1939.

Vol. 4.

No. 150.

reproduction. A close-up of the front of the set is given in Fig. 2; the large diameter wide angle lenses on their focusing rack being clearly visible. By being built into a neat compact unit in this way, the alterations which have to be effected to a theatre are of a relatively minor character, and it is this form of equipment which will be employed in the Gaumont British circuit cinemas for showing the Derby when it is televised next month.

#### In New York

QUITE recently the G.B. headquarters in New York have received many enquiries concerning cinema television in that city; this being a direct result of the enthusiastic reports which have appeared in America following the Boon-Danahar fight. The outcome of this is that Baird technical experts are leaving at once for New York together with complete television units. These will be installed in famous American

cinemas, and a Broadway première of the Baird system will take place within the next few weeks. This will undoubtedly be linked up with the World's Fair television transmissions, and of course the apparatus is being made to conform to the American standards which differ so radically from the British ones. Provided the transmitted pictures are satisfactory, and this is a matter which has yet to be established, there is no doubt that American audiences will enjoy seeing pictures of this size and clarity, for there is nothing in that country to compare with what has so far been achieved in London. Mr. Isidore Ostrer is determined to expedite his plans and so give every encouragement to the huge potential market offered on the other side of the Atlantic. In this way it is hoped in some measure to offset with cinema and home television, some of the huge gains which the American talkie equipment manufacturers made when sound films first came to

#### Another Fight

THE third big boxing match to be televised and rediffused to those cinemas with suitable equipment installed, proved to be extremely successful. It was shown at the Marble Arch Pavilion and Tatler cinemas and, as in the case of the Boon-Danahar match, the atmosphere of the ringside was reproduced to the audiences by the contestants, Farr and Burman. The B.B.C. are gaining by experience in these matters, and by careful attention to lighting there was adequate contrast in the large pictures projected on to the screen. As an indication of the form taken by the actual Baird installation at the Marble Arch Pavilion, reference should be made to Fig. 1. A few seats in the centre stalls gangway have been removed, and the compact twin cathode-ray tube projector unit is neatly roped off so that the operating engineer can attend to his controls undisturbed. In addition to adjusting the set itself this same engineer raises or lowers the screen through a trap door in the stage, and this is seen quite clearly with the loud-speakers on each side to give the sound

Fig. 2 (right).—The Baird twin-projector large screen receiver complete with lenses.

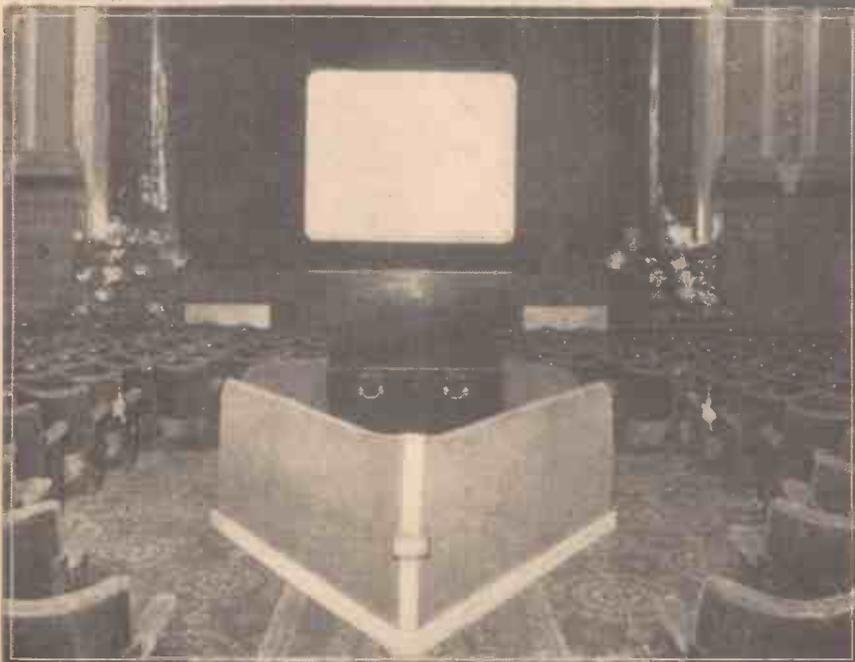
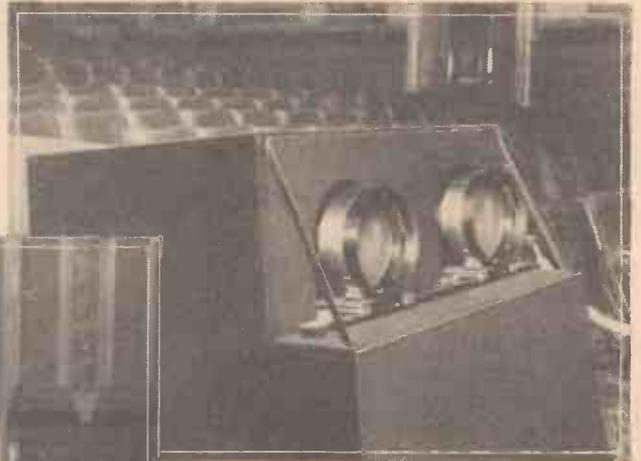


Fig. 1.—The Baird receiver in the centre of the stalls at the Marble Arch Pavilion, with the 15ft. by 12 ft. screen.

Great Britain. One angle in which C.R. tube projection pictures have shown their superiority over other methods is in the question of brightness. In the case of home receivers, many compromises have often to be effected in order to meet the conditions of sustained domestic viewing when the set is operated with unskilled hands. With big screens, however, very high anode voltages can be employed, for all the equipment is under the control of skilled operators who are well versed in the art of maintaining a true balance of contrast and brightness for the picture when observed in any part of a large theatre.

#### RADIO IN AVIATION

Owing to pressure on our space this week, we regret that the continuation of Radio in Aviation has had to be held over.

# TELEVISIONS

## Polish Efforts

**P**OLAND has been very much in the news lately because of international questions which loom large round the country. It is learned, however, that technical development in television matters has been progressing slowly, and vision signals are being radiated in Warsaw on a wavelength of 7.5 metres (40 megacycles). There are only a very few cathode-ray tube receivers available for test purposes, but ultimately it is hoped to cover the whole of the city, together with the suburbs, with an adequate signal service. The initial tests are being undertaken with pictures from a film scanner using an apertured disc for picture dissection. An ambitious programme has not been formulated at the moment, and the picture standard is only one of 120 lines with sequential scanning giving 25 pictures and frames per second. A measure of flicker is therefore apparent, but it is anticipated that before long improvements will be carried out, and a higher definition attempted.

## Aeroplanes and Television

**I**T is known that many experiments have been undertaken to ascertain with what degree of success visual information can be televised from aeroplanes in flight to certain land stations. In some quarters it has been said that the reason for the relatively small amount of information concerning television progress in Germany is largely due to the close co-operation existing between the

Government departments and the research organisations of television manufacturers who are perfecting equipment of this character. One reason why these air suggestions have been revived, quite apart from any military significance, is that it is thought that the equipment could be quite easily developed so as to be ultra-sensitive at the red end of the spectrum. With low-lying cloud it is known that quite a lot of detail can be recorded by infra-red ray aerial cameras, so why not television cameras? In the event of Government services, troop movements, artillery positions, ground contour, etc., would all be made clear to headquarters when kept in touch direct by television transmissions. With a more peaceful incentive, however, the value of such a device when weather conditions give fog and mist cannot be over-estimated. Perhaps in due course apparatus of this nature will be made available, and it should then be possible for outside broadcasts, particularly those of races, to be undertaken by television transmissions from the air, the results being relatively independent of weather conditions.

## Flyback Line Suppression

**I**T is very annoying when watching a television programme on a home receiver to find that the flyback lines are in evidence. These show as fairly bright inclined line traces on the cathode-ray tube face, and under normal circumstances do not make their presence felt as they occur during the

black pulse period. If they are in evidence however, this may be due to the fact that the contrast or gain control of the receiver itself is set back too far or, alternatively, the brightness knob may be advanced forward by too wide a margin. Both these items should be tried before looking elsewhere for the trouble. The normal receiver incorporates a flyback suppression circuit, and if any of the condensers have failed in this part of the equipment, then the effect will be apparent on the screen. With magnetically operated sets it is often found that the pair of line coils are surrounded by a thin metal shield. This has a split down the centre, and unless this junction coincides with the coil centre, then flyback lines will appear or the picture definition will be materially affected.

## Is America Ready?

**A**S the last of the television transmission standards was only decided upon in America some three months ago, it left the engineers charged with completing the high-powered radio transmitters very little time for their work, and still less for testing prior to going on the air on regular schedule on April 29th. One factor which has been the subject of considerable discussion is the method of eliminating one of the sidebands, for the Americans have agreed to work on a single sideband standard with a channel 6 megacycles wide. It is recognised that the design and operation of a high-powered ultra-short-wave transmitter of the single sideband type is a big problem, and the engineering world will watch with interest the efforts of those undertaking the work.



Mr. Donald F. Boyd, for the last three years the senior Talks Producer in the North Region, has been appointed Assistant Programme Director of the B.B.C.'s North Region.

The Postmaster-General has appointed Colonel A. S. Angwin, Deputy Engineer-in-Chief to be Engineer-in-Chief on the retirement of Sir George Lee on May 31st. The Post of Deputy Engineer-in-Chief will be filled by Mr. P. J. Ridd, and Mr. G. F. O'Dell has been promoted to the position of Assistant Engineer-in-Chief.

The Radio Manufacturers' Association have appointed Mr. A. John Dannhorn as their Publicity Officer. The appointment is to the staff of the Association, and Mr. Dannhorn will handle the publicity direct from the Association's offices at 59, Russell Square (Museum 4031) where he will be available on Tuesday, Wednesday and Thursday mornings of each week. His principal work, of course, will be the publicising of Radiolympia, which is due to take place this year between August 23rd to September 2nd.

## PATENTS AND TRADE MARKS

Any of our readers requiring information and advice respecting Patents, Trade Marks or Designs, should apply to Messrs. Rayner and Co., Patent Agents, of Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.

**MODEL 7021.** Chassis. A popular 3-valve S.G.3 model. Wave-range 200-2,100 metres. Engraved dial. Amazing range and volume. Chassis size approx. 7 1/2" H. x 10 1/2" W. x 7 1/2" D. Fully tested. **BARGAIN 19/6.** British S.G. Det. and Pentode valves 13/6 extra.

**MODEL 7030A.** 5v. A.C. All-Wave Super Chassis. A superlative receiver incorporating modern improvements. Output over 3 watts, air cored bandpass coils. S.M. tuning, illuminated dial, A.V.C., tone control, P.U. sockets, wave range 18-52, 200-550, 900-2,100 metres. A.C. 200/250v. Chassis dimensions approx. 8 1/2" H. x 12" W. x 9 1/2" D. Fully tested. **BARGAIN, less valves, 62/6, or with valves, 82/6. 5/- deposit secures.**

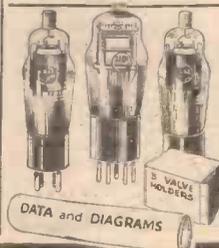
**MODEL 8025.** Console All Wave Battery S.G. 6 complete receiver in splendid console cabinet, 31" high and fitted with matched permanent magnet M.C. speaker and 2 British valves of guaranteed life. Wave-range 18-52, 200-2,100 metres, less batteries. Ready for use. **BARGAIN £4/19/6, or 5/- deposit secures.**

**MODEL 7053.** A.C. Mains Bandpass S.G.4, complete receiver in pleasing inlaid walnut veneered upright table cabinet with oversized moving coil speaker. Receiver incorporates latest 4-valve circuit arrangement providing wonderful selectivity and sensitivity. Output over 3-watts. Wave-range 200-2,100 metres. P.U. sockets. A.C. 200/250 volts. Ready for use. **BARGAIN 84/-.** 5/- easy-payment deposit secures.

**MODEL 7053.** As above, chassis only. Size approx. 7 1/2" H. x 12" W. x 9 1/2" D. Fully tested. Less valves, **BARGAIN 47/6,** or complete with 4 matched valves 55/-, or 5/- down and 18 payments of 5/-.

**MODEL 7054.** Super A.C. Mains Bandpass. S.G.4 chassis with matched valves. 200-2,100 metres. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. **BARGAIN 57/6 or 5/- down and 12 monthly payments of 5/3.**

**MODEL 7032.** Battery. All-Wave S.G.3 in handsome walnut veneered upright table cabinet with moving coil speaker and valves. Less batteries. Wave-range 14-2,100 metres. World-wide reception. Only 10 m.a. H.T. consumption. Station-name dial. The set for those with no mains at their disposal. **BARGAIN 85/- or 5/- only secures, balance in 18 monthly payments of 5/6.**



**5/6 THE LOT POST FREE**

**Order Now**

Secure this 3-valve offer and send for list "v" covering all valve types available at amazing bargain prices.

## MAKE and SAVE Money Money

Backed by the N.T.S. complete satisfaction guarantee, these bargains represent special opportunities to replace your own radio or to sell again at a handsome profit. Supplied complete with all instructions. **NEW LISTS FREE.**

## SPECIAL BARGAINS

**MODEL 7032.** Fully tested chassis only. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. Less valves, **BARGAIN 42/-.** Complete with valves 65/-, or 5/- down and 12 monthly payments of 5/3.

**MODEL 7034.** Super All-Wave (S.G.3) battery receiver. Superb cabinet and a set that will delight all the family. Stations galore with grand tone. Less batteries. Ready to play. **BARGAIN £4/19/6.** 5/- easy-payment deposit secures.

**MODEL 7034.** Super chassis as above with valves. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. **BARGAIN 67/6, or 5/- down and 15 monthly payments of 5/3.**

**MODEL 7045.** Battery Bandpass S.G.4 chassis with matched valves. Highly efficient 4-valve model with S.G. and Class "B" output. Amazing range. English and Foreign programmes always available. Wave-range 200-2,100 metres. Quietest H.T. consumption 8 m.a. Chassis size approx. 7 1/2" H. x 12" W. x 9 1/2" D. Fully tested. **BARGAIN 55/-.**

**MODEL 7044.** Super Bandpass Class "B" 4 chassis with all valves. Wave-range 200-2,100 metres. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. **BARGAIN 67/6.**

**MODEL 7053A.** 5-valve Battery Broadband chassis with all valves. Seven stage superhet circuit with Class "B" driver and output. Wave-range 200-2,100 metres. Slow motion tuning. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. Dial calibrated metres and station names. Fully tested. **BARGAIN £3 12s. 6d., or 5/- down and 12 monthly payments of 6/3.**

Class "B" output. Amazing range. English and Foreign programmes always available. Wave-range 200-2,100 metres. Quietest H.T. consumption 8 m.a. Chassis size approx. 7 1/2" H. x 12" W. x 9 1/2" D. Fully tested. **BARGAIN 55/-.**

**MODEL 7044.** Super Bandpass Class "B" 4 chassis with all valves. Wave-range 200-2,100 metres. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. **BARGAIN 67/6.**

**MODEL 7053A.** 5-valve Battery Broadband chassis with all valves. Seven stage superhet circuit with Class "B" driver and output. Wave-range 200-2,100 metres. Slow motion tuning. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. Dial calibrated metres and station names. Fully tested. **BARGAIN £3 12s. 6d., or 5/- down and 12 monthly payments of 6/3.**

## TESTED KITS-VALVES FREE

**ALL-WAVE WORLD S.G.3.** Wave-range 9-2,000 metres, slow-motion tuning. Station-name scale. Kit includes all parts with transformer, etc., and FREE S.G. Det. and Pentode valves. Less value of £4/15/0.

**MODEL 7032A.** 5-valve Battery Broadband chassis with all valves. Seven stage superhet circuit with Class "B" driver and output. Wave-range 200-2,100 metres. Slow motion tuning. Chassis size approx. 8 1/2" H. x 12" W. x 9 1/2" D. Dial calibrated metres and station names. Fully tested. **BARGAIN £3 12s. 6d., or 5/- down and 12 monthly payments of 6/3.**

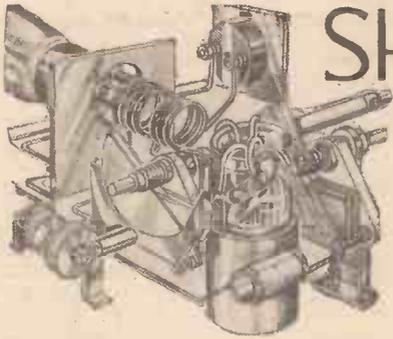
**ALL-WAVE WORLD S.G.4.** Employs one more S.G. audio stage than the 3-valve model and all extra components. Station name scale. 4 valves given FREE. Astounding **BARGAIN** at 42/- cash or C.O.D., or 2/- down and 12 monthly pmts of 3/9.

**COILS.** Complete set of 10 coils, 9-2,000 metres. List 27/6.

**N.T.S. BARGAIN, 17/6,** or add 1/6 to World Kit deposit and to each monthly payment. **N.T.S. SHORT-WAVE BOOK** will full kit descriptions and data FREE.

**BARGAIN PARCELS.**  
1 each 2 and 3 gang variable condensers, 1 coil, 1 transformer, 3 valve holders, 6 resistors, 5 fixed condensers, 1 dot, various control knobs and 1 brand-new ready-drilled plated steel chassis. List value 45/-. **Bargain 5/9, plus 9d. for special packing and postage. ORDER EARLY.**

**NEW TIMES SALES CO.**  
56 (Pr.W.38), LUDGATE HILL, LONDON, E.C.4  
Phone: City 6510. Est. 1924



# SHORT-WAVE SECTION

## IMPROVEMENT IN SHORT-WAVE AERIAL SYSTEMS.

A Method of Feeding Directional Arrays to Avoid Losses

WHEN using directional short-wave aeri-als it is often desired to adjust the relative phase and amplitude of the currents in the elements of the array to obtain a desired directional diagram. A difficulty often experienced in doing this with an array of radiating elements lies in that when an adjustment is made to the amplitude of the current in an element there is, at the same time, an undesired change effected in the phase of the current.

It is possible, however, to provide a feeder system to an array of aeri-als in which difficulties of this nature are substantially overcome. This may be done by working upon the principle of feeding an aerial from a feeder which is a quarter wavelength long or

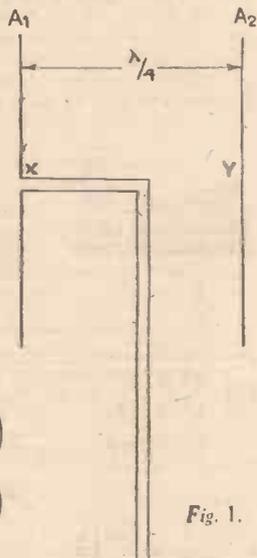


Fig. 1.

Fig. 2.

an odd multiple of a quarter wavelength. With this, by adjusting the characteristic impedance of the feeder the amplitude of the current in the aerial can be adjusted without affecting its phase.

According to one way of doing this a radiating element in an array is fed from a feeding point by a feeder of length substantially equal to a quarter of the operating wavelength or any odd multiple thereof, whereby the amplitude of the current in the element is adjusted by adjusting the characteristic impedance of the feeder, the phase of the current remaining constant, and the desired directional diagram is obtained.

### An Example

In order that this suggestion may be more clearly understood the following example, with reference to the accompanying drawings, may be given, in which:

Fig. 1 shows a known arrangement of a pair of dipoles separated by a quarter of a wavelength, only one of the dipoles being connected to a feeder, and

Fig. 2 shows the type of directional diagram obtained therewith;

Fig. 3 shows an alternative known method of feeding the array shown in Fig. 1;

Fig. 4 shows a length of feeder line terminated in a given impedance;

Fig. 5 illustrates, in accordance with this suggestion, the method of feeding the dipole array shown in Fig. 1; and

Fig. 6 illustrates one method according to the idea of adjusting the characteristic impedance of a feeder.

Referring to Fig. 1, there is shown therein a pair of vertical radiating elements, A<sub>1</sub>, A<sub>2</sub>, spaced by one quarter of a wavelength with the object of obtaining a horizontal directional diagram of cardioid shape, so that there is zero transmission in the direction denoted by XY and a maximum in the opposite direction denoted by YX. These requirements demand that the currents in the two elements shall be equal in magnitude, and that the current in the element A<sub>1</sub> shall lag behind that in A<sub>2</sub> by a phase angle  $\frac{\pi}{2}$  radians.

In the arrangement of Fig. 1 the element A<sub>2</sub> is not fed, and the desired phase relationship is obtained by adjusting the length of this element. However, the correct phase relationship is obtained at only one frequency and the amplitudes are then unequal, so that while it is possible to achieve a minimum, this minimum never approaches a true zero.

An alternative is to feed both elements, and in Fig. 3 a known method of doing this is shown. The two elements, A<sub>1</sub>, A<sub>2</sub>, are connected by an air-spaced quarter wavelength line and it is supposed that the phase delay introduced by the line is equal to the delay due to the time of travel of an unguided wave surface over the distance between them. However, the satisfying of the necessary conditions depends on the impedances of the elements and on that of the line, and while a fair approximation to a perfect zero is attainable the adjustments are very interdependent.

Referring to Fig. 4 it will now be explained in what manner this suggestion overcomes the kind of difficulty that has been discussed

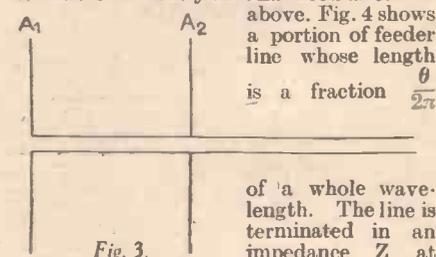


Fig. 3.

above. Fig. 4 shows a portion of feeder line whose length is a fraction  $\frac{\theta}{2\pi}$  of a whole wavelength. The line is terminated in an impedance Z at one end, and has applied at the other the potential difference E. If it is assumed that the line is non-dissipative, then the current flowing in the impedance Z is given by

$$I(\theta) = \frac{jE}{Z_0} \left(-1\right)^{\frac{n+1}{2}}$$

when  $\theta = \frac{n\pi}{2}$ ; (n = 1, 3, 5, . . . . .) Z<sub>0</sub> being the characteristic impedance of the line, and by

$$I(\theta) = \frac{E}{Z} \left(-1\right)^{\frac{n+2}{2}}$$

when  $\theta = \frac{n\pi}{2}$ ; (n = 0, 2, 4, . . . . .). It will be seen that when  $\theta$  is any odd multiple of  $\frac{\pi}{2}$  the phase of the current I is entirely fixed when that of the potential difference E is also fixed, but the amplitude may be adjusted to any desired value by properly adjusting the impedance Z<sub>0</sub> of the line. This fact is made use of in this suggestion to adjust the amplitude of current in a radiating element independently of the phase. Relative phases may be correctly achieved by adjusting the phase of the other element or elements by any

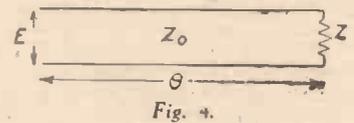


Fig. 4.

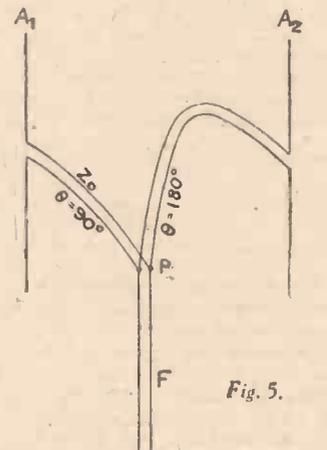


Fig. 5.

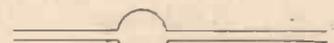


Fig. 6.

method, but preferably in accordance with the second of the above expressions for the current I.

Fig. 5 shows the application of these principles to the array comprising the elements A<sub>1</sub>, A<sub>2</sub> of Figs. 1 and 3. From a point P on the feeder F a quarter wavelength line is taken to the element A<sub>1</sub> and a half wavelength line is taken to the element A<sub>2</sub>. The current in the element A<sub>1</sub> is thus expressible as

$$I\left(\frac{\pi}{2}\right) = -j\frac{E}{Z_0}$$

and that in the element A<sub>2</sub> by

$$I(\pi) = -\frac{E}{Z}$$

Z being the impedance of the element A<sub>2</sub>. Preferably A<sub>2</sub> is tuned substantially to its resonance so that any small adjustment of phase may be effected by effecting small changes in the length of A<sub>2</sub> without there arising an appreciable change in amplitude. Complete independence of the phase and amplitude adjustments is not necessary however. The amplitude of current in A<sub>1</sub> is then correctly adjusted without causing any phase changes by adjusting the impedance Z<sub>0</sub>.

The value of Z<sub>0</sub> may be changed by adjusting the spacing of the conductors or in finite steps by varying the size of the conductor. Alternatively a reactance may be connected across the feeder preferably at its mid-point. This reactance may be

(Continued on page facing.)

# Leaves from a Short-wave Log

## Invasion of 41-metre Band

**B**OTH Europe and Asia are now trying out broadcasts at high power in a new short waveband. JLG, Tokio (Japan), 50 kilowatts, is already operating regularly on 41.18 m. (7.285 mc/s), and Paris-Mondial on 41.21 m. (7.28 mc/s). DJI, Zeesem (Germany) will soon try out 41.15 m. (7.29 mc/s), and Daventry (G.B.) has been allotted 41.32 m. (7.26 mc/s) for GSU.

## Schenectady's New Aerial

**D**R. E. F. W. ALEXANDERSON of the General Electric Company (Schenectady, N.Y.) has designed a new "panel" aerial which is expected to double the strength of W2XAD's signals on 31.41 m. (9.55 mc/s) destined to South America. By holding the signal close to the earth it has been found that a gain in strength is obtained, and that at the same time a considerable reduction in fading may be achieved. The aerial wires are supported in shape of a frame resembling a huge box kite, by two masts 300ft. in height.

## Radio-Saigon—A Correction

**A**CCORDING to the latest information the transmitters opened by the French Colonial authorities on March 25th last at Saigon (Indo-China), work simultaneously on 358 m. (838 kc/s), 49 m. (6.122 mc/s), and 25.12 m. (11.991 mc/s). They now broadcast daily between B.S.T. 00.45-01.15; 05.45-06.45, and 13.00-14.30.

## SHORT-WAVE SECTION

(Continued from previous page.)

provided by a variable condenser or by a length of transmission line or by a tuned circuit. However, the magnitude of the reactance must be sufficiently large not to destroy the action of the quarter wavelength line. As another alternative, series reactances may be inserted preferably at the mid-point. As a further alternative the conductors of the line may be locally separated to produce a similar impedance irregularity. This alternative is illustrated in Fig. 6, the conductors shown being bent at one point into a loop of the correct dimensions.

It will be appreciated that this idea is not limited in its application to the simple example given, which is by way of illustration only, and that it may be applied to provide adjustment with directional diagrams other than a cardioid, wherein the phase differences, for example, are other than  $\frac{\pi}{2}$  it merely being necessary then to adjust suitably the length of the aerial  $A_2$ . This idea is clearly not limited to an array comprising two elements only. It will be appreciated further that although feeders of the parallel wire type have been shown in the illustrations, this is by no means necessary, and concentric feeders are equally applicable. It may also be pointed out that although the idea has been described with reference particularly to transmitting aerials, it is of course equally applicable to receiving aerials.

# TELEVISION FEATURES

## TELEVISION'S OWN GARDEN

**M**R. C. H. MIDDLETON is a familiar figure these days in Alexandra Park, or rather in that small portion of the Park, surrounded by a low palisade, which forms the Television Garden. For Mr. Middleton is making his plans for a regular series of Saturday afternoon transmissions from this delightful spot.

Flowers will be the main attraction this summer, and during the opening transmission on May 6th the subject will be sweet peas in the different stages of development. The peas have been grown from seed.

Carnations, and their allies the pinks, will also be dealt with during the series, and a noble display of sunflowers is expected.

The Television Garden is some three hundred yards from the studios. Cameras connected by cable with the control room can cover the whole garden, including the two small lawns, the rock garden and pool, and the avenue of roses.

## FIRE-FIGHTING DISPLAY IN HYDE PARK

**T**ELEVIEWERS will have "front seats" for a great fire-fighting and A.R.P. display in Hyde Park on June 3rd, during which a fifty-foot tower will be burnt down and exciting "rescues" will be staged.

The Duke and Duchess of Kent will be present to inspect the four hundred men of the London Fire Brigade who can be spared from their stations, as well as some of the twenty thousand members of the Auxiliary Fire-fighting Services.

The B.B.C. mobile television unit will be drawn up on the review ground near Marble Arch to show the whole of the display, which will last one hour.

The London Fire Brigade is providing 150 vehicles of all types, including engines, trailer pumps, lorries, with 120 A.R.P. appliances. The opening procession will include girls on duty in a mobile "watchroom." The "A.F.S." has three thousand women members on this duty, many of whom are telephonists and typists during the day.

All the items will be televised, and the crowning event will be the burning of the tower. Eight escapes and four ambulances will be involved. Water for the forty-eight trailer pumps used for the fire-fighting will be taken from canvas pools.

# PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM

An invaluable work, giving facts, figures, tables and formulae for the Mechanic, Fitter, Turner, Draughtsman, and Engineer, Containing nearly 400 illustrations; It is an essential work of reference for the amateur craftsman and those engaged in the mechanical trades.

6/- net (by post 6/6)

Available from all bookellers, or by post from the publishers

GEORGE NEWNES, LTD. (Book Dept.), TOWER HOUSE, SOUTHAMPTON STREET, STRAND, LONDON, W.C.2.

# ELECTRADIX

The widest possible range of Relays from the robust electro-magnet to the sensitive moving-coil relay.

Nos. 1 to 18 have their magnet windings distinct from the silver-tipped contact blades which carry about 250 m.a.



## TYPE "S" SELECTOR RELAY SWITCHES.

As illus. 7 arms of 25 ways each. Relay solenoid operated for distant control. As used in 'Tote and Auto' phone exchange; 10 $\frac{1}{2}$  G.P.O. Vertical Relays; 5 $\frac{1}{2}$  to 15 $\frac{1}{2}$ .

## SINGLE BLADE RELAYS.—No. 1 type 60D.

1,000 ohms "on-off" s.p. 6 volts, 8 m.a. 7 $\frac{1}{2}$ . No. 2 type 832 s.p. 2,000 ohms "on" only, 10 volts 5 m.a., 8 $\frac{1}{2}$ .

## S.P.C.O. RELAYS, No. 5 type 300a, 80 or 450 ohms.

polarised, 3 blade 3 volts, 20 m.a., 7/6. No. 6 type 194a, 325 ohms 2 bobbin, 60D/10/1, 3 volts 32 m.a., 8/6. Ditto, No. 7, 14,000 ohms, 20 volts, 21 m.a., 12/6. No. 8a, type W.E. on 4in. ebonite panel 40 ohms, 6 v. 30 m.a., 10 $\frac{1}{2}$ .

## MULTI-BLADE RELAYS.—No. 9 type A.G. 1,500 ohms, 2 coil.

D.P. "on-off" 8.6 22 volts, 150 m.a. No. 10 type A.H., 1,500/2,000 ohms 2 coil, 3 circuits, 8 blades "on-off" 15 volts, 100 m.a., 9 $\frac{1}{2}$ .

No. 11 type S31, 1,500 ohms, 8 blades, 3 circuits, 7 "on-off" 3 circuits S.P.C.O., 12 volts, 12 m.a. Blades removable, 12/6. No. 12 type, 27B Spare, 1,000 ohm coil with armature, no contacts, for making relays, 2/6.

## L.R. SERIES RELAYS.—No. 13 type LA, 1 ohm, 2 on 1 off, 12/5.

No. 14 type L B ditto, 10 ohms, 12/6.

**HAND RELAY**—No. 15 type 1,950 coil, 1,300 ohms, trip contacts "on" until hand reset, 12 $\frac{1}{2}$ . No. 16, ditto, but reverse, contact set "on" by hand, trip-off by relay coil, 1,200 ohms, 14 volts, 10 m.a., 12 $\frac{1}{2}$ .

## SPECIAL LIGHT S.P. RELAYS for model control. No. 3, type D

41 one blade "on-off", 10,000 ohms, 20 volts, 24 m.a., 12/6. No. 4, 2,000 ohms, 10 volts, 5 m.a., 10 $\frac{1}{2}$ . No. 4a, 5 ohms, 2 m.a., 1 amp., 7/6. Heavier Current Relays for Transmitters, etc. Sounder type 5 amps. 15/-.

## American Ham Relays, 7/6. Ship Magnetic Key

Relay, 15 $\frac{1}{2}$ . Cased high-class polarised 2-way Relays, 25/-.

## SUPERSENSITIVE MOVING COIL RELAYS.—These work on really

tiny currents from photo-cells, etc. A special rectifier can be used for AC impulses. Two types: (1) The famous large, double-acting Weston Relay, open type, model 30, 50/- List price, 50 dollars; or mounted in mahogany case with glass top, 60/-.

For panel use, the small 2in. meter type W1 works on 50 microamps, with 150 ohms on main contact, 55/-.

## MAGNETIC SWITCHES.—Overload Trip, 2 to 4 amps, 7/6; 6 amp., 10/-; 10 amps, 12 $\frac{1}{2}$ ; 15 amps, 14 $\frac{1}{2}$ ; 20 amps, 16 $\frac{1}{2}$ .- Vener 13-day Time Switches "on-off", 1 amp., 6 amps., 25 amps., 200

amps. Cheap.

## TRANSmitters, MORSE AND SIGNAL KEYS.

Ex. W.D. balanced, solid brass bar, tungsten contact, indicator lamp. Type M81, a guinea key for 7/6. Other keys from 3/- to 30/-.

Learner's outfit complete, 4/9. Ask for specimen illustrated key list "R.V."

## A.R.P. HELPS.—Portable Field Telephone Stations and Exchanges,

with Unbreakable cable. SIGNAL LAMPS, Lucas day and night portable, £3.10. Aldis, C.A.V. ditto, £3/5/-.

Army type D111 double headphones, pocket type, 2/6 pair. Big Mains Alarm Bells, D.C. and A.C. Mains Motor Blowers D.C., 55 $\frac{1}{2}$  A.C., 65/-.

**BATTERY CHARGING ON A.C. MAINS WITH THE A.C. NITRDAY** will keep your battery fit without attention. Model N/A8, 100/250 volts A.C. and D.C. 6/8 volts 1 amp., 15/-.

Model N/B6, 100/250 volts to D.C. 6/8 volts 1 amp., 25/-.

Model N/C8, 100/250 volts to D.C., 6/8 volts 2 amps., 35/-.

Model N/D12, 100/250 volts to 12 volts 1 amp., 32/-.

Ditto, 12 volts 2 amps., with 4-volt tap, 55/-.

5 amp., 24/10/-.

**D.C. GENERATORS, 120 watt, 12 volt 10 amp., with vee pulley, 35/-; 1 Kw. 12/16 volts 30 amps., with vee pulley, 45/-.**

Shunt wound.—110 volts 1 amp., 15/-; 200 volts 1 amp., 17/8; 200 volts 1 1/2 amp., 26/-.



## WINDMILL GENERATORS, totally

enclosed, ball-bearing, left charging at 300 revs., 6 to 12 volt, 8 amp., 35/-.

24 amp., 35/-.

## DISC RECORDING FOR MANY USES.—Electric PEIGH set has

ball bearing centre gear box and geared traverse rod. Set with Tracking Gear, pick-up and tone-arm fitted standard. Fitted with Radiogram enables hams to hear their own set, 37/6.

If unable to call, send for Bargain List of 16 illustrated pages or serial, stating your wants.

# ELECTRADIX RADIOS

218, UPPER THAMES ST., LONDON, E.C.4.

Telephone: Central 4611.

When writing to Advertisers please mention Practical and Amateur Wireless

## "ENGINEERING OPPORTUNITIES" FREE!

ENGINEERING OPPORTUNITIES

168 PAGES

BY PROFESSOR A. M. LOW

This unique Hand-book shows the easy way to secure A.M.I.E.E., A.M.I. Mech.E., A.M.I.E.E., A.M.I.A.E., A.N.I.W.T., A.M.I.E.E., and similar qualifications.

**WE GUARANTEE— "NO PASS—NO FEE."**

Details are given of over 350 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, 40A, Shakespeare House, 17, 18, 19, Stratford Place, W.1.



## Impressions on the Wax

### A REVIEW OF THE LATEST GRAMOPHONE RECORDS

#### H.M.V.

**N**OEL GAY started something when he wrote the "Lambeth Walk." The vogue for gayer ballroom dancing that this song brought in its train first gave us the "Chestnut Tree" and has now given birth to the "Park Parade." This amusing sequence dance which is featured in the new London Hippodrome show "Black and Blue" changes tempo three times. There is the walk, the strut, and the waltz—not forgetting the "Yippy!" at the end. Noel Gay has also written another tune to which you can dance his famous "Walk." This is called "Did you go down Lambeth Way?" Both of these tunes can be heard on *H.M.V. BD 5463*, played by Geraldo and his Orchestra.

The two latest records made by Reginald Foort on his gigantic concert organ are of music that show up to the full the mighty possibilities of this remarkable instrument which requires five huge pantechnicians for transportation; takes seven hours to assemble; cost over £13,000; and of which one section alone weighs over 4,000 lb. On *H.M.V. BD 670*, Foort has recorded two of the loveliest of all melodies: Easthope Martin's "Evensong," and "Solemn Melody," by Walford Davies. On the other record, *H.M.V. BD 679*, he has recorded the "Zampa" overture.

#### Goodman Retires

**A**CCORDING to the latest reports, Benny Goodman is to disband his orchestra at the end of the year. His successor has already been elected. As I have previously mentioned in these notes, Artie Shaw was chosen by a vote of American musicians as the new "King of Swing." Artie Shaw's new record shows the justice of this judgment. It contains two brilliant swing arrangements which not only indicate Shaw's own ability as a clarinetist, but reveal that his band is

one of the most musical groups playing this advanced music. The titles are "Copenhagen" and "Coming On"—*H.M.V. B 8880*.

The probable retirement of Goodman means that his records will soon rise in value as collector's items. For there is a remarkable international demand for "out of print" jazz masterpieces, and records originally issued for two or three shillings can only be obtained now for twice as many pounds. Even now, one old Goodman record is worth £3; others by the Original Dixieland Jazz Band will fetch up to £7.

#### Decca and Brunswick

**T**HE Mills Brothers are in England once again and they will be making a tour of the country in the near future. They break new ground in their latest record "Funiculi Funicula" and "Asleep in the Deep," *Brunswick 02709*. You must hear father Mills singing "Asleep in the Deep" as a straight ballad, whilst the three brothers accompany him in their usual style.

Leaving brothers we come to sisters. The Andrew Sisters have recorded "Hold Tight" and "Billy Boy," on *Brunswick 02717*. I understand that "Hold Tight" is a big seller in America at the present time.

Arthur Tracy (The Street Singer), who has been on the Continent for a few weeks, returned last month with two records featuring four hit songs of the moment. They are "Umbrella Man" and "Grandma Said," *Decca F 6949* and "Two Sleepy People," coupled with "I Shall Always Remember You Smiling"—*Decca F 6979*.

Carl Brisson, the popular film star, makes a welcome return this month on *Decca F 6996*. "The 7.15 to Dreamland" and "While a Cigarette was Burning," are completely suitable numbers for him.

"Tears on My Pillow" and "Deep in a Dream," on *Decca F 6977* and "Lonely"

and "Nine Pins in the Sky"—*Decca F 6978* are first-rate tunes for Lew Stone and his Band.

#### Parlophone

**R**ICHARD TAUBER sings in English for his latest recording on *Parlophone RO 20436*. He chooses "Serenade" from "Frasquita" and "My Hero," from "Chocolate Soldier."

In the 10in. "Classic Series," the Grand Symphony Orchestra have recorded "Rendezvous in Vienna" on *Parlophone R 2639*, whilst the Orchestra Mascotte give a fine performance of "Voices of Spring" and "Autumn Murmurs," on *Parlophone R 2642*. Two other orchestral recordings in this series are supplied by Magyari Imre and His Hungarian Gypsy Orchestra with "Behari Waltzes" and "Serenade," on *Parlophone R 2643* and Orquesta Tipica Francisco Canaro with two tangos "Ciertos Amores" and "Desprecio."

Ronald Frankau, the popular radio star, is extremely funny in "There's Absolutely Nothing Wrong at All" and "One, Two, Three, Four, Five, Six, Seven"—*Parlophone R 2650*.

"Hutch" (Leslie A. Hutchinson) has made two new records this month in which he features songs from the films. They are "Thanks for Everything," from the film of that title coupled with "Hurry Home," on *Parlophone F 1383*, and "Let's Dream in the Moonlight," from the film "St. Louis Blues" and "Lonely," on *Parlophone F 1384*.

#### Bosworth Recordings

**T**HREE new discs have recently been issued in the Bosworth range, *BC 1065* "Cambria" being a double-sided selection of Welsh airs recorded by the Louis Voss Grand Orchestra. Part 1 runs for 3 mins. 3 secs., and Part 2 for 3 mins. 2 secs. *BC 1070* is a pleasing mixture of melodies, on one side the "Elves Dance" (1 min. 28 secs.) and "Waving Fields" (1 min. 34 secs.) and on the other "Canzone d'Amour" (1 min. 50 secs.) and "Ramona" (1 min. 13 secs.). The latter is not the popular tune of some years ago, but is, nevertheless, very catchy. Both sides are recorded by the International Radio Orchestra. The remaining disc, *BC 1071*, is a pair of rhythmic novelty couplings, "Niagara" (2 mins. 24 secs.) and "Ivory Antics" (2 mins. 32 secs.), the former by the Ragamuffin Syncopators and the latter by the Pall Mall Revellers.

#### A Useful Indoor Aerial

**T**HE problem of the best type of indoor aerial is not simple of solution, and in many cases the listener simply suspends any odd length of wire across a room—sometimes with good results—but more often than not with very unsatisfactory results. It is necessary to obtain a fairly good length of wire and in most rooms this means



The Thompson indoor aerial.

that the wire has to be doubled back upon itself—a feature which is not one of the best from an efficiency point of view. Various compact aeriels have been introduced from time to time, and above we show a simple aerial which is obtainable from Messrs. T. W. Thompson, of 176, Greenwich High Road, S.E.10, for 1s.

## TRADE NOTES

post free. This aerial consists of 50ft. of hard-drawn copper wire (not coppered iron) and is wound in a tight spiral from which it may be stretched to any desired length. It is thus suitable for suspension, in any room and is quite neat in appearance. Insulated rings are provided at each end for attachment, and a terminal is mounted on one end for connection of the lead-in wire to the receiver. Although this type of aerial is ideal for use with simple receivers, such as the S.S. One-valver mentioned in this issue, it also gives splendid results with the more powerful types of superhet, in many cases it being preferable to the usual types of large outdoor aerial.

#### New Marconi Valve

**M**ARCONIPHONE announce the release of a new valve for television scanning

circuits—type KT44. Its general characteristics are similar to the KT66, but a 4-volt 2-amp. heater is used. A seven-pin base is fitted and the anode is taken to a top cap connection. A small number of these valves were issued in television receivers under the temporary type reference A855. The list price is 15s.

#### Drydex Battery Additions

**D**RYDEX announce the following new batteries:

Type H.1155: 1½ volts, size 2½in. by 2½in. by 5½in., with fitted socket for two-pin plug, is specially produced for use with Philco set P.429. List price, 2s. 6d. Type H.1156: 45 volts, size, 4½in. by 2½in. by 5½in., with fitted socket for three-pin plug, is also specially produced for use with Philco set P.429, for which receiver two of these batteries are required. The list price is 3s. 9d. Type H.1157: 90 volts H.T. plus 1½ volts L.T., size, 11½in. by 5½in. by 2½in., with fitted socket for four-pin plug, is priced at 10s.

# 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 5s. per Group Volume or in bound volumes price 2s. each.

**TELEVISION.**—Standard Telephones and Cables, Ltd., Hodgson, K. G., and Roseway, W. N. No. 499317.

In a line transmission system for television the level of the high frequencies is increased relatively to that of the low frequencies at the sending end and the relationship is restored at the receiving end by the use of inverse or conjugate networks, which are such that their combined effect produces no distortion of phase and attenuation. As shown, the signals (0—2 megacycles) modulate a carrier (7.5 mc.) in a modulator 2. Fig. 1, and the lower side-band (5.5—7.5 mc.) is selected by a filter 4 and passes through the distorting network 5, which may be of the form shown in Fig. 2. The signals then modulate a second carrier (5 mc.) in a modulator 6 and the lower side-band (0.5—2.5 mc.)

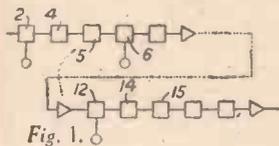
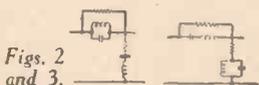


Fig. 1.



Figs. 2 and 3.

is selected. At the receiving end, the signals are applied to a demodulator 12 (5 mc.) and the upper side-band (5.5—7.5 mc.) is selected by a filter 14 and passes through the restoring network 15, which may be of the form shown in Fig. 3. The signals are then rectified and the lower side-band is selected.

**VALVE CIRCUITS FOR WIRELESS RECEPTION.**—General Electric Co., Ltd., and Espley, D.C. No. 499425.

In a receiver for a carrier frequency exceeding 20 mc. particularly for television, to prevent radiation by the detector, following an intermediate-frequency stage, of combination frequencies of the carrier

and local oscillator which lie within the range of the modulated carrier and might be picked up by the earlier stages of the receiver, a frequency-selective element having a high impedance for the unwanted frequencies and a low impedance for the signal frequencies is connected in series with the non-linear impedance of the detector. Fig. 4 shows a double-diode detector in which each diode path has a frequency-selective element Z1, Z2 in series,

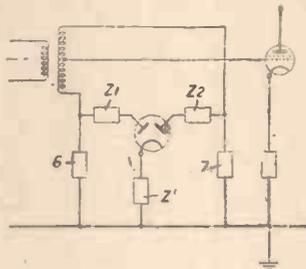


Fig. 4.

the output impedances 7, 6 being operative alternately. A further selective element Z1' in the cathode lead may be used in addition to or instead of Z1 and Z2. **TELEVISION.**—Radioakt.-Ges. D. S. Loewe. No. 499454.

Defects occur in a received picture owing to a delay of synchronising impulses relatively to image signals from an iconoscope transmitter. These are eliminated by passing the synchronising signals from generators 2x, 2y through the transmitter 4, 5, 6 and a special receiver 7 . . . 10 to generators 3x, 3y (Fig. 5) of relaxation oscillations for the iconoscope 1. The delay of the synchronising impulses in the special receiver is the same as that in the distant receiver. If the iconoscope scans

the picture at a distance from the transmitter, the synchronising signals are transmitted to the relaxation oscillators by a wireless or wired-wireless link (not shown).

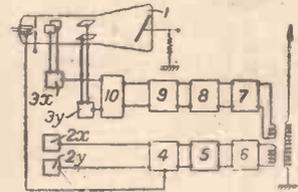


Fig. 5.

## Civilian Wireless Appointments in the Royal Air Force

To meet the immediate requirements for large numbers of trained wireless operators and wireless electrical mechanics in the expanded Royal Air Force, it has been decided to augment the supply of personnel trained at the Royal Air Force Electrical and Wireless Schools by the employment of a number of civilians.

Applications are accordingly invited from candidates with a practical experience of wireless, including those who have gained their wireless knowledge and experience as amateurs. The selected candidates will be employed as civilians at Royal Air Force stations at home, as near as possible to the districts which they choose.

The applications should be addressed to the Under Secretary of State (S.5.f), Air Ministry, London, W.C.2.

**Civilian Wireless Operators** must be capable of sending and receiving accurately in the Morse Code at 20 words per minute, and should have had experience of W/T communication. It is also necessary for wireless operators to have a general knowledge of electricity, radio receivers, and their principles of operation and tuning. The rate of pay for this trade is from 60s. per week, with an annual increase of 3s. per week up to a rate of 75s. per week.

**Civilian Wireless and Electrical Mechanics** must be qualified as wireless operators, and must also be capable of installing, maintaining and repairing wireless and electrical equipment both for aircraft and ground stations. The duties involve testing and servicing aircraft transmitters and receivers, and their associated equipment, such as batteries, generators, etc. The rate of pay for this trade is from 75s. per week, with an annual increase of 3s. per week up to a rate of 90s. per week.

Civilian wireless operators and wireless and electrical mechanics are not required to carry out flying duties. Operators normally undertake the radio watch keeping and communications with aircraft and ground stations.

The appointments will be on a temporary basis, although a proportion of suitable applicants are likely to be retained for some years. The rates of pay are inclusive, and men engaged will, as in other civil employments, find their own lodgings, food and clothing. Civilians employed in the Royal Air Force may use their Station canteen, and make purchases at their Station Institute grocery shop. They are also eligible to avail themselves of the Station recreational facilities.

This offer of employment provides a means whereby civilians may make their contribution to National Defence, and at the same time obtain for themselves useful experience in aeronautical communications, and in the operation and maintenance of modern radio apparatus.

## 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. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

### Latest Patent Applications.

- 10969.—Cosmocord, Ltd., and Schumann, A.—Gramophone pick-ups. April 11th.
- 10858.—Eckersley, P. P., and Carpenter, R. E. H.—Wire broadcasting systems. April 6th.
- 10842.—Gollnow, J.—Mast aerials. April 6th.
- 11006.—Hazeltine Corporation.—Automatic control for combined television and sound broadcasting systems. April 11th.
- 10787.—Lorenz Akt.-Ges., C.—Television receivers. April 6th.
- 10789.—Lorenz Akt.-Ges., C.—Television system. April 6th.
- 10744.—Radiowerk E. Schrack Akt.-Ges.—Electrolytic condensers. April 6th.

### Specifications Published.

- 503327.—Clothier, S. L., and Hogenkamp, H. C.—Methods of and apparatus for scanning in television systems.
- 503493.—Traub, E.—Mechanical transmitting apparatus.

- 503494.—Traub, E.—Television transmitting apparatus.
- 503496.—Marconi's Wireless Telegraph Co., Ltd., and Brailsford, J. D.—Radio and like receivers.
- 503419.—Marconi's Wireless Telegraph Co., Ltd., and Linsell, A. A.—Television receivers.
- 503501.—Cole, Ltd., E. K., and Bradford, G.—Discriminator networks for radio receivers employing automatic fine tuning.
- 503502.—General Electric Co., Ltd., Jesty, L. C., and Sharpe, J.—Cathode-ray tubes.
- 503429.—Standard Telephones and Cables, Ltd.—Control devices and systems for radio sets.
- 503268.—Radio Corporation of America.—Sound recording and reproducing.
- 503278.—Cork, E. C., and Pawsey, J. L.—Aerial systems.
- 503391.—Clothier, S. L., and Hogenkamp, H. C.—Methods of and apparatus for scanning in television systems. (Divided out of 503327.)
- 503469.—Radiowerk Horny Akt.-Ges.—Radio-receiving apparatus.

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.

# Varley

## BATTERY RECEIVERS

### B.P.114 3-Valve S.G. Receiver

with pentode output valve. An easy receiver to construct. Blueprint giving full wiring and constructional details is available, price 6d. Receiver incorporates Varley B.P.114 2-gang Unit—iron-cored coils with built-in wave-change switch.

### ARP 22-Valve Straight Receiver

specially designed for local station reception. Built around Varley B.P.80 Duo Nicore Aerial Coil. An inexpensive set to build—very suitable for emergency receiver in event of failure of electricity supply. Wiring Diagram 4d.

B.P.114 2-gang Coil Unit 13/6  
B.P. 80 Duo Nicore Aerial Coil 6/-

Write for details of other Circuits and Blueprints to—

**VARLEY** (Proprs. OLIVER PELL CONTROL LTD.),  
CAMBRIDGE ROW, WOOLWICH,  
S.E.18



Said Peter Augustus de Wet,  
"I've found out what's wrong with this set.  
For all it's requiring  
is just a rewiring.  
And this time, with  
FLUXITE you bet!"

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, or filled 2/6



ALL MECHANICS WILL HAVE

# FLUXITE

IT SIMPLIFIES ALL SOLDERING

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



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.)

### The Trio-Pen S.W. Two in India

SIR,—I wish to thank you for publishing my letter in PRACTICAL AND AMATEUR WIRELESS, dated February 4th, 1939, through which I have gained many correspondents in the United Kingdom and one from Norway. I am still waiting for correspondents from India. The Trio-Pen S.W.2 is working very well on all bands above 15 metres, but as yet I cannot get satisfactory results on 30 mc/s.

I submit the best from my log from January 23rd, 1939, to February 18th, 1939. Listening periods, 18.00 hours to 24.00 hours (I.S.T.). All are on 14 mc/s:

VK2NO, NS, YQ, NQ, VB, OQ, OJ;  
3HG, WA, ZL, ES, KX, PE, FF, 1G, XG,  
DG; 4KO, WS, JU, BB, AP, JP.

W5FDI, ACY, FSS, GGX, GAR, BEK,  
EHM, DNV; 6NHB, IGX, KRD, NMI,  
BPM; 7BVO, EGV, FEZ, EYD, FAQ,  
FLG, GPY; PK1RI; 2WL, WY; 4JD,  
AY; 6XX; G2IO; 5MY, DQ; 6TD,  
GH; all on L.S. R5.

Also G8KT, 2KB, 2ML, 2LI; 3CP,  
3BX, 3AD, 5AU, 5BP and 5BA, all on 'phones.

VE3AJX, ACD, KC, BV, HJ; 4AGA,  
JE, SS, RO; 5AAD, VO, EF.

I have just completed my library with your latest handbooks and manuals, and I feel proud to know that I have so much reliable information at hand.—Fus. E. ROSENDALE, 1st Bn. Royal Fusiliers, Jhansi, U.P., India.

### Correspondent Wanted

SIR,—I am anxious to get in touch with any radio Hams in this neighbourhood, my own particular interests being the short and ultra-short waves. I should be specially glad of some friendly co-operation. I am an old-timer, having clear memories of such gear as the first slider coil, Dutch valves that consumed almost 1 amp., the variometer, and, of course, the crystal detector. Will any reader interested please drop me a line.—F. FORD (Bedford Lodge, Camden Place, Bourne End, Bucks).

### A 14 mc/s Log from Gloucester

SIR,—I enclose my log, which I hope will be of interest to other readers. The receiver is an 0-v-2, using headphones, with a V-type aerial 90ft. long and 33ft. high.

'Phone stations on 14 mc/s received during the last fortnight: Africa.—ZS5Q, ZS5BZ, VQ2CM, VQ4ECJ, ZSIT, OQ5ZZ, ZEIJH, ZS6DY. Asia.—ZC6HS, VB7RA, VE2FA, KA3KK, PK4KS, and VS2AK. Australia.—VK3HG, VK5AI, VK2AGU, VK5RN and VK4PF. S. America.—VP6YB, VP3CO and CX2CO. N. America.—W7ESK. Europe.—ZB1E, ZU7AY and OH2QM.—A. ROZIER (Stow-on-the-Wold).

### A 5-valve Battery Superhet

SIR,—I am in hearty agreement with suggestions by other readers for a 5-valve battery-operated superhet designed on the lines of a communications receiver.

I should like to see it covering from the 10-metre amateur band up to about 160 metres using standard plug-in coils. A really efficient method of band-spreading is essential of course. As selectivity is of primary importance it should be made variable by incorporating a variable selectivity I.F. transformer, such as the type made by the Premier Co., which allows variation between 5 and 10 kc/s.

I think an H.F. stage is advisable, preferably tuned, although if untuned it would simplify construction. If A.V.C. is employed it would be a good idea to include a switch to cut it out so that some idea of the intensity of the QSB may be obtained.

Such a set would, I am sure, be a great boon to many readers who cannot or do not wish to use the mains.

Thank you very much for a very fine wireless journal.—J. G. LITTERICK (Muswell Hill).

### Audible Radiations

SIR,—I have read with interest the letters published recently on the above subject.

I built a crystal set on a table near our rediffusion loudspeaker. This was turned on to one of the programmes but the volume control was turned down so that no signals were audible. However, I heard the programme in my earphones, even when the cat's-whisker was touching the crystal holder, or a short distance away from it. I found that changing the switch from A to B changed my programme correspondingly, and in the "off" position I received nothing. I experimented, and found that with one terminal of the 'phones earthed and the other touching an indoor aerial or a metal object like an ashtray near the loudspeaker, I could hear the signals. I also received them by touching the lead-covered cables, bringing in the programmes with the free terminal of the 'phones.—A. ROBINSON (Whitley Bay).

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 Neenes, 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.



# QUERIES and ENQUIRIES

heard. There are elaborations of the simple scheme outlined. Messrs. Electradix may be able to supply complete apparatus.

## Modulation Hum

"I have an A.C.-D.C. receiver, but when I tune in to London or any other powerful station there is a loud buzz which I cannot cure. I have tried different speakers, but they all give the same effect. Could you give any suggestion as to what the trouble may be and the best method of overcoming it?"—L. F. (Hereford).

It would appear, as different speakers have been tried, that the trouble is modulation hum. A defective speaker can give a buzzing noise, but modulation hum also gives rise to a sound which may be described as a buzz or loud hum. There are various methods of overcoming the trouble, one of the simplest being the connection of a .1 mfd. fixed condenser across the rectifier. H.F. chokes on the mains input side may also be tried, but better H.F. by-passing on the initial stages of the receiver may prove all that is necessary.

## Current Reduction

"I am building an A.C. set in which I am able to use an existing mains transformer, with one exception. There are three valves in the set, but the heater winding on the transformer is marked 4 volts at 5 amps. I have therefore 2 amps too much and I believe this may give rise to an increased voltage on the heaters. How should I dispense with the excessive 2 amps without upsetting performance?"—S. T. R. (Bath).

If the regulation of the transformer is good it may not be necessary to worry about the current rating. Probably the best plan would be to put a good voltmeter on the heater circuit when testing out the receiver and note whether or not the voltage does rise. If so, the extra 2 amps may be disposed of by loading the winding by placing a resistor across it—4 volts at 2 amps would call for a resistance of 2 ohms. The wattage rating would be 8 (current squared times ohms).

## Buzzer Wavemeter

"I was recently advised to get a buzzer wavemeter to line up my set so that I could make out a station name scale. Unfortunately I do not know what this device is and cannot see any advertisements of them. Could you help me in this connection by either telling me how to make one or where I could buy one?"—P. W. (Gloucester).

The buzzer wavemeter is a simple crystal receiver circuit, with a battery and buzzer in series in place of the crystal and phones. In other words, the buzzer and battery have a tuned closed circuit across them. You could therefore convert any ordinary crystal set by including these two items in place of crystal and phones and could use a change-over switch so that the apparatus could be used as wavemeter or receiver. The apparatus is tuned to the desired frequency and placed near the receiver to be lined up, and the latter is tuned until the note from the buzzer is

## Root Mean Square Value

"In certain radio measurements I have seen the letters R.M.S. and have been told that this is not a true reading. I should like to know exactly what this means and how it differs from the true reading, if indeed it does differ as I have been informed."—L. C. (Kidderbrook).

THE letters stand for Root Mean Square and it is the value of an alternating or oscillating current given by the square

### 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.

root of the sum of the squares of the successive values of the current for a half period. In a pure sine wave this would be .707 times the maximum value. It is the current which is indicated by a hot wire instrument, and the voltage which is indicated by an electrostatic voltmeter.

## Electrolytic Condenser Polarity

"I have an A.C. mains set and this was not giving good results so I got a friend to look at it. He told me that the electrolytic condenser for blasing the output valve was the wrong way round—I have the positive side to the chassis. Can you confirm that this is correct and what difference does it make which way round this particular condenser is joined?"—S. R. (Hove).

THE bias resistance in the normal cathode circuit causes a voltage drop across it so that the cathode is positive in respect to the grid—which, of course, is joined to the earth line. Therefore, the grid is made so many volts negative with respect to the cathode, and accordingly the electrolytic condenser across the resistance should be joined with its negative pole to earth and positive to cathode. Reversing the connections will result in the application of reversed polarity to the condenser, which will damage it and probably destroy the condenser effect entirely. You should reverse your condenser, but may find that a new component is now needed.

## Indoor Aerial

"I have what I thought was a good outdoor aerial, and in the course of some experiments the other day I put up a rough indoor aerial running straight across the room. I found to my surprise that this gave me much louder signals, and I should like to know whether you can give me any reason for this as I always thought that an indoor aerial was not so efficient as an outdoor arrangement."—B. Y. S. (Highbury).

THE outdoor aerial is definitely better as it is not screened as an indoor aerial would be. In your case you would probably find that the indoor aerial runs in a different direction and may thus be directional to the station which you tuned in with better volume. On the other hand, your outdoor aerial may be badly insulated or there may be some leakage to earth in some part of the complete system. It may also be found that the larger outdoor aerial exercised a damping effect on the circuit in use and the removal of that damping by a small aerial load may result in increased efficiency or even in slight oscillation in an H.F. stage—giving signal boost.

## Metal Rectifier

"I wish to make up a battery charger to operate from A.C. mains. I use a 2-volt and a 6-volt accumulator (the latter for a small model) and should like to know what would be the most suitable metal rectifier for my purpose so that I could charge both cells—not necessarily both at once."—J. W. (Birmingham).

WE assume that you would only need a current of about 1 amp, and in that case could use the LT.4 rectifier. With a tapped transformer giving A.C. outputs of 7.5, 9 and 11 volts, you could use this to charge 2, 4 or 6 volts (that is 1, 2 or 3 two-volt cells) at 1 amp. A series resistance of 1.75 ohms should be included in the positive charging lead.

### 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.

F. B. (Beighton). We cannot recommend anything simpler, and advise you to read the "Wireless Constructor's Encyclopedia" or a similar book to obtain the necessary knowledge.

P. H. (Belfast). Standard transformers may be used. The wiring will be clear when you obtain the necessary jack, as the contacts are clearly indicated.

F. T. (Torquay). There is no restriction as to hours, but special frequencies must be used.

W. D. (N.18). We are sorry that we cannot meet your requirements. Although the parts may be suitable for inclusion in a modern set, they may be defective, and thus you will introduce trouble in any new set you may build.

F. C. (Co. Tyrone). Although the idea is practicable, we regret that we cannot give instructions for carrying it out, and cannot supply a blueprint or circuit.

S. C. B. (Wolverhampton). You can retain your present valve and change over the connections to grid and anode, or, alternatively, perhaps your dealer would exchange the valve for one with a grid top cap.

E. L. G. (S.W.2). We suggest a simple one-valver for a start, such as the Pyramid, the kit for which costs 47s.

D. M. (Dublin). The address is Stratton and Co., Ltd., Eddystone Works, Bromsgrove Street, Birmingham.

A. P. (Portsmouth). Full details may be obtained from the Quartz Crystal Co., Ltd., 71, Kingston Road, New Malden, Surrey.

P. D. (Carrickmacross). The most suitable unit would be the Argon Charger, which was described in our issue dated June 18th last. A metal rectifier would not be suitable for this particular purpose.

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

# Practical and Amateur Wireless BLUEPRINT SERVICE

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 MECHANIC, 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.

**PRACTICAL WIRELESS** No. of  
Date of Issue. Blueprint

**CRYSTAL SETS.**

Blueprints, 6d. each.  
1937 Crystal Receiver .. .. PW71  
The "Junior" Crystal Set .. 27.8.38 PW94

**STRAIGHT SETS. Battery Operated.**

**One-Valve : Blueprints, 1s. each.**  
All-Wave Unipen (Peutode) .. PW31A  
Beginner's One-Valver .. 19.2.33 PW85  
The "Pyramid" One-valver (HF Pen) .. 27.8.33 PW93  
**Two-valve : Blueprints 1s. each.**  
Four-range SuperMag Two (D, Pen) .. PW36B  
The Signet Two (D & LF) .. 24.9.33 PW76  
**Three-valve : Blueprints, 1s. each.**  
The Long-range Express Three (SG, D, Pen) .. 24.4.37 PW2  
Selectone Battery Three (D, 2 LF Trans) .. PW10  
Sixty Shilling Three (D, 2 LF (HC & Trans)) .. PW34A  
Leader Three (SG, D, Pow) .. PW35  
Summit Three (HF Pen, D, Pen) .. PW37  
All Pentode Three (HF Pen, D (Pen), Pen) .. 29.5.37 PW39  
Hall-mark Three (SG, D, Pow) .. 12.0.37 PW41  
Hall-mark Cadet (D, LF, Pen (HC)) .. 10.3.35 PW48  
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) .. 13.4.35 PW49  
Genet Midget (D, 2 LF (Trans)) .. June '35 PM1  
Cameo Midget Three (D, 2 LF (Trans)) .. 8.0.33 PW51

1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) .. PW53  
Battery All-Wave Three (D, 2 LF (RC)) .. PW55  
The Monitor (HF Pen, D, Pen) .. PW61  
The Tutor Three (HF Pen, D, Pen) .. 21.3.36 PW62  
The Centaur Three (SG, D, P) .. 14.8.37 PW64  
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) .. 31.10.36 PW60  
The "Colt" All-Wave Three (D 2 LF (RC & Trans)) .. 18.2.39 PW72  
The "Rapide" Straight 3 (D, 2 LF (RC & Trans)) .. 4.12.37 PW82  
F. J. Camm's Oracle All-Wave Three (HF, Det., Pen) .. 28.8.37 PW78  
1938 "Triband" All-Wave Three (HF Pen, D, Pen) .. 22.1.38 PW84  
F. J. Camm's "Sprite" Three (HF Pen, D, Det) .. 20.3.38 PW87  
The "Hurricane" All-Wave Three (SG, D (Pen), Pen) .. 30.4.33 PW89  
F. J. Camm's "Push-Button" Three (HF Pen, D, (Pen), Tet) .. 3.9.33 PW92

**Four-valve : Blueprints, 1s. each.**  
Sonotone Four (SG, D, LF, P) .. 1.5.37 PW4  
Fury Four (2 SG, D, Pen) .. 8.5.37 PW11  
Beta Universal Four (SG, D, LF, Cl, B) .. PW17  
Nucleon Class B Four (SG, D (SG), LF, Cl, B) .. 0.1.31 PW34B  
Fury Four Super (SG, SG, D, Pen) .. PW34C  
Battery Hall-Mark 4 (HF Pen, D, Push-Pull) .. PW46  
F. J. Camm's "Linnit" All-Wave Four (HF Pen, D, LF, P) .. 20.9.36 PW67  
All-Wave "Corona" 4 (HF Pen, D, LF, Pow) .. 0.10.37 PW79  
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl, B) .. 12.2.33 PW83  
The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC)) .. 3.0.38 PW90

**Mains Operated.**

**Two-valve : Blueprints, 1s. each.**  
A.C. Twin (D (Pen), Pen) .. PW18  
A.C. D.C. Two (SG, Pen) .. PW31  
Selectone A.C. Radiogram Two (D, Pow) .. PW19  
**Three-valve : Blueprints, 1s. each.**  
Double-Diode-Triode Three (HF Pen, DDT, Pen) .. PW23  
D.C. Ace (SG, D, Pen) .. PW25  
A.C. Three (SG, D, Pen) .. PW29  
A.C. Leader (HF Pen, D, Pow) .. 7.1.39 PW35C  
D.C. Premier (HF Pen, D, Pen) .. 31.3.34 PW35B  
Ubique (HF Pen, D (Pen), Pen) .. 28.7.31 PW36A  
Armada Mains Three (HF Pen, D, Pen) .. PW33  
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) .. 11.5.36 PW50  
"All-Wave" A.C. Three (D, 2 LF (RC)) .. PW54  
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) .. PW56  
Mains Record All-Wave 3 (HF Pen, D, Pen) .. 5.12.36 PW70  
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, Pen) .. PW34D  
A.C. Hall-Mark (HF Pen, D, Push-Pull) .. 124.7.37 PW45  
Universal Hall-Mark (HF Pen, D, Push-Pull) .. 9.2.35 PW47  
A.C. All-Wave Corona Four .. 6.11.37 PW81

**SUPERHETS.**

Battery Sets : Blueprints, 1s. each.  
A.C. £5 Superhet (Three-valve) .. 5.6.37 PW40  
F. J. Camm's 2-valve Superhet .. 13.7.35 PW52  
F. J. Camm's "Vitesse" All-Waver (5-valver) .. 27.2.37 PW75

**Mains Sets : Blueprints, 1s. each.**

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 PW59  
F. J. Camm's Universal £4 Superhet 4 .. PW60  
"Qualitone" Universal Four .. 16.1.37 PW73  
**Four-valve : Double-sided Blueprint, 1s. 6d.**  
Push-Button 4, Battery Model .. PW95  
Push-Button 4, A.C. Mains Model .. 22.10.38

**SHORT-WAVE SETS.**

**One-valve : Blueprint, 1s.**  
Simple S.W. One-valver .. 9.4.33 PW88  
**Two-valve : Blueprints, 1s. each.**  
Midget Short-wave Two (D, Pen) .. PW38A  
The "Fleet" Short-wave Two (D (HF Pen), Pen) .. 27.8.38 PW91  
**Three-valve : Blueprints, 1s. each.**  
Experimenter's Short-wave Three (SG, D, Pow) .. 30.7.38 PW30A  
The Perfect 3 (D, 2 LF (RC and Trans)) .. 7.8.37 PW63  
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen) .. 1.10.38 PW68

**PORTABLES.**

**Three-valve : Blueprints, 1s. each.**  
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) .. PW65  
Parvo Flyweight Midget Portable (SG, D, Pen) .. 10.6.37 PW77  
**Four-valve : Blueprint, 1s.**  
"Imp" Portable 4 (D, LF, LF, Pen) .. 10.3.38 PW86

**MISCELLANEOUS.**

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

**AMATEUR WIRELESS AND WIRELESS MAGAZINE**

**CRYSTAL SETS.**  
Blueprints, 6d. each.  
Four-station Crystal Set .. 23.7.38 AW427  
1934 Crystal Set .. AW444  
150-mile Crystal Set .. AW450

**STRAIGHT SETS. Battery Operated.**

**One-valve : Blueprints, 1s. each.**  
B.B.C. Special One-valver .. AW387  
Twenty-station Loudspeaker One-valver (Class B) .. AW449  
**Two-valve : Blueprints, 1s. each.**  
Melody Ranger Two (D, Trans) .. AW388  
Full-volume Two (SG det, Pen) .. AW392  
Lucerne Minor (D, Pen) .. AW426  
A Modern Two-valver .. WM409

**Three-valve : Blueprints, 1s. each.**

Class B Three (D, Trans, Class B) Fan and Family Three (D, Trans, Class B) .. 25.11.33 AW410  
£5 5s. S.G.3 (SG, D, Trans) .. 2.12.33 AW412  
Lucerne Ranger (SG, D, Trans) .. AW422  
£5 5s. Three : De Luxe Version (SG, D, Trans) .. 10.5.34 AW435  
Lucerne Straight Three (D, RC, Trans) .. AW437  
Transportable Three (SG, D, Pen) .. WM271  
Simple-Tune Three (SG, D, Pen) .. June '33 WM327  
Economy-Pentode Three (SG, D, Pen) .. Oct. '33 WM337  
"W.M." 1934 Standard Three (SG, D, Pen) .. WM351  
£3 3s. Three (SG, D, Trans) .. Mar. '34 WM354  
1935 £6 6s. Battery Three (SG, D, Pen) .. WM371  
PTP Three (Pen, D, Pen) .. WM389  
Certainty Three (SG, D, Pen) .. WM393  
Miniature Three (SG, D, Trans) .. Oct. '35 WM396  
All-Wave Winning Three (SG, D, Pen) .. WM400

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

65s. Four (SG, D, RC, Trans) .. AW370  
2HF Four (2 SG, D, Pen) .. AW421  
Self-contained Four (SG, D, LF, Class B) .. Aug. '33 WM331  
£5 5s. Battery Four (HF, D, 2 LF, LF, Trans) .. WM350  
£5 5s. H.K. Four (SG, SG, D, Pen) .. Mar. '35 WM384  
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen) .. Apr. '36 WM404

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

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

**Mains Operated.**

**Two-valve : Blueprints, 1s. each.**  
Consoelectric Two (D, Pen) A.C. .. AW403  
Economy A.C. Two (D, Trans) A.C. .. WM286  
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  
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 WM329  
Harris' Jubilee Radiogram (HF Pen, D, LF, P) .. May '35 WM356

**SUPERHETS.**

**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) .. WM379  
**Mains Sets : Blueprints, 1s. 6d. each.**  
Heptode Super Three A.C. .. May '34 WM350  
"W.M." Radiogram Super A.C. .. WM396

**PORTABLES**

**Four-valve : Blueprints, 1s. 6d. each.**  
Holiday Portable (SG, D, LF, Class B) .. AW393  
Family Portable (HF, D, RC, Trans) .. AW447  
Two H.F. Portable (2 SG, D, QP21) .. WM363  
Tyers Portable (SG, D, 2 Trans) .. WM367

**SHORT-WAVE SETS—Battery Operated.**

**One-valve : Blueprints, 1s. each.**  
S.W. One-valver for America .. 15.10.38 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. Simplified Short-wave Super .. Nov. '35 WM397

**Mains Operated.**

**Two-valve : Blueprints, 1s. each.**  
Pen-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 : Blueprint, 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

**MISCELLANEOUS.**

S.W. One-valve Converter (Price 6d.) .. AW329  
Enthusiast's Power Amplifier (1/6) .. WM387  
Listener's 5-watt A.C. Amplifier (1/6) .. WM392  
Radio Unit (2v.) for WM392 (1/-) .. Nov. '35 WM398  
Harris Electrogram (battery amplifier) (1/-) .. WM399  
De Luxe Concert A.C. Electrogram (1/-) .. Mar. '36 WM403  
New Style Short-wave Adapter (1/-) .. 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

**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.

**SOUTHERN RADIO'S Bargains.**

**5/-** BARGAIN Parcels of Useful Radio Components, coils, transformer resistances, condensers, wire, circuits, etc., value over 20/-; 5/- per parcel.  
**T**ELSEN W349 Midget Iron Core Coils, 3/6; dual range coils, 2/6; with aerial series condenser W76, 3/3.  
**A**.C./D.C. Multi-meters, 5-range, 8/6; Ace "P.O." microphones, 4/-.  
**2/6** ORMOND Loud Speaker Units, new and boxed, 2/6 each.  
**36** ASSORTED 1-watt Wire-ended Resistances, 5/6; 24 tubular condensers, assorted capacities up to 0.5 mfd., 8/-; volume controls, assorted capacities (less switch), 7/6 dozen; with switch, 11/6 dozen; mica condensers, assorted, 1/9 dozen; Mains-bridge type condensers, 1 mfd., 2 mfd., 4 mfd., 8 mfd., 8/- dozen; valveholders, 5-pin, 7-pin, 9-pin, 2/6 dozen; battery leads, multi-way, 6/6 dozen; parcel of assorted servicing components comprising resistances; tubular, mica, variable, electrolytic and block condensers; wire; sleeving; volume controls; valveholders, etc., etc., 10/- each; parcel containing at least 100 articles.  
**S**OUTHERN RADIO, 46, Lisie Street, London, W.C. Gerrard 6653.

**RESISTANCES 1!**—Parcels of 50, 1-watt to 2-watt consisting of 20 useful values, only 1/9 for 50.—Harrison & Co., 89, Great Portland Street, London, W.1. Langham 2471.

**V**AUXHALL.—All goods previously advertised are still available; send now for latest price list, free.—Vauxhall Utilities, 163a, Strand, W.C.2.

**LOUDSPEAKER REPAIRS**

**L**OUNDSPEAKER 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.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

**NEW LOUDSPEAKERS**

**3,000** SPEAKERS from 6/6 each, P.M. and energised 4in. to 14in., including several Epoch 18in.—Sinclair Speakers, Alma Grove, Copenhagen Street, N.1.

**VALVES**

**A**MERICAN Valves in Sealed Cartons, all types 5/6 post paid.—Valves, 661/3, Harrow Road, N.W.10.

**NEW RECEIVERS AND CHASSIS**

**C**HASSIS, panels and cabinets drilled to your requirements. Example, aluminium chassis 10" x 8" x 2", 4/6. Black crackle panel 10" x 8", 3/-. Satisfaction guaranteed.—The Universal Productions, Rigby Lane, Bromsgrove, Worcs.

**A**RMSTRONG IMPORTANT ANNOUNCEMENT: for the convenience of our customers we have moved to modern offices and showrooms at Walters Road, Holloway. Walters Road adjoins Holloway Arcade and is readily accessible from all parts of London. ARMSTRONG Co., will gladly demonstrate 1939 range of Radio chassis at the new premises. Kindly note in future all correspondence to Armstrong Manufacturing Co., Walters Road, Holloway, London, N.7.

**PREMIER 1939 RADIO**

**R**OLA M.C. SPEAKERS, complete with Output Transformer, 8in. P.M., 15/-; 10in. P.M., 19/11; G12 P.M., 79/6; G12 energised, 1,250 or 2,500 ohms, 59/6.

**Premier Short-Wave Kits**  
Complete to the last detail including all Valves and coils, as well as theoretical and wiring diagrams and lucid instructions for building and working. Each kit is supplied with a steel Chassis and Panel and uses plug-in coils to tune from 13 to 170 metres.  
1 Valve Short-Wave Receiver or Adapter Kit 17/6  
1 Valve Short-Wave Superhet Converter Kit 20/-  
1 Valve Short-Wave A.C. Superhet Converter Kit .. 22/6  
2 Valve Short-Wave Receiver Kit .. 25/-  
3 Valve Short-Wave Screen Grid and Pentode Kit .. 58/6

**PREMIER U.S.A. QUARTZ TRANSMITTING CRYSTALS.**

7 mc Band, 10/- each, with Calibration Certificate Enclosed holder and Base, 3/-.

**PREMIER MOVING COIL METERS**  
Guaranteed Accuracy within ± 2 per cent.  
Model No. 21. Model No. 311.  
3in. square case. 3 1/2in. diameter round case.

0-1 mA	.. 18/6	0-1 mA	.. 22/6
0-10 mA	.. 17/6	0-10 mA	.. 20/-
0-50 mA	.. 17/6	0-50 mA	.. 20/-
0-100 mA	.. 17/6	0-100 mA	.. 20/-
0-250 mA	.. 17/6	0-250 mA	.. 20/-

Model 311. 0-1 mA. movement, with calibrated scale, volts-ohms-m/A, 25/-.

**VOLTAGE MULTIPLIER RESISTANCES**, guaranteed accuracy ± 2 per cent. All standard ranges, 1/3 each.

**TAPPED SHUNT** to provide readings of 5 mA., 25 mA., 250 mA., and 1,000 mA., 5/6.  
**PREMIER S.W. H.F. Chokes**, 10-100 metres, 9d. each. Pie-wound, 1/6 each. Screened, 1/6 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.  
**UTILITY Micro Cursor Dials**, Direct and 100 : 1 Ratios, 3/9.

**PREMIER Short-Wave Condensers**, all-brass construction, with Trolitul insulation. 15 mmf., 1/6; 25 mmf., 1/7; 40 mmf., 1/9; 100 mmf., 2/-; 160 mmf., 2/3; 250 mmf., 2/6.

**TROLITUL DOUBLE SPACED TRANSMITTING CONDENSERS**. 15 mmf., 2/9; 40 mmf., 3/6; 160 mmf., 4/8.

**NEW TROLITUL SPLIT STATOR CONDENSERS**, 50 x 50 mmf., 10/6.

**COIL FORMERS**, 4- or 6-pin low-loss, 1/- each.  
**AMERICAN VALVES**. We hold the largest stocks of U.S.A. tubes in this country and are sole British Distributors for TRIAD High-grade American Valves. All types in stock. Standard types, 5/8 each. All the new Octal Base tubes at 6/6 each, 210 and 250, 8/6 each.

**EUROPA MAINS VALVES**, 4 v. 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 H. ex. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 31-watt D.H. Triode, 7/6; 350 v. and 500 v. F.W. Rect., 5/6; 13 v. 2 amps. 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 1939 HIGH FIDELITY AMPLIFIERS**

**A NEW COMPLETE RANGE OF 7 HIGH FIDELITY PA AMPLIFIERS FOR A.C. OR A.C./D.C. MAINS OPERATION.**

	Kit of Parts with Valves	Completely Wired and Tested
3-watt A.C. Amplifier	.. 22 0 0	22 15 0
3-watt A.C./D.C.	.. 22 0 0	22 15 0
6-watt A.C.	.. 25 5 0	26 0 0
8-10 watt A.C./D.C.	.. 24 10 0	25 5 0
15-watt A.C.	.. 25 15 0	27 0 0

Black Crackle Steel Cabinet 15/- extra.

**NEW PREMIER SELF-POWERED RF TUNING UNIT**, incorporating a Var-Mu Pentode amplifier followed by a power grid detector. Designed for high-fidelity reception. Wave range 200-560 and 800-2,000 metres £4 : 9 : 6 complete with valves.

**PREMIER BATTERY CHARGERS**. Westinghouse Rectification. Complete. Ready for use. To charge 2 volts at 1/2 amp., 10/-; 6 volts at 1/2 amp., 16/6; 6 volts at 1 amp., 19/6; 12 volts at 1 amp., 21/-; 6 volts at 2 amps., 32/6.  
Orders 5/- and over sent Post Free. Under 5/- please add 6d. Postage.

Have you had our 1939 Catalogue, Handbook and Valve Manual? 90 pages of Radio Bargains and Interesting Data. **Price 6d.**

**ALL POST ORDERS TO:** Jubilee Works, 167, Lower Clapton Road, London, E.5. Amherst 4723.  
**CALLERS TO:** Jubilee Works, or our NEW PREMISES, 169, FLEET ST, E.C.4. Central 2833 or 50, High St, Clapham, S.W.4. Macaulay 2381.

**BATTERY CHARGERS**

**B**UILD the Argon 2 to 25-volt Charger. Transformer, 12/6. Valve, 10/6. New List of Transformers ready.—Thompsons, 176, Greenwich High Road, Greenwich.

**NEW RECEIVERS, COMPONENTS AND ACCESSORIES**

**B**ANKRUPT Bargains. New goods only. Full stock valves, components. Receivers from 4 to 10 valves. Car radios, press button 5v., 25-15s. Truphonic 5v. all-wave 101 gns. 1030 superhets, 6 gns. Write for requirements.—Butlin, 6, Stanford Avenue, Brighton.

**B**ANKRUPT Bargains.—Brand new 1938 Philco B model 847—Empire 8. Finest 8-v. All-wave Superhet available. Exceptional short-wave performance. 4 W.B. in maker's sealed carton with guarantee. List price, 29 guineas; cash price, £13 13s. 0d. Send 14d. stamp list of other bargains.—261-3, Lichfield Road, Aston, Birmingham.

**MISCELLANEOUS**

**E**NTHUSIASTS, Special Imported American Radio. Short wave books, magazines. Samples 2s. 6d. Catalogue included.—P. W. Final, 15, Nashleigh Hill, Chesham.

**D**.C. AVO-MINOR, 20s.—Crabbe, 42, Coventry Road, Market Harborough.

**W**ANTED S.T.400 A.C. Blueprint, "Constructor," March, 1933.—55, Beccmead Avenue, Kenton, Middlesex.

**T**HERE'S MONEY IN RADIO!—If you understand radio you can make substantial profits in spare time. For hints and ideas get MONEY-MAKING MADE EASY, by J. Harvey Wood. Available from all booksellers, 2/6 net, or by post, 2/10, from the Publisher, C. Arthur Pearson, Ltd., Tower House, Southampton Street, London, W.C.2.

**"THE OUTLINE OF WIRELESS,"** by Ralph Stranger. Fifth Edition, 8s. 6d.—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, or by post 9s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

**E**VERYMAN'S WIRELESS BOOK, by F. J. Camm, 3s. 6d. An invaluable book of reference, explaining the operation, upkeep and overhaul of all types of wireless receiver. 200 illustrations. From all Booksellers and Newsagents, or by post 4s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

**THE 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, or by post, 4s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

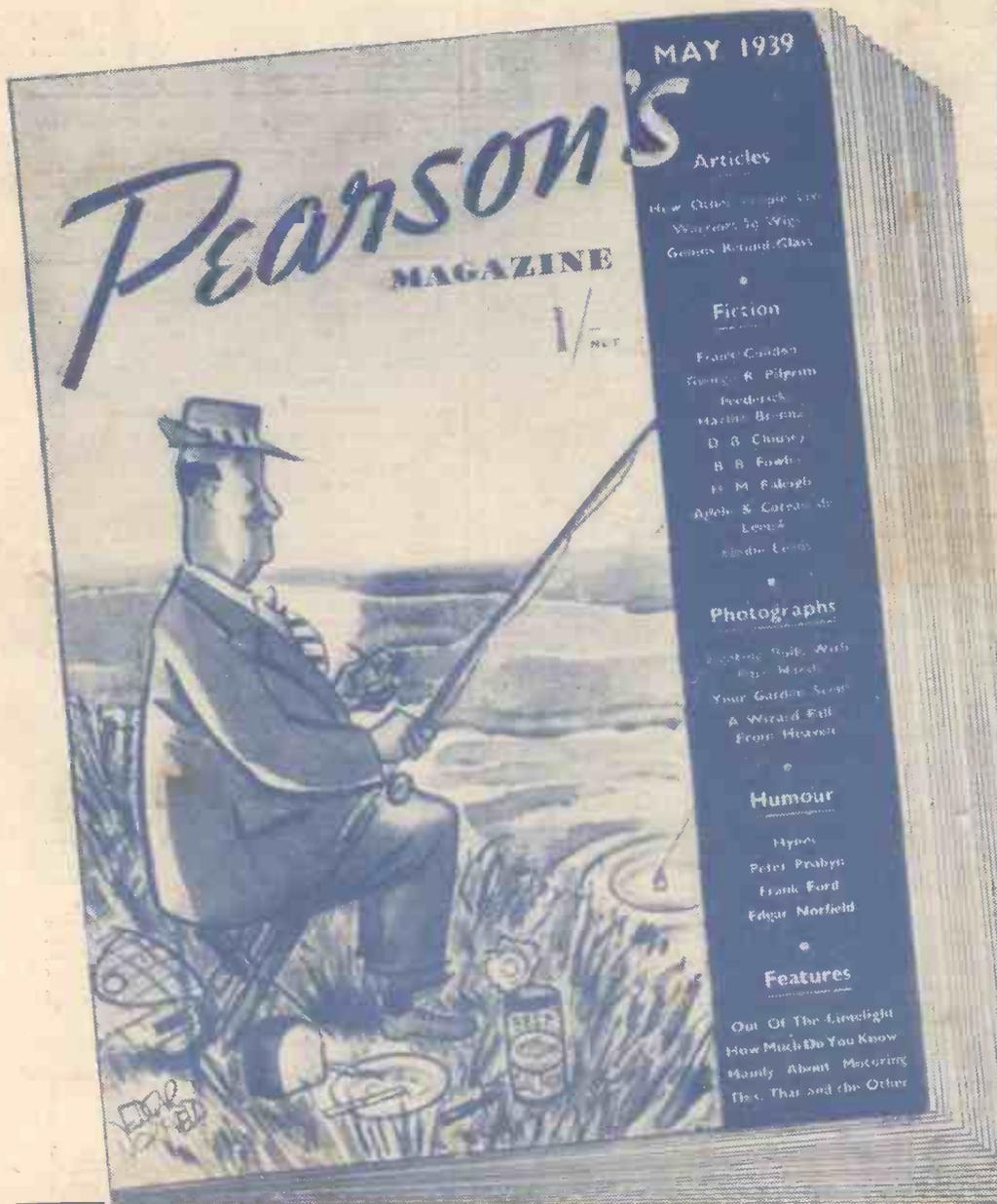
**S**IXTY TESTED WIRELESS CIRCUITS, by F. J. Camm, 2s. 6d.—This handbook contains every modern circuit complete with instructions for assembling, component values, and notes on operation. Obtainable at all Booksellers and Newsagents, or by post 3s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

**FREE ADVICE BUREAU COUPON**

This coupon is available until May 13th, 1939, and must accompany all Queries and Wrinkles.  
**PRACTICAL AND AMATEUR WIRELESS,**  
6/5/39.

# It's Startlingly Different!

**A**T last Man has a magazine to himself—PEARSON'S MAGAZINE—which in an attractive new form presents everything that man is thinking and talking about. . . . Personalities in which he is interested, stories that do not pander to sentiment, candid opinions on current events, virile humour and entertaining features, and striking photographic sections. A magazine, in fact, that reflects in every way the masculine point of view. Get your copy now!



G. Arthur Pearson, Ltd.

Contents that prove that PEARSON'S is your Magazine!

## HOW OTHER PEOPLE LIVE.

A series that takes you all over the world. First you go to America and see in amazing photographs Man's methods of eating and travelling, his law and order, and the odd people with whom he daily brushes shoulders.

## WARRIORS IN WIGS

Man's Point of View on a Man's Job—about famous Counsel whose brilliant legal battles have established great reputations. Read this month of the criminal cases that established the name of Sir Patrick Hastings, K.C.

## MAN'S POINT OF VIEW IN PICTURES

See a man fighting bulls with bare hands. See how your garden seeds are tested to ensure that they will grow. Watch what happens in an African village full of dusky maidens when an airman makes a forced landing in their midst.

## THE WORLD OF MEN

Test your knowledge with "How Much Do you Know?" Enjoy "Mainly About Motor-ing" and "This, That and the Other"—Matters of the moment for men.

## 8 SHORT STORIES IN WHICH MEN PLAY THE LEADING RÔLES

## MAN'S HUMOUR

By Hynes, Frank Ford, Edgar Norfield, Peter Probyn, and other artists men appreciate.

No wonder it's going round that PEARSON'S MAGAZINE is startlingly different!

**1/-** MONTHLY

May issue out now of all Newsagents and Bookstalls.

Practical and Amateur Wireless, May 13th, 1939.

ALL THE LATEST TELEVISION NEWS

# Practical and Amateur Wireless

3<sup>D</sup>  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

GEORGE  
NEWNES  
Publication

Vol. 14. No. 317.  
May 13th. 1939.

AND PRACTICAL TELEVISION

Two Novel

CRYSTAL  
SETS



THE BOOK FOR THE AMATEUR!

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

Edited by F. J. CAMM.

An important 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.

ADVT.

GREAT NEW PRACTICAL PART WORK

# MOTOR REPAIR *and* OVERHAULING

**FIRST PARTS**  
Now on Sale

**T**HIS authoritative new part work is absolutely essential to Garage Proprietors and Mechanics, to service men and motor engineers—and all who have a practical interest in mechanical transport. Providing in convenient form all the time-saving repair methods applicable to the leading makes of cars and motor vehicles, it ensures that every job taken in will be carried out expeditiously and to the satisfaction of the customer! It is no exaggeration to say that MOTOR REPAIR AND OVERHAULING will quickly prove itself worth its weight in gold as a garage standard reference work.

1/- WEEKLY PARTS



Men in the motor industry value efficiency above all else, and this great new work assures expert maintenance knowledge for no fewer than 200 popular models.

To be completed in 4 Volumes:

- Vol. 1. Standard Motor Components and Repair Methods.
- Vol. 2. Engine, Clutch and Gear Box Units.
- Vol. 3. Body, Chassis and Frame Repair.
- Vol. 4. Electrical and Accessory Equipment.

Written by highly-skilled engineers and mechanics. Illustrated by clear photographs of actual service operations and with many useful charts and tables.

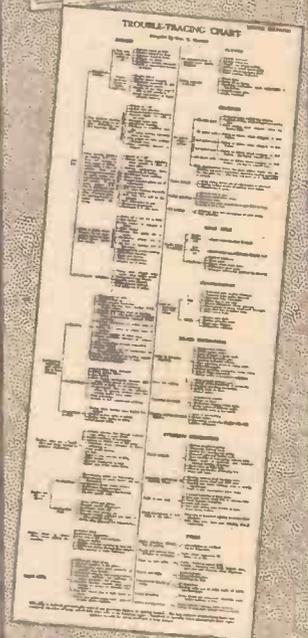
OVER 1,500 ILLUSTRATIONS

**GET YOUR COPIES TO-DAY**

Of all Newsagents and Bookstalls

2

Invaluable Charts Presented With **PART 1**



These are a QUICK CHECK-OVER DATA SHEET and a TROUBLE-TRACING CHART for car and components.

Every part throughout the work will include a Quick Check-Over Data Sheet. In this way over 200 models will be dealt with.

# Practical Hints for S.W. Experimenters

See page 197



# 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. XIV. No. 347 May 13th, 1939.

## ROUND *the* WORLD of WIRELESS

### Crystal Sets

WITH most hobbies it is usual to commence at the bottom and work up, taking each phase in its stride and studying the various developments as you go along. In radio, unfortunately, many amateurs commence activities by trying to build a multi-valve receiver, and accordingly they are unable to trace a fault should it arise, or are unable to obtain maximum results, as they are not familiar with various parts of the circuit. It is, therefore, highly desirable to commence activities by constructing a simple receiver and then trying out the effects of various modifications, passing on by stages as the requisite knowledge is gained. The simple crystal receiver can be quite complicated in design, and there are many interesting experiments which may be carried out with the arrangement. In this issue we describe a skeleton crystal receiver which may be regarded as a suitable medium for such experimental work, the coil being so designed that various experiments may be carried out, and various crystal combinations may be tried. We also describe in this issue another crystal receiver of more standard design for those who require a small stand-by receiver for use whilst the standard receiver is undergoing modification or repair, or for portable use.

### Doug Browning Joins N.B.C.

DOUGLAS BROWNING, since 1936 a member of the announcing staff of WLW, recently left Cincinnati to join the staff of the National Broadcasting Company, Radio City, New York.

One of Cincinnati's most popular announcers, Browning became noted for his "ad libbing" ability, and won especial favour for his handling of dance band broadcasts of WLW. Born Thomas Douglas Browning, he received his education in Cincinnati grade and high schools, the University of Cincinnati, and the Cincinnati Technical School. Later he made an extensive study of dramatics with Francis Duff Robinson in New York.

Having completed his studies, he made his acting debut in the stage version of "Craig's Wife," and later appeared in "Clarence," "Cat o' Nine Tails," "Family Affair," "The Brat," and other productions. Afterwards he became a member of the old "Opera Guild" network show, leaving to

join the staff of the Nation's Station. Browning is 29 years of age.

### "Admission Free"

LONDON'S Museums will be dealt with in a new television talks series, beginning in June, entitled "Admission Free." It is hoped that the directors of all the principal museums will face the cameras to show and describe some of the principal items in the collections, and particularly those which often escape the notice of the public.

Besides the ten-piece band, the outfit includes a cabby-crooner, Alec Stringer, and a straight singer, Ted Frost. Albert Gray is conductor and compère.

### Reactions

HERE is a new parlour game for listeners taking the form of a development of the old family game of "clumps," which, when it was recently introduced on the air, brought many requests for a repeat performance. In "Reactions," to be broadcast on May 14th, each player in the game is given a famous identity and he has to guess who he is supposed to be by finding out from his opponents their reactions to his assumed personality. The fewer the questions the better, the side scoring the fewest points being the winner.

A team of authors, consisting of Horace Richards, Brian Flynn, James Gilroy, and Shirley Long, will be pitted against four B.B.C. officials—John Cheatle, Robert MacDermott, Jack Inglis and Leslie Bailly having volunteered their services as "reactionaries."

### "Urdd" Peace Service

EVERY year an "Urdd" Peace Service is broadcast on the Welsh wavelength. This year it will come from Canaan Chapel, Maesteg, Glam, on May 14th. The address will be given by the Rev. E. J. Williams. In the course of the service children will recite the Welsh Children's Message of Peace, which has been broadcast for many years on Goodwill Day, May 18th.

### Who are the Irish?

ESTYN EVANS, Lecturer in Geography at Queen's University, Belfast, will give the third of his talks in the series entitled "Who are the Irish?" on May 10th. Having shown in his previous talks why the terms "English race" and "Celtic or Gaelic race" are confusing and misleading, Mr. Evans is now to examine the question of whether there is a distinctive race-type evolving in Ireland. He will tell listeners something of the data on which anthropologists work, how head-measurements are taken, and details of colour and stature. With him at the microphone will be a field worker, Mr. John Mogy, who will answer questions about his researches.

On Other Pages	
An Experimental Crystal Set ..	195
Short-wave Section ..	197
On Your Wavelength ..	199
Radio in Aviation ..	201
Readers' Wrinkles ..	203
Adding an Extra Wavelength Range ..	204
"A Stand-by" Crystal Set ..	206
Harnessing the Electron Stream ..	209
Practical Television ..	210
Practical Letters ..	213
Queries and Enquiries ..	215

### Taxi-drivers' "Cabbyret"

TEN London taxi-drivers who have formed themselves into a band have been booked by the B.B.C. to broadcast as London's contribution to the fourth of the series of all-Regional "Roundabout" programmes on May 24th. The combination was recently organised by Albert Gray, who, at present a cab-driver with a West-end rank as his headquarters, has had some stage experience, and broadcast not long ago in "In Town To-night."

Several other members of the band are colleagues of his at Hanover Square; two are from Oxford Street; another "prefers railway stations"; one is stationed at "The Rat's Hole," near Charing Cross Station; yet another is a "cruiser."

# ROUND the WORLD of WIRELESS (Continued)

## New S.W. Station for Finland

MARCONI'S Wireless Telegraph Co., Ltd., recently secured an important contract from Finland for the supply and erection of a 50kW short-wave broadcasting station to be installed at Pori, near the Gulf of Bothnia. The station is to be completed in time for the Olympic Games, which are to be held in Finland in 1940.

## Shades of Bonaparte

ACCORDING to a Paris radio journal it is reported that a small wireless transmitter is to be installed at Longwood, St. Helena, the house actually occupied by



Young radio operators for Britain's Air Force are now being trained largely in flying classrooms. Machines have been equipped with radio transmitters so that many youngsters may be trained at once. Our illustration shows an instructor (without overalls) with a radio apprentice showing some detail of the working of a set, whilst others look on.

Bonaparte when he was a prisoner of the British in that island. To commemorate his memory the broadcasting studio will use the call: *Ici Poste Napoleon*.

## Another Radio Conference

THE next meeting of the U.I.R. (Union Internationale de Radiodiffusion) will take place at St. Moritz (Switzerland) on June 14-24 next.

## Higher Power for London and North Regional Transmitters

THE B.B.C. announces that a contract has been placed with Marconi's Wireless Telegraph Co., Ltd., for the supply of two transmitters to replace the present 70-kilowatt Regional transmitters at Brookmans Park (London Regional) and Moorside Edge (North Regional) stations. The new transmitters will each be capable of supplying an aerial power of 120 kilowatts, the maximum allowed by the provisions of the European Broadcasting Convention recently concluded at Montreux. It is expected that the new equipment will be ready for service by the spring of 1940.

## Concert Party "High Spots"

VICTOR SMYTHE is putting on another "Northern Concert Party Cavalcade" for half an hour on May 16,

## INTERESTING and TOPICAL NEWS and NOTES

and veterans of this popular type of entertainment in the Region, managers as well as artists, will be taking part. The same week (Friday evening, May 19) will bring a relay from Leslie's Pavilion, Rusholme, Manchester, a famous home of concert-party, and a hall in which many now-famous stars of the music-halls and of "straight" drama made a start, or at any

be broadcast. The concert is given by the City of Birmingham Orchestra, conducted by Eric Woodward, and Grieg's Lyric Suite will be the chief work. Stuart Robertson (bass-baritone) will be the vocalist for two arias by Handel.

## Variety from Dudley

THE Hippodrome at Dudley is a theatre which has an interesting history. It formed the subject of a broadcast last year in the series entitled "Variety Comes Back." On May 16, Regional as well as Midland listeners will hear several of the star turns in the Dudley Hippodrome's "bill." It is hoped that these will include Beryl Orde and Dawn Davies.

## Concert from Plymouth

THE Plymouth Orpheus Society, conducted by David Parkes, will broadcast on May 13th in the Western programme. The solo artist will be Barbara Woodbery (pianoforte).

## Licences in Palestine

IT is announced that an increase of 50 per cent. on the present annual receiving licence of 500 mils (approximately 10s.) was imposed from the beginning of April by the Palestine Broadcasting Service. It is now anticipated that the annual revenue from licences will amount to roughly £P30,000.

## Kingswood Prize Silver Band

HOOPER BUSSELL (baritone) will be the solo artist in a concert to be broadcast by the Kingswood Prize Silver Band, conducted by W. Stanley Smith, from the Bristol studios on May 24. The band has been in existence for over fifty years, and is well known in the West of England.

## SOLVE THIS!

### PROBLEM No. 347

Jackson made up an A.C. mains receiver, but before plugging in the valves decided to test everything. He commenced his tests at the mains end and connected the mains in order to measure the outputs and see whether any short-circuits were present. He connected one side of his meter to the chassis and transferred the other meter lead to various parts of the circuit. He found, however, that when his lead was placed on the heater terminals of the rectifier valveholder he obtained a reading of 350 volts. He decided that he had mistaken the secondary windings, but a check proved that this was not so. He tested again and still found 350 volts at the heater. He therefore took a resistance meter to trace for short-circuits but could not find any. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your entries to The Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 347 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, May 15th, 1939.

### Solution to Problem No. 346

Lester's aerial was shorted to earth, and thus when he joined it to the anode of the H.F. valve, which was joined to H.T. positive through the choke, he short-circuited the mains through the choke which accordingly burnt out.

The following three readers successfully solved Problem No. 345 and books have accordingly been forwarded to them: J. Heard, The Gardens, Ripon House, Putney Heath, S.W.15; G. Barrow, 9, Meadow Lane, Long Eaton, Nr. Notts; A. R. Watson, 75, Elwyn Road, March, Cambs.

rate made appearances early in their careers. This broadcast will present a good part of the "Quaintesques" show presented by Billie Manders.

## Charlie Kunz in Belfast

WORLD-FAMOUS synepated pianist Charlie Kunz will pay a visit to Belfast in the near future to appear at the Royal Hippodrome and, on May 16, the microphone will be taken to the Hippodrome for an excerpt from the show, which will include a special turn by this popular pianist.

## The Club of Queer Trades

THE fifth episode of the "Club of Queer Trades," by G. K. Chesterton, adapted for broadcasting by Douglas Cleverdon, will be produced by Michael Goodwin in the National programme on May 14. This episode is entitled: "The Noticeable Conduct of Professor Chadd." The first four episodes have been broadcast in the Regional programme.

## Cheltenham Festival Concert

THE fourteenth annual competitive music festival at Cheltenham will open with a public concert in the Town Hall on May 14, when the second part will

# An Experimental Crystal Set

Constructional Details of a Highly Efficient Receiver in Skeleton Form for Beginners and Advanced Experimenters - - By W. J. DELANEY

**M**ANY newcomers to radio read of the "old days," when crystal sets and simple valve receivers were totally different in appearance from those which we know to-day. They read how long-

of the field of the coils and this naturally led to very large lay-outs. If two coils had to be used the apparatus became unwieldy, or screens had to be employed. These naturally came within the field of the coils and reduced efficiency.

### Higher Efficiency Components

Reducing the size of a coil, or placing it within a screen reduces efficiency, but

the widest adjustments for varying conditions was the carborundum, although this has the disadvantage of requiring some form of applied potential. To enable newcomers, therefore, to participate in experimental work with a crystal receiver, and to judge just what such a receiver can do under the correct conditions, we have built up an experimental set on the old lines and the finished model may be seen in Fig. 1. The coil is home-made, using a heavy gauge bare wire with a thin primary, offering maximum inductive and minimum capacitative coupling.

To retain selectivity the crystal may be tapped on to the coil, and provision is made for four separate adjustments. Three separate degrees of aerial coupling are also available, whilst the detector may be replaced by any preferred type. A carborundum combination was used in the original model, the parts for this being obtained from Electradix Radios for 2s. 6d.

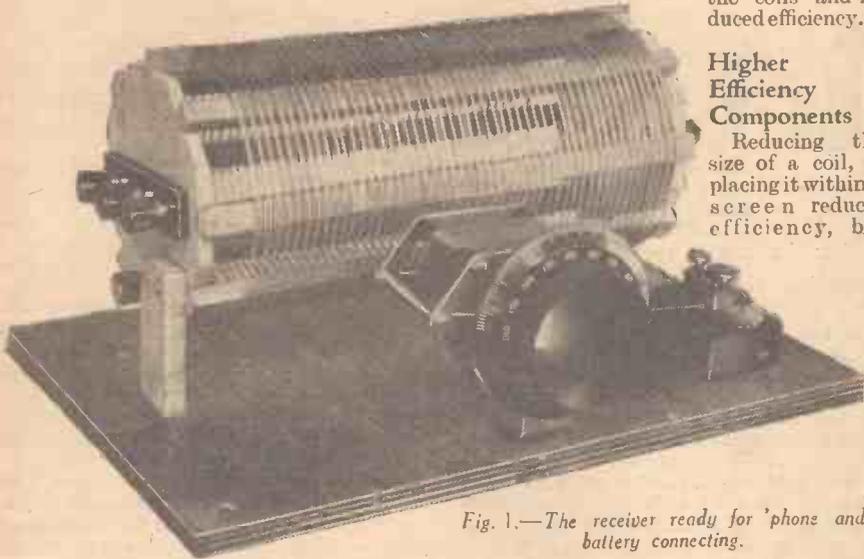


Fig. 1.—The receiver ready for 'phone and battery connecting.

distance reception was often carried out on crystal receivers, but the apparatus which they try to-day does not seem to give the same high performance. It is true that conditions on the air to-day are vastly different, and it is often overlooked that the many changes which have been made in components and designs are not necessarily for the better. For instance, in the early days, coils having a diameter of 4in. or so were the only ones in use and newcomers are apt to think that the smaller coil in use to-day is naturally a more up-to-date design. A large diameter coil has naturally a large field surrounding it, and as valves became lower in price constructors built multi-valve receivers. In order to enable the coils to function properly it was necessary to place components out

this was offset by the introduction of valves of higher efficiency, and thus, what was lost on the swings was gained on the roundabouts. In a simple crystal receiver, however, we are not concerned with any valves or other high-efficiency parts, and thus must rely upon the tuning circuit to supply to the rectifier as much energy as possible. It is also necessary in such a case to introduce some form of selectivity device, as a very efficient coil of the type previously described will naturally be fairly flatly tuned.

The type of crystal detector which is most popular to-day is the semi-permanent type, as there is no question of searching for a sensitive point or of continual re-adjustment. The original form of rectifier which was most reliable and capable of

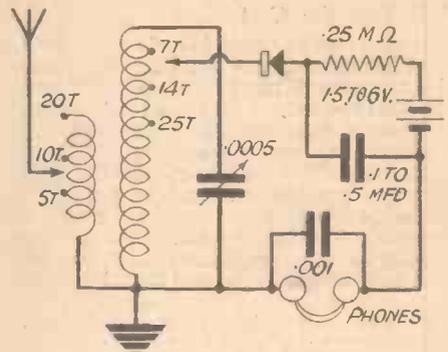


Fig. 3.—Theoretical circuit of the crystal set.

### Making the Coil Former

The coil is made round a skeleton wooden former, for which three octagonal pieces are cut to the dimensions given in Fig. 2, and round these eight strips of wood  $\frac{1}{8}$ in. by  $\frac{1}{4}$ in. are nailed and glued. These strips are grooved to accommodate the wire and the most satisfactory way of doing this is to cut all the strips first to exactly 9in. in length. Four shorter pieces are then nailed on a large piece of board round the strips packed closely together, as shown in Fig. 4. The strips are then numbered in pencil from 1 to 8. At a point half-an-inch from the right hand end, a line is ruled across with a square and at the upper edge a further point  $\frac{1}{16}$ in. to the left is marked. From this latter and the point at the lower edge, lines are ruled off  $\frac{1}{8}$ in. apart right across the strips, and saw-cuts are then made with a thick hacksaw blade as shown in Fig. 4. Twenty lines are then cut with the point of a sharp penknife between the first set of cuts, the primary winding being accommodated in these thinner cuts. They should be made slightly deeper than the saw-cuts. Clean off the top surfaces of the strips with fine sandpaper before removing the

(Continued on next page.)

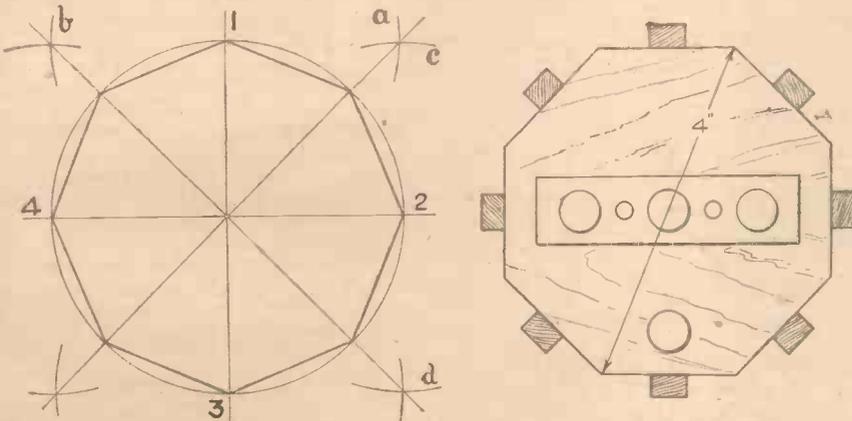


Fig. 2.—How to mark out the coil ends, and details of the finished end. Three of these discs are needed. Compasses are used to mark off the arcs in order—a, b, c.

**AN EXPERIMENTAL CRYSTAL SET**

(Continued from previous page.)

locking strips, and then cut out the two ebonite terminal strips. Three terminals are attached to these and they are screwed to the end plates with two small screws. To enable the terminal plates to be at-

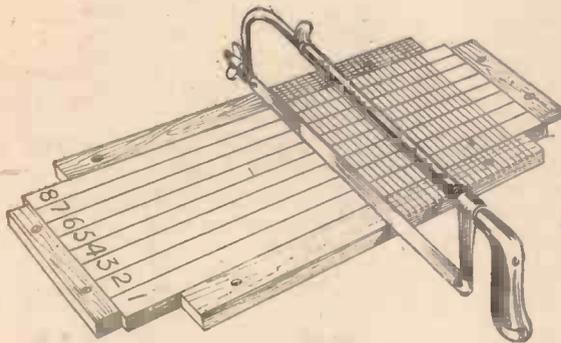


Fig. 4.—Marking out and cutting the grooves in the supporting strips.

tached to the wood end cheeks clearance holes must be drilled in the latter. Soldering tags should be attached on the terminal strips and small holes drilled through which the wire may pass for connection purposes.

**Winding the Coil**

Nail the strips of wood on the end cheeks with the centre disc in position. The latter was not used in the original model, but it prevents the strips from being bent with the pressure of the wire and ensures that the turns will not move when the coil has been completed. Two lengths of tinned copper connecting wire (18 gauge) were used in the original coil, but if you have a reel of the wire this may be used. It is sold by Messrs. Peto-Scott in 20ft. and 30ft. lengths, and two of the latter will just complete the coil described. The end of the wire is passed round the first strip and through the lower hole in the end cheek and attached to the soldering tag. The wire is then carefully wound round the former

until it is full, the termination being taken to the other lower terminal. The tapping points for the crystal are made with spare tinned copper wire soldered to the three terminals and taken up to the 7th, 14th and 25th turns from that end.

The primary is wound with 34 gauge enamelled wire, the beginning being attached to the first of the three terminals at the primary end of the coil, and tappings being taken by making a loop, pushing this down and hooking it through the small holes in the terminal strips by means of a crochet hook. The end of the loop is scraped and soldered to the terminals. The tappings are made at the 5th and 10th turns from the earthed end.

The coil is mounted by means of small strips of wood screwed to the base-board, which measured in the original model 12ins. by 8ins. The condenser is mounted on a metal component-mounting bracket fitted to the front of the baseboard.

**Mounting the Crystal**

The crystal is obtained in two separate parts and these will have to be mounted on some form of mount the method depending upon the facilities you have for drilling ebonite and the adjustments which you may wish to make to the parts. As the set is intended as an experimental model no panel has been provided, but one could be used and the crystal mounted on the panel for ease of adjustment, although with this type of detector it is not necessary to make adjustments unless experiments are being carried out.

To enable the potential to be applied a leak may be joined in series with a battery or a potentiometer used as shown in Figs. 3 and 5. Phones are, of course, connected between earth and the crystal combination as shown in the theoretical circuit Fig. 3.

**Using the Set**

The aerial should be joined to the top end of the primary winding for preliminary

tests, whilst the crystal should be joined to the lower terminal on the right-hand end of the coil. This will give maximum

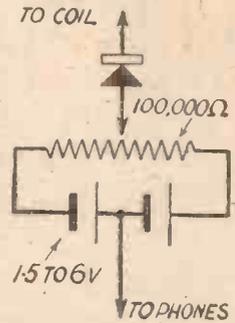
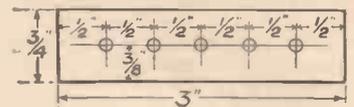


Fig. 5 (above)—Alternative battery connections for the crystal, and Fig. 6 (below): Marking out details of the terminal strips.



results for preliminary tests. Screw down the adjusting screw of the crystal and use about 1.5 volts. Rotate the tuning condenser until the local station is heard. You can then try the effects of transferring the crystal connection to either of the three taps on the coil, and also of shifting the aerial connection to the remaining taps on the primary. After this, varying potentials on the crystal may be tried out. With these varying adjustments the set may be made to suit any particular conditions—maximum selectivity and sensitivity when long-distance listening is required and no local station is on the air, or maximum selectivity when a local is present on a nearby wavelength.

**NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK**

5/-, or 5/6 by post from  
GEORGE NEWNES, Ltd., Tower House,  
Southampton Street, Strand, London, W.C.2.

**Erie High-voltage Multi-Resistor**

THE Erie Multi-Resistor is of particular interest to television engineers and designers, for it is intended for use with relatively high voltages such as those used in cathode-ray tube circuits. Furthermore, it will dissipate a very much higher wattage than most forms of carbon or composition resistances.

**Description**

In order to use a resistance with very high voltages the length of the unit must be greatly increased to prevent breakdown. To overcome this difficulty the Erie Multi-Resistor is constructed in the form of rings of resistance material which are connected in series and separated by Isolantite insulating spacers, the whole being assembled on a tube of similar material. Thus a resistor of fairly large effective length is obtained in a small space with the added advantage that a large number of tappings may be made without difficulty.

The length of a multi-resistor unit

depends entirely upon the rating required. At the moment two sizes are manufactured, and these are designated Size A and Size B respectively. The ratings given by the makers are as follows:

SIZE A.			
Overall diam.	.. .. .	1 1/2 in.	
Max. W. per in. length	.. .. .	3.5	
Max. V. per in. length	.. .. .	5,000	
Max. V. per ring	.. .. .	1,000	
SIZE B.			
Overall diam.	.. .. .	3 in.	
Max. W. per in. length	.. .. .	1.75	
Max. V. per in. length	.. .. .	3,000	
Max. V. per ring	.. .. .	600	

Prices are available on request.

**Test Result**

We received for test a sample of Size A, about 3in., long containing 16 resistance rings in series. Each ring has therefore a resistance of about 62,500 ohms. On the basis of 3.5 W. per inch, and about five rings per inch, the wattage per ring

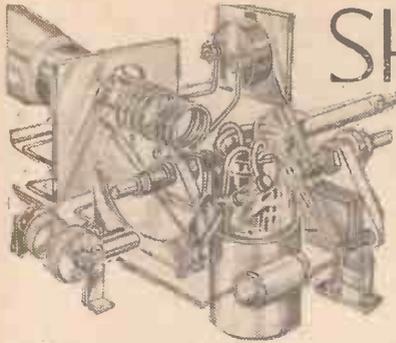
is 0.7 W., and therefore the maximum voltage across each ring of our sample should be about 209 V.

We tested it with 215 V. across each section, and found that the resistance elements became warm, but there were no signs of over-heating, so that the wattage rating is quite conservative.

The voltage rating also appears to be satisfactory, and providing the 3.5 W. per inch is not exceeded, the voltage can be as high as 5,000 V. per inch.

From the information supplied by the manufacturers it would appear that the only limit to the size of the tubing they can supply is the length of the ceramic tubing forming the core. They indicate that 18in. is the limit here, so that working on a basis of 5,000 V. per inch, it should be possible to obtain a resistance capable of working under an applied maximum voltage of 90,000 V., which is more than is likely to be encountered even in television receivers.

The resistors are certainly of an interesting design, and should form highly satisfactory solutions of many television and amplifier resistance problems.



# SHORT-WAVE SECTION

## PRACTICAL HINTS FOR S.W. EXPERIMENTERS

A Few Methods of Assuring Rigid Mechanical Erection of U.S.W. Aerials are Discussed in this Article. By A. W. Mann.

IN articles dealing with the construction and erection of ultra-short wave aerials of the tubular and rod types, it is often stated that the aerial proper is supported by means of stand-off insulators. The experimenter with practical experience knows just what the foregoing sentence is meant to imply, but the beginner has sometimes to do a little thinking before he can make a start, and in many instances binds a few turns of wire around the aerial rod, loops it around the terminal heads of the insulators, and makes that do.

Such methods are more or less satisfactory in the same way as a hook-up receiver is satisfactory. It works, but its reliability is doubtful.

Apart from the danger factor, which applies to all types of overhead erections, there are other factors to be considered. For example, sway due to wind resistance and consequent artificial fading of signals.

aerial arrays and multiple reflector arrangements, the different units being arranged on wooden frameworks, the method as outlined at Fig. 5 is worth considering.

In this instance the larger type stand-off insulator is recommended, owing to the fact that the larger diameter base, which is fitted with three screw holes, and is in general of more robust construction, makes them very suitable for supporting half-wave tube and rod aerials and reflectors.

### Methods of Mounting

Fig. 6 shows one method of mounting, the end being flattened, drilled and bent at right angles. The bend, however, should not be sharp, but gradual in the interests of strength, and to avoid fracture.

Reverting to Fig. 3, this method has much to recommend its use, where beam systems of the four-element type are to be erected.

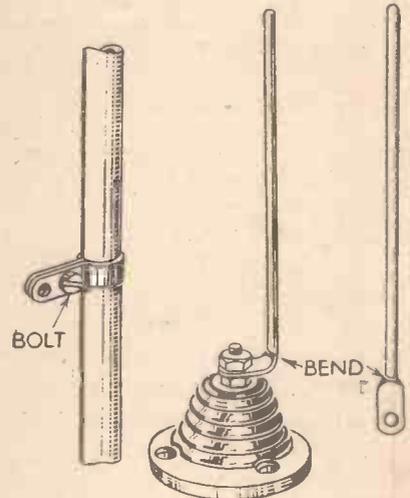
Whilst there are acknowledged difficulties associated with the construction of ultra-short-wave receivers, the most general one does not concern construction but the calibration of completed receiving apparatus, due to the fact that in many districts there are no amateurs working on the five-metre band. This difficulty also applies to the short-wave club fraternity, who share their headquarters with other organisations on alternate evenings. Under such circumstances it is impossible to install permanent calibration apparatus.

One of the most accurate and useful methods of calibration, and one especially applicable to ultra-short-wave work, is the Lecher wire method. Unfortunately to set up suitable apparatus requires considerable space, and in addition the work of calibration requires time and care in order

that a worth-while standard of accuracy may be achieved.

### Measuring Apparatus

Figs. 7 and 8 show a very useful and efficient mechanical arrangement of Lecher wire measuring apparatus. First let us examine in detail its general construction. We have two parallel wires 4ins. apart and each 25ft. long fastened at the one end to a stand-off insulator. At the other there is a ceramic double-eye insulator, and a coil spring. This spring is fastened to another



Figs. 4, 5 and 6.—A clip clamped to an insulator rod, and method of fixing an aerial rod to a stand-off insulator.

stand-off insulator, and in both instances the double-eye insulator isolates the Lecher wires from the tension springs. Across the two parallel wires is the shorting bridge, which consists of a short length of stiff wire, with the ends turned over so that it may be moved to any point at will, in order to short-circuit the two wires. Thus with the wires, loop, and shorting bar there is a closed circuit, the constants of which can, within defined limits, be varied at will.

The single-turn loop is, of course, coupled to the respective stand-off insulators.

### Constructional Details

In the interests of accurate calibration the mechanical construction must be as rigid as possible, and the tension of the two

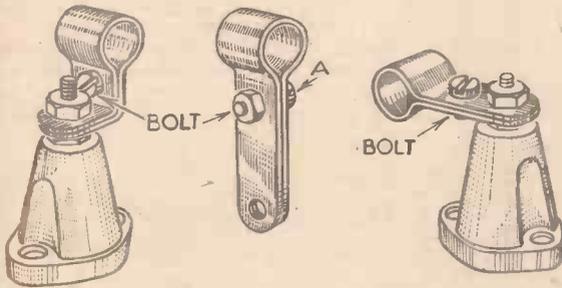


Fig. 1 (centre), Fig. 2 (right) and Fig. 3 (left).—Details of special clips for tubular aerial support.

Another factor is that of unsatisfactory mechanical construction producing cracking. The methods described below assure rigid mechanical erection of short and ultra-short-wave aerials in which copper tube or solid rods are incorporated.

### Special Clips

Fig. 1 shows a special clip made from thin gauge sheet brass. These are bent and formed around a piece of rod or tube of the same diameter as the aerial element to be used, the bending being carried out in a way that on completion the space between the leg portions of the clip is  $3/32$  in. so that when tightened on to the aerial the locking bolt, which is fitted in a suitable hole drilled as far up the neck of the clip as possible, will draw the legs together so that the clip has a firm and rigid hold around the aerial rod or tube. Fig. 2 shows a clip mounted on a Raymart type insulator, a terminal screw hole being drilled at the lower edge of the legs.

Passing to Fig. 3 we have the same type of clip bent at right angles, and fitted to an insulator. Fig. 4 shows a clip clamped to an insulator rod. Two or more clips are, of course, required according to the length of the aerial to be erected.

When experiments are being carried out with reflectors, and especially in the case of

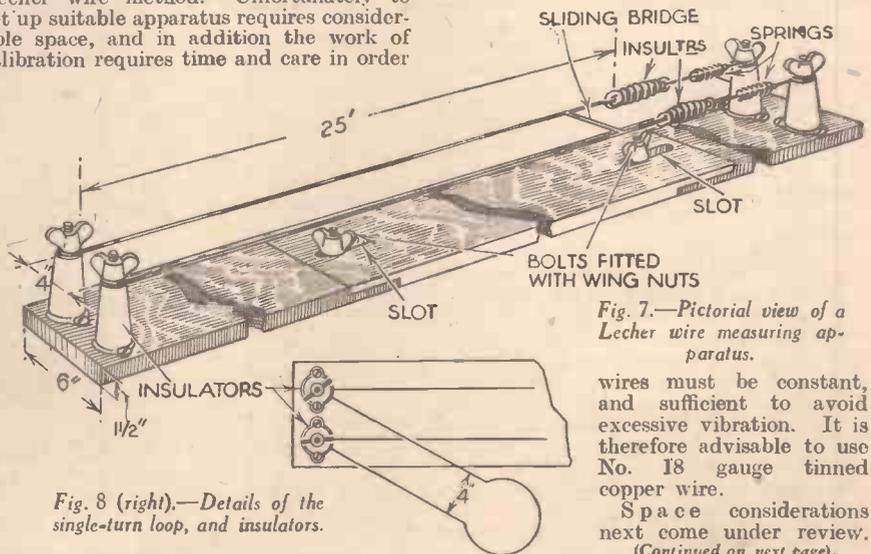


Fig. 8 (right).—Details of the single-turn loop, and insulators.

Fig. 7.—Pictorial view of a Lecher wire measuring apparatus.

wires must be constant, and sufficient to avoid excessive vibration. It is therefore advisable to use No. 18 gauge tinned copper wire.

Space considerations next come under review. (Continued on next page.)

## SHORT-WAVE SECTION

(Continued from previous page.)

The length of wire required is 25ft., plus insulator base dimensions, tension springs, and double-eye insulator, and a clear run of at least 28ft. will be necessary.

Comparatively few club rooms, and fewer experimental workshops, have a bench of this length available, and this means that a specially built bench is necessary. As such apparatus is not in constant use, the expense would hardly be justified and clubs sharing their room with other organisations must rule out the idea.

The idea of arranging the Lecher wires on a plank of sufficient length comes to mind, but presents another problem, i.e., where to store it when not in use.

With the foregoing considerations in mind, the arrangement shown in Figs. 7 and 8 will perhaps prove to be of interest.

## Three-section Base

Instead of a single 28ft. by 6in. by 1½in.

plank, we have three separate sections which are half-lapped, as shown in Fig. 7.

Slots are cut to suit the bolts used through the combined thicknesses of the half-lap joints, and the whole is bolted together with suitable bolts and washers.

These slots also serve the additional purpose of allowing tensioning adjustments to be carried out, in addition to the tension provided by the springs.

The adaptability of this method of construction will be appreciated where conditions are as outlined earlier in this article, because the apparatus can be assembled in a short time, and after use can be dismantled and stored in a comparatively small space.

Lecher wires as specified are suitable for calibration purposes up to seven metres, the coupling coil, as shown, being used as the means of coupling the oscillator and Lecher wire circuit inductively.

The fundamental principles, and the

application of the Lecher wire system having been fully dealt with in past issues, and various text books, I do not propose to deal with them in this article, in which we are concerned only with the setting up of suitable apparatus.

There remains one important point, and this concerns the support of the three-section base. This should be arranged so that there is absolutely no possibility of the base sagging, as if this should happen the tension of the wires will be reduced, and calibration with any degree of accuracy will be impossible, therefore a centre as well as end supports should be provided.

In use, the apparatus should be set up clear of surrounding objects.

The method of construction outlined is less complicated than others in which hinged sections are used, and where club room facilities allow may be assembled and supported on trestles as semi-permanent apparatus.

## Leaves from a Short-wave Log

## Good Signals from Burma

**R**ADIO-BURMA is the call of the XYO transmitter at Mingalodon working on 49.94 m. (6.0072 mc/s) with a power of 1.2 kW. It is on the air daily from B.S.T. 14.00-17.40 with a news bulletin in the English language at B.S.T. 16.15. The distance from Rangoon to London is roughly 5,400 miles. All reports of reception should be addressed to Station XYO, Burma P.T.T. Department, Central Telegraph Office, Rangoon, Burma.

## Radio Saigon

**T**HE new 10-kilowatt short-wave station is now broadcasting daily on 25.02 m. (11.991 mc/s), and 49 m. (6.122 mc/s) simultaneously. The programme schedule is as under: G.M.T. 23.45-00.15, news in Annamite and French; 04.45, Annamite entertainment; 05.00-05.45, music and news; 12.00, native songs, etc.; 12.15, music and drama (French); 12.30, news bulletin in French only; 12.45, Variety (French); 13.30, Concert (European music); 14.00, Broadcast in English; 14.15, Chinese transmission. All reception reports should be addressed to the Société Indo-Chinoise de Radiodiffusion, at Saigon (French Indo-China).

## New Short-wavers for Morocco

**I**T is stated that on behalf of the Office Chérifien a 12-kilowatt transmitter is in course of construction near Rabat (Morocco); it may start testing towards the middle of August on 36.64 m. (8.188 mc/s) and 25.13 m. (11.94 mc/s). The call-sign allotted is CNR2.

## Morse Tuition

**I**T may interest readers to know that I F Y D, Paris, on 74.35 m. (4.035 mc/s), broadcasts almost daily at B.S.T. 20.30 a series of slow morse transmissions for the purpose of providing tuition to French amateurs.

## New Hungarian Transmitter

**O**NE of the Szekeshvar (Budapest) stations would appear to be testing on 25.32 m. (11.85 mc/s) almost every evening at B.S.T. 22.15. The call is given out in Magyar, German, French and

English. So far, the details of the station have not been published in the Berne list.

## A New Call from Hayti

**C**ALLING Broadcasting Nacional a transmitter in the Dominican Republic has been logged on 47.06 m. (6.375 mc/s). The call-sign allotted to the station is HIIB, and the studio is located at Santiago de los Caballeros. The broadcasts may be heard nightly from B.S.T. 23.30-04.00.

## Good Signals from Georgetown

**S**INCE the closing down of VP3MR, British Guiana now only owns one short-wave station, namely, VP3BG, and although only of a power of 200 watts, its signals are well heard in the British Isles, from midnight B.S.T. onwards. The transmissions are made on 48.94 m. (6.13 mc/s), daily between B.S.T. 16.15-17.15, and from 21.45-01.45. Man and woman announcers. The studio usually closes down with the melody: *Good Night, Pretty Maiden, Good Night*, followed by *God Save the King*. All reception reports should be addressed to the British Guiana United Broadcasting Co., Ltd., 16, Robb and Hincks Street, Georgetown (British Guiana).

## Another Powerful U.S.A. Short-waver

**T**HE World Wide Broadcasting Corporation of Boston (Mass.) has under construction a new 20-kilowatt transmitter, WIXAR, which will operate on 25.58 m. (11.73 mc/s).

## The Short-wavers of Chile

**A**CCORDING to the latest lists, here are the details of the principal S.-W. stations in the Republic of Chile.

Santiago: CB1185, 25.32 m. (11.85 mc/s), 5 kW; CB1180, 25.42 m. (11.8mc/s), 1 kW; CB1174, 25.55 m. (11.74 mc/s), 4 kW; CB1170, 25.64 m. (11.7 mc/s), 150 watts; and CB960, 31.25 m. (9.6 mc/s), 100 watts.



Mr. G. Stephenson, who recently flew across the Channel in a glider, is also a radio expert. He is a designs engineer in the research laboratory at the H.M.V. factory at Hayes. In our illustration Mr. Stephenson is seen at the testing bench.

# ON YOUR WAVELENGTH



By *Thermion*

## Television in the Provinces

THE R.M.A. move to press the Government for the establishment of television transmitters throughout the country, starting at Birmingham, is gathering momentum. It recently formed the subject of a question in the House of Commons, when Major Proctor referred to the fact that only £21,000,000 out of a total of £36,000,000 raised by wireless licences had been passed over to the B.B.C. since broadcasting was inaugurated in this country. He suggested that the need for a television service throughout the country warranted arrangements for the B.B.C. to receive the whole of the revenue from wireless licences. Mr. R. Morgan also directed the attention of the P.M.G. to the R.M.A.'s scheme for the immediate establishment of a television station in the Birmingham area, under which scheme the R.M.A. would be prepared to meet part of any loss.

The official reply came from Sir Walter Womersley (Assistant Postmaster-General), who said that the total receipts from wireless receiving licences up to the end of 1938 was about £36,000,000. The Post Office has received about £4,000,000 of this to cover its expenses, and the B.B.C. has been paid about £22,300,000. The Exchequer has kept about £9,700,000. He points out that the percentage of the licence revenue paid to the B.B.C. has been progressively increased, and under present arrangements the amount accruing to them to cover the costs of their services represents about 81 per cent. of the total licence receipts, while the Post Office keeps 9 per cent. and the Exchequer 10 per cent. He went on to say that the question of extending the television service to cover the whole of the country raised many problems, both financial and technical. All aspects of the question, including the tentative proposals of the R.M.A., are being investigated, but a decision has not yet been reached.

## Radiolympia

NOW let me turn to the plans which are in hand for the Radio Show which this year will take place from August 23rd to September 2nd. Its

layout will include an architect-designed exhibition with standardised lines of form both for the hall and for the individual stands; the largest theatre show ever staged at Olympia, which will include radio and television stars; television operating on all stands occupied by television manufacturers, a television section in which the public may view in comfort a model factory, including working exhibits; a technical section, a special export section, tea gardens and restaurant, and a cinema are other features which will ensure that this is the best radio exhibition ever. At one end of the exhibition will appear a replica of Broadcasting House, and at the other a version of the Alexandra Palace television area.

The cabaret show which makes its reappearance will run four or five shows daily, whilst the model factory will exhibit examples of bakelite moulding, condenser manufacture, loudspeaker testing, repetition work, valve making, coil winding, etc.

There will be a special section for home constructors, and this will also include exhibits of interest to the service engineer. The cinema will show films indicating various facets of radio manufacture.

The "Services" exhibit will indicate the use which the Army makes of radio, and this will include the latest predictor devices for plotting the course and speed of aircraft. The Navy will exhibit a radio cabin as fitted to a modern battleship. A flying squad car, radio-equipped, and a reconstruction of Scotland Yard's famous radio room will constitute the police display. The G.P.O. also have an interesting exhibit. A special theme song is entitled "Let's All Go to the Radio Show." It is to be broadcast some weeks before the opening of the show.

## Interference

THE Anti-Interference Bill was mentioned in the House of Commons recently. It is the fervent hope of every television manufacturer that legislation will be introduced making it an offence to operate any electrical gear which interferes with television programmes. I have expressed the point of view on a number of occasions that such legislation will never reach the Statute Book because it cuts across Common Law. I have stated also that, however much we desire users of apparatus to suppress it, it is a problem which will be finally solved at the receiving end. In the House of Commons, Mr. Day asked the question as to when such legislation would be introduced, such legislation to give to the Post Office additional powers in connection with electrical interference with wireless and television. In reply, Major Tryon said that he had nothing to add to his previous answer of March 13th, in which he said that the annual cost to the Post Office of helping owners of wireless sets to obtain broadcast reception free from interference was £95,000. He had also stated that work on a new Wireless Telegraphy Bill, which would deal, among other things, with interference, was continuing, but it was indicated that the problem is one of great complexity, involving consultation with many commercial and other interests which would be affected. Major Tryon, therefore, could not give any assurance that the Bill would be introduced during the current session.

## Relays by 'Phone

IN spite of international crises home affairs do continue to occupy a little of the Government's time. The question of the Post Office relays by 'phone was raised by Mr. R. Morgan, and in reply Sir Walter Womersley said: "Generally a subscriber to the service will be able to use his existing wireless set, but a small amount of additional apparatus will be necessary to connect between the telephone circuit and the wireless set. This will be provided by the Post Office, but there will be an additional charge for it, which will include also its maintenance. I hope to be able to announce the details of the new

service shortly." It is stated that existing relay systems will be used for the radiating of emergency messages either local or national. The Postmaster-General hinted at that in a further reply.

### Crooners, Take Warning!

TAKE warning, all crooners, with ears to the ground; Thermion rightly declares that you're not worth five pound, "At the end of the week," when you've finished your "croon," Which is all "nasty noise" and very small "tune." 'Tis like bellow of bull and like bleating of sheep, And groans of the dying which make our nerves creep. Jungle-folk gibberings, whining and howls, Grunting of porkers and cluckings of fowls! Would be no more annoying to hear in our rooms, Than the horrible noises you make in your "croons."

You always drag in the word "memoree," To rhyme with a line that concludes "melodee"; And though oft born in Britain, you sing down your nose, With "Ammurrican accent" you vainly suppose. Sometimes human language you firmly discard, And drift into monkey talk, noisome and hard. Such as "Rodeodo" or "Hide-do-dee." Oh! would from such drivel we soon may be free. And we cannot deny that it's rightly been found, That a week of such rubbish is not worth five pound!

"TORCH."

### Empire Day Programme from Canada

IT is interesting to note the details of the programme preceding the broadcast to the Empire by the King on Empire Day, May 24th, in the course of the Royal visit to Canada. The programme, which has been prepared by the Canadian Broadcasting Corporation, will begin at 7.15 p.m., B.S.T., and will conclude with the speech of His Majesty at 8.0 p.m.

The broadcast opens with a greeting to the King from the peoples of all the nations of the British Commonwealth. Then will follow individual greetings from each province in the Dominion of Canada, spoken by typical citizens of the Dominion—a fisherman in Nova Scotia speaking

## Notes from the Test Bench

### Anchoring Leads

THE increasing use of wire-end components has led in many cases to difficulty owing to the absence of terminals to which flexible leads (for mains or battery supplies, for instance) can be attached. It will have been noticed in recent designs published in these pages, that a simple way of overcoming this trouble is to attach small pieces of ebonite or paxolin to the bolts holding down the larger components, and to mount soldering tags on these insulated strips. In this way various components may be held rigid and flexible leads may be anchored. It should be remembered, of course, that many of the smaller components with wire ends may introduce difficulties if they are not held rigid by some such device as that mentioned.

### Symmetry in Layout

MANY constructors who try to design their own receivers fall into the trap of arranging all parts symmetrically, or at least in some kind of order. This can introduce difficulty, although wiring may be simplified. For instance, chokes and transformers when placed in line may cause the windings on the components to be inductively coupled. If a case of hum is found and smoothing does not produce any effect one of the transformers or chokes should be provided with fairly long flexible leads and the holding-down bolts removed from the component. It should then be turned at various angles and, if necessary, tilted up on one or other of its corners. It may be found that only when this latter procedure is adopted is induction removed, and with it, the introduction of hum.

### Test Bench Fitments

WHILST on the subject of hum it is important to remember that when building or fitting-out a test bench, wires carrying A.C. should be very carefully arranged and if possible screened by passing through standard earthed conduit. A case recently came to notice where a constructor had built such a bench and after it had been in use some time decided to fit a bench light. He accordingly carried a length of flex from the nearest lamp to the bench and mounted a pivoting light on the back. The result was that when he next tried to service a set he could not remove the hum which was introduced by reason of the close proximity of the mains lead to the aerial lead across the bench.

for the maritime provinces; a member of an ancient French-Canadian family from Quebec greeting His Majesty in the name of French Canada; from Ontario an elevator operator from the Bank of Commerce Building, Toronto, the highest building in the British Empire; a farmer's wife speaking for the prairie provinces from Saskatoon; a transport pilot talking from Edmonton, Alberta, in the name of the people of the Canadian North; and finally a dock worker in the Port of Vancouver sending greetings in the name of British Columbia.

From Canada the programme moves to South Africa, where greetings to the King come from an English-speaking engine driver and an Afrikaans-speaking worker. Then to Macheke, Southern Rhodesia, for greetings by a tobacco planter. Next in the roll-call, Australia, where a doctor of the Australian Medical Aviation Service speaks in the name of all Australians. Turning south to New Zealand, a Wellington school-girl and a Maori student salute the King. The greetings from India will take the form of a special poem written for the occasion by the famous Indian poet, Sir Rabindranath Tagore. The Governor of Jamaica will then be heard speaking from Kingston in the name of the peoples of the British Islands in the Caribbean Sea; to be followed by a greeting from St. Johns, the capital of Newfoundland.

Last in this Empire-wide chain, messages of loyalty and devotion in the names of the people of the United Kingdom—the motherland—a schoolmaster from Scotland, a linen worker from Northern Ireland, a Welsh miner, and, in the name of England, a boy from the training ship H.M.S. Conway, will be broadcast. But why not include England first?

The programme concludes with a final salute from Canada. The voice of the King will then be heard speaking from Winnipeg to his peoples in all parts of the world.

## PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM

400 pages, 6/- or 6/6 by post from

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

# RADIO IN AVIATION—3

THE range requirements for the aeronautical services vary considerably. They may extend the full length of the course flown or they may be limited to half the course or even to a small fraction. There are, for instance, the short-distance services which are met with on European lines, the long-distance flights of trans-oceanic services, and the short ranges of certain military and naval aircraft.

This variety of ranges has brought about the use of a gradually widening band of radio frequencies. In the early days all aircraft communications were made on long and medium-waves up to frequencies not exceeding 700 kc./sec.; the ranges required did not normally exceed 100 miles or so, and for these ranges medium waves and trailing aeriels were quite satisfactory. As aviation developed, these wavelengths failed to provide adequate signal strength, and attention was turned towards the use of short waves. It was already known, however, that short waves, which were fairly reliable for distances less than 70 miles or so and for distances in excess of 300 miles up to several thousand miles, were quite unreliable for use over the skip zone, which can be roughly estimated for the present purpose as ranging from 100 to 300 miles. Consequently it was found necessary to provide two wavebands; one, the medium waveband, for use on the first part of the journey, and the other for use from 200 miles onwards. This provision called for the use of two aeriels and means for changing over from one to the other. One particular type, utilised in the R.A.F. over a certain period but now abandoned, took the form of a compound trailing wire. This consisted of two trailing wires end to end with a length of insulating cord between them; one was of the full length of 200ft. for use on the medium waves, while the other, for the short waves, had a length of 30ft., and so was very much more efficient than the fixed type. It would have been best to make the short aerial the lower one, so that when the long one was wound in the remaining wire would be unaffected by possible resonances in the 200ft. length; this, however, entailed a considerable loss of time in winding in and out to change over from short to long waves, and the reverse arrangement was adopted. It has now been replaced by the provision of a fixed aerial and a trailing aerial to meet the need of rapid wave-change. In some cases it is necessary to utilise several short waves at various times of day and night and at varying distances.

In the case of military aircraft, and particularly of fighters and others intended at certain times to fly in formation, the question of range of communications is a rather peculiar one. The occupants of the several aircraft may be required to communicate with each other by means of radio-telephony when the formation is flying wing-tip to wing-tip, i.e., at a range of a few yards. At any instant the leader of the formation may be called from the ground station, situated perhaps 100 miles away. Alternatively, the aircraft may separate to distances of many miles. Under these conditions it will be appreciated that automatic volume control is an insufficient means of maintaining relatively constant output. For this reason hand control is usually found more satisfactory, although care is required to avoid leaving the receiver at low gain after a local communication to ensure against the loss of a distant call. This

## We Now Deal With the Question of Range of Communications, Microphones, and Other Important Factors

problem does not arise in the case of civil aircraft, which can, therefore, take advantage of the automatic form of control.

### Vibration

One of the most troublesome features of aircraft radio-communication is the insidious effects of vibration. Considering the power and speed of the engine, the aerodynamical reactions of the air-frame (which includes wings, fuselages, and tail), and the forces acting on the propeller, it is not surprising that vibration is at a rather high level.

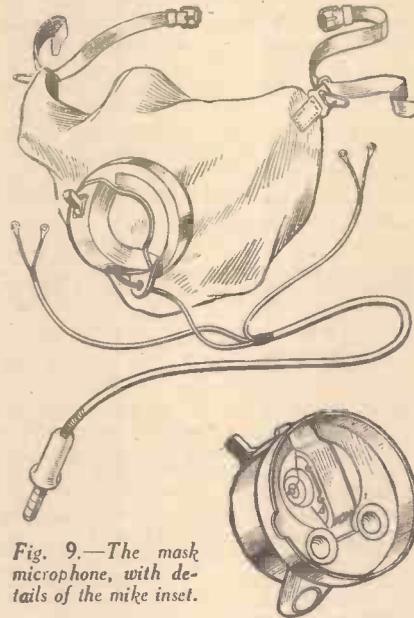


Fig. 9.—The mask microphone, with details of the mike inset.

Very careful attention must be given to the secure locking of all screws and bolts and the tying-down of all anchorages in the wiring. Methods of locking and securing which are normally found satisfactory for occasional mechanical shock and vibration are frequently unreliable when subjected to the continuous trepidations to which this class of apparatus is subjected in aircraft. It is generally found preferable, at some inconvenience, to secure internal screws and bolts by cementing them in place with a touch of varnish or like substance.

But the chief difficulties occasioned by vibration are in connection with the frequency stability of the radio-communication circuits and electrical stability of components. These vibration effects belong to two separate classes: (1) direct transmission, and (2) airborne vibrations. The former are fairly easily dealt with, but the latter have been more troublesome.

### Microphonic Valves

Microphonic trouble with valves can be said to be contemporary with the introduction of the dull-emitter filament. Early

valves of this class generated a continuous ringing sound in the telephones, which completely swamped weak and even medium signals. It was, therefore, usual to select valves having this characteristic present to a minimum extent, and these were reserved for use as detectors, where the trouble was most felt. Medium-quality valves were employed in the early stages of amplification, and bad ones in the output stage; valves of excessively bad quality were relegated for use in ground receivers. The subsequent development of the multiple suspension filament afforded a marked improvement and it can now be said that microphony is a thing of the past. The growth of broadcast reception played no mean part in the elimination of this extremely annoying defect.

### Microphonic Circuits and Components

But valve microphony is by no means the only cause of vibration-produced radio-frequency instability. The rather flimsy construction of the variable air-condensers originally available caused serious frequency-modulation effects which adversely affected superheterodyne reception. These effects naturally produced a chopping-up of the received signal, which was particularly distressing in the case of telephony. Condenser designs had to be overhauled to ensure substantial rigidity and stability of the rotor and stator.

Receiver inductances, being usually wound on solid formers, naturally gave no trouble, but rigidity of the general wiring has had to receive careful attention to obviate changes in circuit impedance.

### Noise

Owing to its close association with vibration, noise may conveniently be considered as the next cause of difficulties.

Noise affects radio-communication efficiency in three ways: first, in connection with its direct effect on the valves, as already considered; secondly, in relation to the speech efficiency of the microphone when telephony is employed; and thirdly, in respect of aural reception.

### Microphones

From the earliest days of radio-telephony the direct impact of extraneous sound waves on the microphone was a cause of considerable trouble. The subject was actively studied in many quarters, but perhaps nowhere with such insistence as in the R.A.F., where telephony occupied an important place. Starting from standard ground-type microphones held in the hand and completely unprotected from the effects of external noise and, incidentally, of wind and slip-stream, there were developed many types of protected hand-held microphones giving a gradually improving ratio of speech to noise. Many designs were evolved in England, and particularly in America, in which an attempt was made to balance out the unwanted noise while retaining a certain amount of sensitivity to the closely applied vocal sounds. But, on the whole, improvements were slight and not infrequently quite negligible.

Seeing that there was little hope of keeping noise out of the microphone, even when the latter was completely enclosed in a padded mask, which, incidentally, introduced serious acoustical difficulties, the problem was attacked from the point

## RADIO IN AVIATION

(Continued from previous page.)

of view of the sonic spectrum essential to intelligible speech. It was soon realised that it was desirable to eliminate response to frequencies below 700 cycles per sec. or thereabouts—this, more by good luck than good design, was already partially catered for in the characteristics of the microphone sound-box, of the speech transformers and of the earphones. It was also ascertained by trial and error that frequencies higher than about 2,500 cycles per sec. were unessential to the production of satisfactory speech in the presence of aircraft noise. Further progress was made on this basis, but such progress was always behind requirements, owing to the fact that aircraft engines constantly increased in power and air speeds rose.

The introduction of the combined oxygen and microphone mask was another serious setback, the requirements of the one clashing with the needs of the other. The necessity for ventilation reintroduced extraneous noise and wind effects. A further complication arose when it was required to use the microphone while lying prone on the floor. Nevertheless, there was produced a useful compromise in the form of a microphone fitted to a ventilated oxygen-fitted mask and capable of being used in all positions except with the operator lying on one side. This microphone is shown in Fig. 9. The chief point of interest is the fact that the capsule is held with its plane normal to the face of the user and is double-sided.

As the level of aircraft noise showed unmistakable signs of increasing still further, it became necessary to study the problem from a more scientific point of view. It was soon realised that no amount of filtering in the electrical circuits could produce any appreciable improvement, for the main trouble was caused by the non-linearity of the carbon microphones then in use. Acoustic filtering appeared to be out of the question, although of recent years much has been done in telephone laboratories to modify the characteristics of the diaphragm and impart to it a filter action cutting off the lower frequencies. It thus became apparent that the only hope of appreciable relief was to be found in the use of microphones possessing substantially linear characteristics. It is too early to state with certainty that by this means adequate quality may be hoped for, but results of tests on linear microphones are promising. Various types have been produced, such as the crystal class and the electromagnetic type. Unfortunately, all these types are considerably less sensitive than the carbon type, even when the latter is relatively insensitive for use in noisy surroundings. The loss of sensitivity can be roughly expressed as 20 db. and can only be compensated by the provision of a pre-amplifier. This, unpleasant as it may appear at present, will probably have to be accepted if telephony is to survive. With linear microphones the noise of that part of the spectrum which for obvious reasons cannot be eliminated, is heard as an independent background but does not cause the dis-

trressing "chopping up" which is the consequence of inter-modulation.

It is desirable to refer here to a class of microphones which is frequently brought forward as the obvious cure for noise background; it is the type in which the microphone capsule is applied externally to the larynx, and sometimes to the face at the corner of the mouth and other places, with the object of leaving the mouth free while sealing off the capsule and the diaphragm from the extraneous noise. Over a period of 20 years, ever since the War in fact, this class of instrument has been repeatedly tried and experimented with under all possible conditions, but with complete failure. It is not meant to imply that this class of microphone is incapable of providing satisfactory service; in fact, it is known to be sufficiently satisfactory for use with good results in noisy surroundings such as power stations and industrial shops. But aircraft conditions are too severe for it, and if it is designed to eliminate noise its acoustic characteristics are such as to produce speech of low intelligibility. Its application to aircraft for continuous use over a period of an hour or more is further debarred on account of objections of a medical nature. In military aircraft, where high altitudes and the use of oxygen is almost a normal state, the pressure on the jugular vein is a source of danger, and it is not easy to produce a design which shall be comfortable, safe, and efficient. Perhaps a more intensive study would overcome the above difficulties, but the outlook is far from promising.

If the carpenters who lay down ballroom floors could be persuaded to reveal the truth, it is quite possible they would be able to disclose that the magic words, VICTOR SILVESTER, were strewn among the foundations, for this well-built six-footer has undoubtedly done more for modern ballroom dancing than anyone else.

Despite his astonishing success as a performer and teacher of ballroom dancing, the fact is, he was never really trained for it, and had no idea of this profession becoming his career.

Born at Wembley (Middlesex), this enterprising son of the Vicar of Wembley escaped from school to join the Army at the age of fourteen-and-a-half, and was almost at once precipitated into the thick of the battle. He fell a victim to wounds during a grand display of courage, which earned him the Italian Bronze Medal for Military Valour, and when he was demobilised in 1919, he found himself very much at a loose end.

Wandering around Harrods store one afternoon with a friend, he was introduced to Miss Belle Harding, dance hostess at Harrods' Restaurant and the Empress Rooms, and speaking of his inactivity, found her suggesting that he accepted a post as professional partner under her charge at the princely sum of £1 a week!

Naturally enough, he agreed gladly—he just about knew how to dance but had no idea what his duties would be until he started—this situation getting him interested in steps and tempo. He spent hours every day at home practising, and to this diligent application of his own accord, he is able to attribute his subsequent success and fame. It is not an expression of conceit on his part, but, on the contrary, an example of the value of patience and devotion to practice.

In three short years he won the World's Dancing Championship, and he was only twenty-two years of age at the time. He became one of the original committee of the Ballroom Branch of the Imperial Society—

## Radio Biography

VICTOR SILVESTER

largest dancing organisation in the world—which was formed in 1924. Thanks largely to Victor Silvester's aid and advice, this movement founded the basic technique of modern ballroom dancing. He is looked upon as the originator of the waltz as we know it to-day, and to him we have to bow for immeasurable improvements in the execution and tempo of dancing. With his wife—who like him was not a dancer at first, but a "beauty queen" in a national newspaper contest—he is perhaps the greatest demonstrator of ballroom



VICTOR SILVESTER

dancing in the British Isles. He knew that thousands of folk who wanted to learn the essentials of dancing could not afford continuous lessons, so he spent many months getting into book form most of his incomparable knowledge of the subject, so that you and I could purchase the key to success as a dancer for a moderate price, and teach ourselves from his personal tips in our own homes.

His editions include "Modern Ballroom Dancing," "Theory and Technique of Ballroom Dancing," and "The Art of the Ballroom," all brilliant volumes packed with facts, photos and diagrams, the first of which has been the best-seller of all dance books ever published. It has run to 20 editions and over 100,000 copies have been sold.

While the books were selling, it occurred to Victor that the man-in-the-street would find it a distinct disadvantage not having the right kind of music with which to practise to, as it was practically impossible to obtain gramophone records that were ideal for dancing.

Such a loop-hole had to be remedied, so he paid a visit to the Parlophone Company, explained the difficulty and the prospect attached to venturing to make some strict-tempo records with an orchestra specially chosen for the purpose, and they were enterprising enough to give him their immediate backing.

Having learnt the piano—he was taught music and pianoforte in his childhood—he was able to take the matter completely in hand, and Parlophone allowed him to make the first recordings of what has since become known as non-vocal music in perfect dance-tempo.

In Australia, his records are—statistics show—played on the air more often than those of any other band or artist. Even in America—spiritual home of jazz—he is a best-seller, and his ideas have been widely adopted throughout the continent, copied straight off his records.

A PAGE OF PRACTICAL HINTS

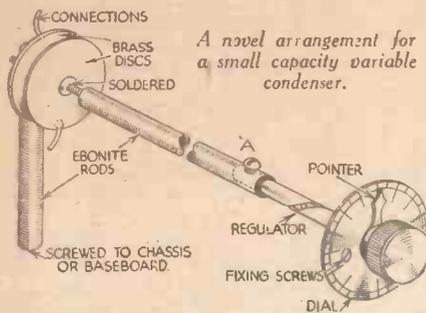
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Small Capacity Variable Condenser

THE accompanying sketch shows a small capacity adjustable condenser I am using in the aerial circuit of my S.W. receiver.



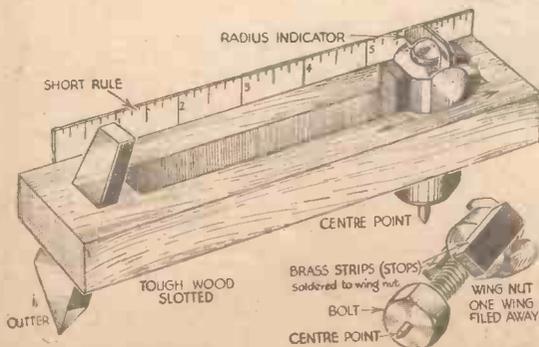
A novel arrangement for a small capacity variable condenser.

The main part is a speed regulator taken from an old gramophone. The ebonite rod is drilled to take the lower end of the regulator (as shown by dotted lines), which is then held in position by screw "A," the other end of the rod being tapped to take a flat-headed screw to which a brass disc is soldered. The length of travel of the regulator is about 1in., and being complete with dial and pointer makes a neat panel control.—R. PHILPOTTS (Cramlington).

A Cutting Tool for Large Circular Holes

A PIECE of wood, a short rule, a large bolt with a wing nut, and a short blade shaped, as shown, from an old file were used for this tool. A slot was cut in the wood wide enough to allow the bolt with the strips of brass to slide up and down its length.

The blade was inserted in a tapered hole, thus fixing screws are not necessary. Screwed to the back of the wood is the short rule, and a tin pointer is fixed into a slot cut in the top of the wing nut. The tool is easily tightened from underneath and a centre point is soldered into a hole in the centre of the bolt head.



An adjustable cutting tool for large circular holes.

THAT DODGE OF YOURS!

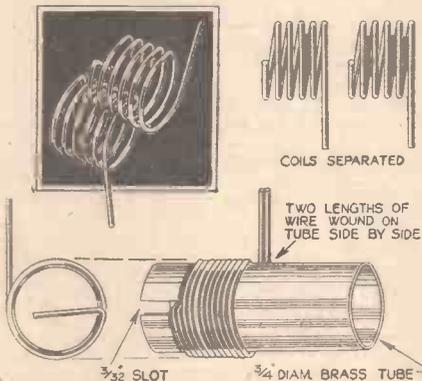
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1.10.0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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.

Winding Ultra-short-wave Coils

WITH ultra-short-wave coils, it is usual to arrange for the turns to be spaced about one diameter of the wire apart. This spacing can easily be obtained by winding two coils together, and after-



A method of winding ultra-short-wave coils.

wards separating them. For winding purposes, all that is required is a metal tube about 3in. long, and of a diameter equal to the required inside diameter of the coils (usually 1/4in. for the ultra-short waves), and having a slot cut at one end as shown in the sketch. This can be about 3/32in. wide by 1/4in. long. In winding the coils, it will be found best to cut off two equal lengths of wire, say, 24in. long (the wire being, of course, 16 or 18 gauge), and fixing two of the ends together in a vice. The two free ends should then be bent at right-angles and slipped into the slot in the tube. Pulling the pair of wires taut, the required number of turns can then be wound on by rotating the tube. Next cut off (allowing a short length of wire for

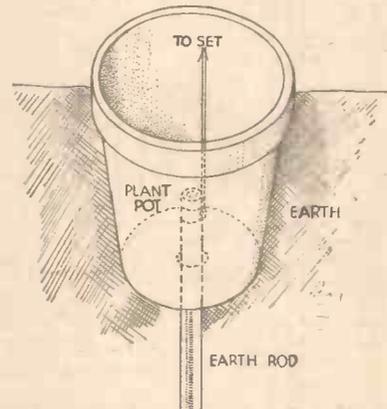
direct connection), and slide off the inter-meshed coils from the tube.

It is then only necessary to rotate one of the coils until both become separated.

In the inset of the sketch, two such coils are shown partly separated, and for clearness, these are shown rather more out of mesh than is actually necessary when separating.—R. L. GRAPER (Chelmsford).

An Effective Earth Device

THE accompanying sketch shows an earth device which I have found very effective. A small plant pot is sunk to the



A flower pot and a copper stake form this effective earth.

level of the ground, and through the centre a long copper stake is inserted from which a wire is attached to the set. If the plant pot is periodically filled with water, thereby keeping the surrounding earth moist, results will be improved.—J. WALKER (Ipswich).

A VALUABLE TECHNICAL LIBRARY!

- WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA 5/-, or 5/6 by post.
- EVERYMAN'S WIRELESS BOOK 3/6, or 4/- by post.
- TELEVISION AND SHORT-WAVE HANDBOOK 5/-, or 5/6 by post.
- THE HOME MECHANIC ENCYCLOPEDIA 3/6, or 4/- by post.
- SIXTY TESTED WIRELESS CIRCUITS 2/6, or 2/10 by post.
- COILS, CHOKES AND TRANSFORMERS 2/6, or 2/10 by post.
- PRACTICAL WIRELESS SERVICE MANUAL 5/-, or 5/6 by post.
- PRACTICAL MECHANICS HANDBOOK 6/-, or 6/6 by post.
- WORKSHOP CALCULATIONS, TABLES AND FORMULÆ 3/6, or 3/10 by post.

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

# ADDING AN EXTRA

**D**ESPITE the increased popularity of all-wave receivers during the past few years there is still a predominance of sets designed only for the reception of medium- and long-wave broadcasts. And the increased use of shorter waves, as well as wavelengths between the normal S.W. bands from about 10 to 80 metres, makes it worth while to modify the receiver to tune to one or more of these lower ranges. Additionally, of course, there are certain ship-to-shore transmissions on wavelengths which are just above those normally reached on the medium-wave broadcast receiver.

It is not always desirable or even possible to modify an existing set to make it a first-class all-wave model, but there is seldom much difficulty in making simple alterations to permit of the inclusion of one or more of the alternative bands. Provided that a high degree of efficiency is not considered essential—and it is not important in many instances—the alteration need not be difficult or expensive. Nor is it necessary to impair the efficiency of the set as it stands, nor even to make operation more difficult.

The actual procedure to be adopted quite naturally depends upon the circuit of the receiver and upon the form of construction employed. Thus the method must be different for a superhet than for a Det.-L.F. outfit. A commercial receiver cannot easily be altered since the chassis is generally so arranged that extra components cannot well be accommodated. In that case the most satisfactory method is, in the majority of instances, to make use of an adaptor or converter.

But here we are not concerned with that side of the question, which has been adequately dealt with in many previous issues. Our concern is more with simple additions that can be made within the present receiver; the changes need scarcely change its appearance, and will not involve the addition of external units and will not make it necessary to modify the outside appearance to any marked extent.

## In O-V-1 Circuit

Thus, when using a Det.-L.F. circuit, the input circuit of which is shown in Fig. 1, it is seldom difficult to add an extra coil unit which can be used in place of the broadcast tuner by the turn of a switch. The simplest arrangement is that shown by heavy lines in Fig. 1. It will be seen that it is here assumed that the broadcast tuner has an aperiodic aerial winding, a grid winding and a reaction winding, and that the reaction condenser is connected between the end of the reaction winding and the anode terminal of the detector valve.

What we require is a three-pole change-

over switch, or three separate single-pole change-over switches ganged together. It will be seen that the earth ends of the three windings on each tuner are connected to the earth line, and that the switch makes possible the immediate transference of the aerial lead-in, grid and tuning condenser, and the reaction condenser from one tuner to the other. It does not matter whether the additional tuner is made to cover a single waveband (as a plug-in six-pin coil would do) or two bands controlled by means of a built-in two-way switch. In

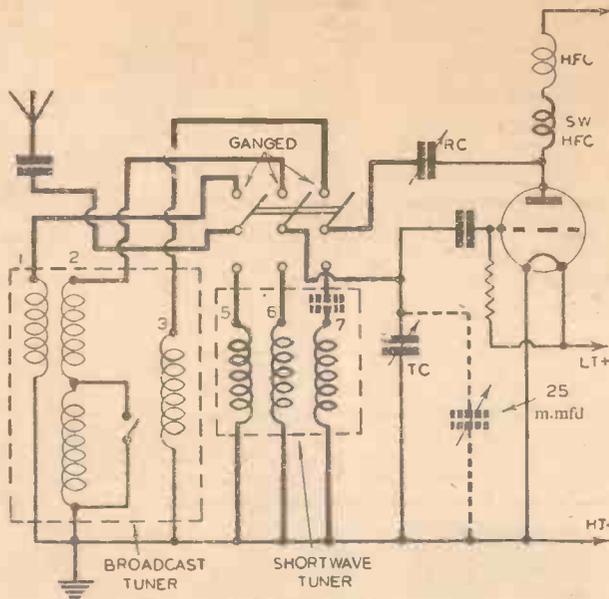


Fig. 1.—Method of connecting the switch, or switches, and additional tuner when using a Det.-L.F. type of receiver. It will be noted that new connections are shown in heavy lines.

the latter case there would be an extra pair of switch knobs on the panel, and one of these would give the change from broadcast to S.W. bands, while the other would permit of the use of either of two S.W. bands when the main three-pole switch was set to the short-wave position.

## Suitable Switches

It will be understood that the three-pole switch, or the three single-pole switches, must be of the anti-capacity type, whilst

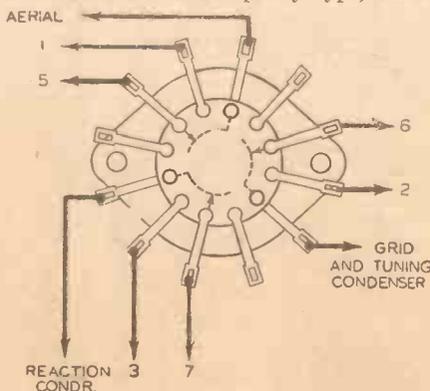


Fig. 3.—A less expensive and sometimes more convenient method of ganged switching is by means of a rotary switch, of the type shown above. Connections correspond with those given in Fig. 2.

## Some Notes on the Modification to Permit of Tuning Over Wave Between Approximately 200

it will be appreciated that maximum efficiency will be obtained when the switches are placed as near as possible to the terminals to which they are connected. One very convenient method is to use three baseboard mounting toggle switches of the two-way type, ganging these by means of a common spindle, as shown in Fig. 2. A less expensive method is to use a so-called rotary selector switch of the three-pole three-way type as illustrated in Fig. 3; in this case the three poles are employed, but only two of the available three "ways." This type of switch, like the baseboard-mounting pattern previously referred to, can be mounted close to the coils and operated by means of a long spindle. There are, of course, many other types of

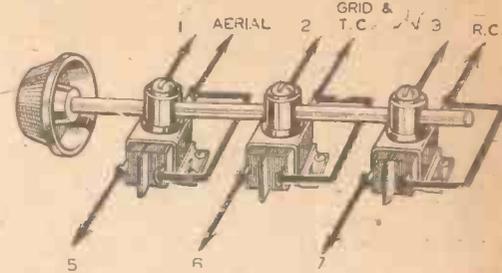


Fig. 2.—One convenient method of switching is by means of a number of Q.M.B. toggle switches of the chassis- or baseboard-mounting type, operated by means of a single spindle, which provides ganging.

switch available for the purpose, and it is not necessary to enumerate them.

Unless the tuning condenser—probably of .0005-mfd. capacity—is provided with a very good slow-motion drive, it is generally worth while to connect a low-loss variable condenser of about 25 mmfd. in parallel with the existing tuning condenser, as indicated by broken lines in Fig. 1. Even this should be provided with a good drive. In the majority of instances, however, it is preferable to replace the existing condenser drive by a first-class one giving a smooth, slow-motion control. By that means the symmetry of the panel need not be spoiled, and the advantage of the better drive is obtained on all wavebands.

## H.F. Chokes

Another desirable modification is the inclusion of a short-wave choke between the anode of the detector valve and the "reaction" choke already included in the circuit. The combination acts in a similar manner to an all-wave choke. In many instances it might be found that the capacity of the reaction condenser is too high to give smooth control on the lower wavebands, but this difficulty can easily be overcome by inserting a fixed or pre-set condenser between the end of the reaction winding on the short-wave coil and the change-over switch. This is also shown by broken lines in Fig. 1.

When the aerial tuner in the broadcast

# WAVELENGTH RANGE

## Extension of a Broadcast Receiver Bands Additional to Those 550 and 900-2,000 Metres

set is not provided with an aperiodic aerial winding, it is necessary to make only slight alterations to the connections already described. In Fig. 4 the connections are shown where the aerial lead-in is taken to a tapping on the grid winding. In this diagram a .0001-mfd. fixed condenser is

circuit on the S.W. band, a good-quality all-wave choke (or a 100,000-ohm fixed resistor) being brought into circuit to replace the tuner. Both switches could be ganged for single-knob operation, and each should be as close as possible to the components to which it is connected. Of course, a S.W. coil could be switched into circuit in place of the previous aerial coil, but that would introduce fairly difficult trimming problems, when using a gang condenser for tuning. Besides the alterations described it is generally necessary to fit a good S.W. choke between each existing choke and the corresponding anode, or to replace existing chokes by others of the

arrange to switch an S.W. oscillator coil in place of the oscillator coil already in the set (see Fig. 6), and to make the aerial circuit aperiodic, using either a S.W. choke or a fixed resistor as shown in Fig. 5. In most cases this arrangement works very well with a simple superhet, especially since the oscillator section of the gang condenser used for 465 kc/s has a capacity of under .0002-mfd. And, in spite of the aperiodic aerial coupling, the degree of selectivity provided is ample for nearly all requirements. It is not necessary to alter the I.F. transformers, nor any H.F. chokes, because the intermediate frequency and second-detector circuits continue to operate at 465, 110 or 150 kc/s, as before.

Although screened S.W. coils might be desirable in the case of H.F. and superhet receivers they are not likely to be necessary

*by The Experimenters*

also inserted between the change-over switch and the aerial winding on the short-wave coil to reduce the effective capacity of the normal aerial series condenser.

### Reaction Circuit

When the reaction condenser in the existing receiver is connected between the "earthy" end of the reaction winding and earth it is best to alter its position, making it as shown in Fig. 1. If that introduces hand-capacity effects it will probably be worth while to move the condenser farther away from the panel and to operate it through an extension spindle, or otherwise to fit a screened drive, earthing the frame of the drive.

### For H.F. Receivers

The general arrangement described is directly applicable to an H.F.-Det. type of receiver, where the additional coil is connected to be inter-changed with the inter-valve tuner. Thus, if tuned transformer coupling were used the connections would become as shown in Fig. 5. This time the tuned-grid coupling is retained for medium- and long-wave working, a tuned transformer being used on the lower wave-band.

It will be seen in Fig. 5 that aperiodic aerial coupling is shown for the aerial

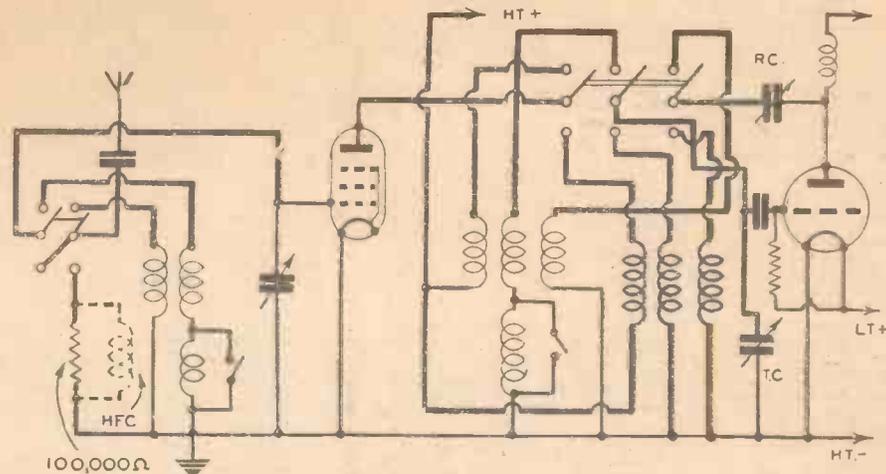


Fig. 5.—When using an H.F.-Det. circuit with ganged tuning, it is generally better to provide aperiodic (untuned) aerial coupling on short waves. This may be done by using an H.F. choke or a non-inductive resistor to replace the aerial coil. It is often desirable to connect the variable condenser directly to the coil, so that it is not in parallel with the aerial-earth component on short waves.

all-wave type; the second method is preferable although rather more expensive.

### Superhets

With most types of home-constructor superhet circuits it will be found best to

if the rest of the receiver is well screened. In consequence, either plug-in coils of the four- or six-pin type, or home-made coils can be used satisfactorily. The main requirement is that the switches should be of good quality and leads short and direct.

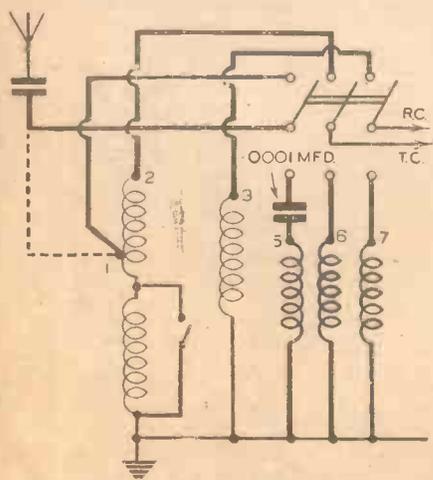


Fig. 4.—These connections correspond in principle to those shown in Fig. 1, but apply when a tapped grid winding is used. The method of adding the extra tuner is perfectly simple.

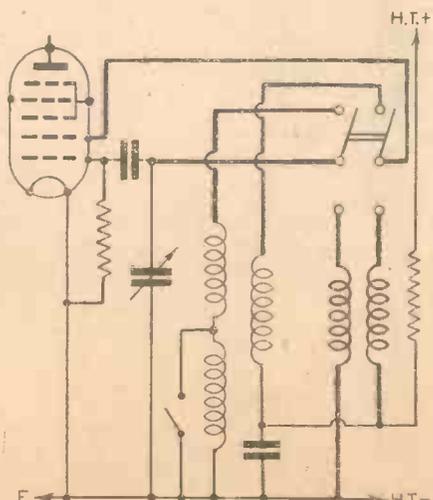


Fig. 6.—Method of switching for the oscillator coil in a superhet. In this case the aerial-circuit arrangement can be the same as that shown for an H.F. circuit in Fig. 5.

### Vision and Sound Combined

An interesting suggestion has been made by Zvorykin in America whereby he claims that it is possible to combine the vision and sound signals so that they can be radiated on one carrier wave. Only very brief details of the scheme are at present available, but the idea is put forward in the hope of simplifying and cheapening the service.

According to the invention it is proposed to insert the sound signals in compressed form at the end of each line during the usual black pulse period employed for synchronising purposes. At the receiving end by means of a storage device the sound signals are "elongated" so that they are reproduced in their natural time periods. There is thus a form of concertina action which compresses the sound signals at the transmitter, records and radiates them during line scan intervals, and then decompresses them at the receiver. Whether this added complication will compensate for the release of a separate carrier-wave remains to be seen, while the important question of possible distortion has not been dealt with so far.

# A "STAND-BY" CRYSTAL RECEIVER

An Efficient Crystal Receiver is Always Useful, and No Constructor Should Be Without One, as it Forms an Ideal Stand-by Arrangement for Emergencies

By THE TECHNICAL STAFF

JUDGING by the number of inquiries received about crystal receivers, it would appear that they are again on the upward swing of the cycle of popularity. Whether this is due to the appreciation of the splendid quality of their reproduction, when used in conjunction with a good pair of headphones or a high-fidelity amplifier, the fact that they are not dependent on batteries or mains supplies for their operation, or the less pleasant realisation that they are ideal for emergency use in A.R.P. shelters, cannot be determined from available records. The fact remains, however, that a compact, sturdy, fool-proof receiver is required by many of our readers, therefore the model described below has been produced to meet those demands.

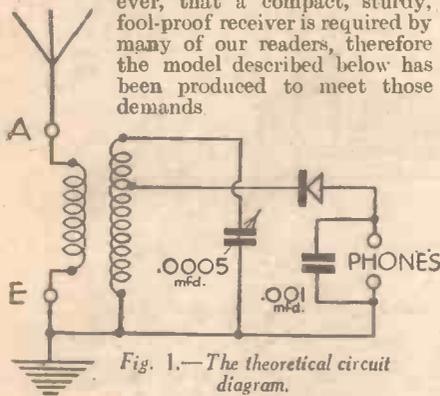


Fig. 1.—The theoretical circuit diagram.

For the benefit of those who have not yet used a crystal receiver and, incidentally, for those who have not used one since the day when they switched over to a more ambitious valve set, a few words of warning concerning what some might call the defects of this type of receiver would not be amiss.

It must be appreciated that during these days of high-powered transmitters the selectivity of a circuit plays a very important part in satisfactory interference-free reception. The required degree of selectivity is invariably obtained by the use of several tuned circuits employing coils designed to give the utmost selectivity; the fact that a certain loss in efficiency is often produced is not so serious in the case of a receiver using modern valves, as the overall arrangements can be so designed to provide an adequate surplus of power under normal, or average, conditions.

With the more simple crystal circuit, however, it is not possible, owing to its sensitivity and effective range of reception being within fairly definable limits, to obtain a degree of selectivity comparable with, even, a one-valve set using reaction. With a set of the experimental type, along the line of the one described on other pages of this issue, quite sharp tuning can be secured but, generally speaking, the characteristics of the crystal, the fact that loosely-coupled circuits cannot be used *ad lib* by reason of signal strength, and the

remaining consideration of simplicity, makes the selectivity of a crystal set a factor which tends to limit its application nowadays.

This does not mean that it is a one-station arrangement, except, of course, for those who are living within the swamp area of a transmitter, but it does mean that razor-edge tuning must not be expected by all users, and that local conditions can play a very important part in the performance of the set. At Tower House, both the London stations can be received without noticeable interference, though it is possible to hear, faintly, the other station when the one to which the set is tuned has a break in the programme. In S.E. London, a higher degree of selectivity is obtained and, as a point of interest, Radio Normandie can be heard when the locals are off the air.

With the majority of crystal receivers,

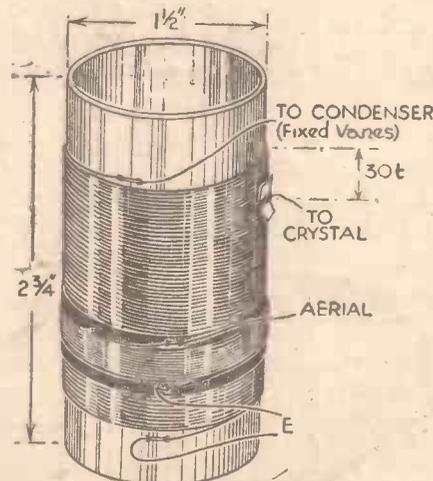


Fig. 2.—Details of the coil.

trouble is often experienced on the long waves by the "break-through" of the nearest medium-wave station. Admitted that this can be overcome by inserting in series with the aerial lead-in a suitable inductance and tapping the aerial well down

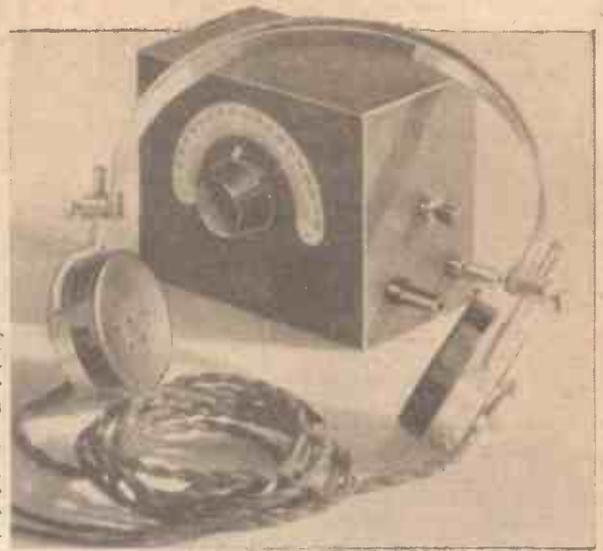


Fig. 4.—This view of the finished receiver gives a good idea of its size in comparison with a pair of headphones.

the tuning coil, but as this only complicates matters and as the same programme as that of the long-wave National can be heard on the medium-wave National, it was decided not to include a long-wave section on the coil specified for the "Stand-by" receiver.

### Design

To obtain the maximum amount of selectivity consistent with signal strength, the aerial is coupled to the crystal circuit by means of a small coil wound over the tuned section while the crystal is tapped down its associated coil to reduce damping effect. The tuning is carried out by means of a .0005 mfd. solid-dielectric variable condenser connected across the whole of the secondary winding.

For simplicity and reliability a detector of the semi-permanent type is used as it is far less susceptible to vibrations, and it allows a sensitive point to be obtained without the fiddling adjustments associated with the old cat's-whisker type of detector.

The theoretical circuit is shown in Fig. 1, and owing to its simplicity it does not call for any detailed explanation.

### Construction

To make the receiver as compact and robust as possible, all the components are mounted in a small wooden box measuring 4 1/2 in. x 3 1/2 in. x 2 11/16 in. The one used was fitted with a sliding lid and supplied in plain whitewood finish. The latter item is

(Continued on facing page)

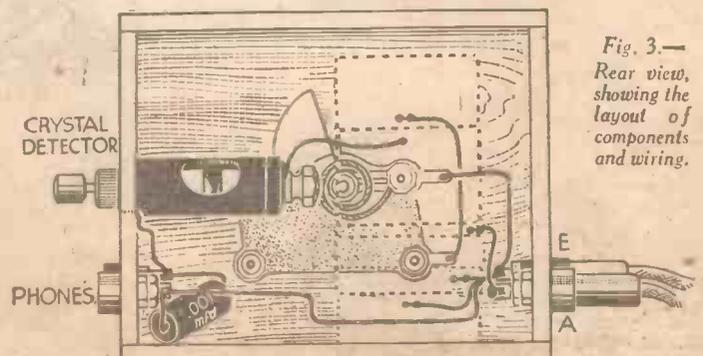


Fig. 3.—Rear view, showing the layout of components and wiring.

**A STAND-BY CRYSTAL RECEIVER**

(Continued from previous page)

a consideration, as it allows the case to be painted or finished off according to individual taste.

Assuming that the sliding lid forms the back of the receiver, the tuning condenser is mounted in the centre of the front panel. Along the bottom edge of the left-hand side are fitted two small Clix sockets for the aerial and earth connections, while in a similar position on the right-hand side are fitted two more for the headphones. Terminals could, of course, be used for these connections, but they would not give such a neat finish, and would be likely to work loose in the wood fixing.

Just above the headphone socket a hole can be drilled to accommodate the crystal detector, but before fixing this component in position connections can be made between the earth socket, the moving vanes of the variable condenser, one telephone socket, and the .001 mfd. tubular condenser can be joined across both headphone sockets.

After this, mark off the fixing holes for the coil on the outside of the bottom section of the box, taking care to see that it is located clear of the variable condenser and the lid. At the point thus marked a hole can be made to take a 1/4 in. countersunk screw to hold the coil in a vertical position inside the case.

Once the coil has been fixed the remaining connections, namely, the aerial, the crystal detector, one side of the 'phones, the fixed vanes of the tuning condenser and, finally, the earth connections can be completed. The receiver is now ready for testing.

**A French Television Inauguration**

THE formal entry of French television into the commercial field has just taken place when the Minister of P.T.T., introduced the first public showing of a 6ft. by 4ft. television picture at the Marigny Theatre, Paris, as announced in April 29th issue. The standard of definition employed was one of 455 lines with 50 frames per second interlaced to give 25 pictures per second. The vision programme was radiated from the Eiffel Tower aerial on a wavelength of 6.52 metres, the accompanying sound being on 7.14 metres. Apart from line definition the standards of modulation, synchronising, etc., followed quite closely those used by the B.B.C. The big screen receiver used a projection cathode-ray tube with a voltage of 40,000, the equipment being designed according to the Barthelémy system. Observers report that there was a lack of brilliance in the pictures, and in the medium and long shots from the studio the actors were not clearly recognisable. The quality was, therefore, below that which has already been demonstrated in this country, but no doubt improvements will be effected as experience is gained. The same difficulty with the cinema industry has arisen in France as was the case initially here. That is to say, the promised regular transmission of feature films has raised the fear that television will become a competitor instead of an ally to films. This matter will regularise itself once the full purport and scope of television has been thoroughly understood by the executives involved. It is learned that the P.T.T. are proceeding with their plans for provincial centres, and in this category they are certain to steal a march on the British Post Office.

**LIST OF COMPONENTS FOR "STAND-BY" CRYSTAL SET.**

- 1 Coil (T.W. Thompson), 2/.
- 1 Perikon Crystal Detector (Electradix), 2/.
- 1 .0005 Tuning Condenser (Jackson Bros.), Type 2093, 2/6.
- 1 Plain Wooden Case (T.W. Thompson), 9d.
- 1 Scale (Electradix), 2d.
- 1 .001 Fixed Condenser, Dubilier Type 4601/S, 1/.
- 4 Clix Sockets, No. 8, with 4 extra nuts, 8d.
- 2 Clix Plugs, No. 35, 5d.
- 2 Clix Plugs, No. 1, 4d.

**Operation**

With a set of this type it is very desirable to use an aerial of at least average efficiency but, on the other hand, don't use one of excessive length with the idea of increased signal strength, unless you are well away from your local station, otherwise selectivity will be poor.

With the headphones in position, rotate the tuning condenser until a station is heard, and then adjust the crystal detector to obtain the most sensitive contact. When doing this be sure to *withdraw the plunger* before rotating or else the crystals will be damaged. If no station is heard, and you are satisfied that aerial and earth and all wiring are in order, it is possible that the crystal is not making satisfactory contact, so make the adjustment as mentioned above.

Don't overlook the fact that the strength of the rectified signal allows nothing for wastage, so it is very essential to use a good pair of headphones.

**WORKSHOP CALCULATIONS TABLES AND FORMULÆ**

By F. J. CAMM

3/6, by post 3/10 from

George Newnes, Ltd.,  
Tower House, Southampton St., Strand, W.C.2.

**THE DIRECTOR-GENERAL'S ASSURANCE**

THE present Director-General of the B.B.C., Mr. Ogilvie, is certainly keen on making television a national system at the earliest opportunity. In a speech he gave recently at Liverpool he stressed the fact that the development of the resources at Alexandra Palace was not being undertaken for the benefit of those situated in and around London, but was for the purpose of acting as a nucleus of a national system. The figures for the cost involved had already been supplied to the Treasury, and to assist matters it was hoped that a larger proportion of the four and a half million pounds paid annually for wireless licences would be allotted to the B.B.C. than had been the case in the past. If this was done then development would be rapid. Experiments on the coaxial cable and direct radio link were still being conducted by Post Office engineers both in the field and the laboratory, and the results of this work should be available before very long. It was certain, however, that the ultimate decision would depend on cost.

**METAL RECTIFIERS**

IN our issue dated April 22nd, we published an article on Metal Rectifiers and their various applications. Fig. 4 in that article showed an arrangement using H.17 units for the supply of D.C. receivers from A.C. mains. It should be noted in this connection that four of the H.T.17 units are called for in this circuit, each of the symbols in that diagram representing one H.T.17 unit. If only two units are employed and wired in the usual manner they will be damaged by the application of excessive voltage.

**Nothing on the Wireless? Now's the time to**

**RERADIO!**

Some programmes can be boring, we agree. Best to get a guaranteed TROPHY or a Peto-Scott Chassis and you will always have the WORLD at your finger tips.

**Get a 2-Purpose TROPHY**

A TROPHY gets you all the short-wave stations with medium-wave reception when required.



Models from £5/15/0 and as low as 7/- down

**TROPHY 3** A.C. and Battery 3-valvers for operation on 6 to 550 metres using self-locating inductors. Metre-calibrated scale. Built-in speaker. Phone jack. Supplied complete in cabinet with coils for 12-52 metres. BATTERY model, £5/15/0, or 7/- down and 18 monthly payments of 7/-. A.C. model 6 Gns., or 7/6 down and 18 payments of 7/9. Extra coils for complete coverage add 18/9 to cash prices or 1/- to deposit and payments.

**TROPHY 5** A firm favourite. 5 valves and continuous wave-range of 10-550 metres. All essential refinements for efficient DX operation. Bandsread tuning. Frequency or Metre calibrated scale. Built-in speaker. Phone jack. Unbeatable value. Cash price £9. Yours for 10/9 down and 18 monthly payments of 10/9.

**TROPHY 8** A super 8-valve A.C. communication model (illustrated) for serious short-wave work. Bandsreading and all essential refinements. Wave-range 7-550 metres. Complete in pleasing cabinet ready for use with separate P.M. speaker. Price 12 gns. This amazing set is yours for 15/6 down and 18 monthly payments of 15/6.

**NEW PRESELECTOR** for use with any TROPHY or superhet. receiver. Gives increased range, selectivity and signal strength. Wave-range 7-550 metres. Employs 2 low-noise RF pentodes. Self-powered for A.C. mains 200/250 volts. Price £8/15/0, or 11/9 down and 12 monthly payments of 11/7.

**£££'s SAVING CHASSIS**

These chassis are guaranteed for 12 months including valves, which, coupled with modern-to-the-minute features, ensure complete satisfaction. ALL-WAVES 8-Stage S/HET A.C. Model 909MT. This advanced 8-stage 6-valve chassis represents wonderful value for the connaisseur. Wave-range 10-2,000 metres. A.V.C. Station and metre calibrated scale. Pick-up sockets. 3 watts output. Complete with 6 valves. Normal list value £9/10/6. OUR PRICE, £8 19 6, or 8/6 down and 18 monthly payments of 8/7. We Save You £3/0/0. ALL-WAVE S.C.P. Battery Model 901. Proved sensitive 3-valve H.F. Pent., Det. and Harries distortionless output Pentode. Wave-range, 18-2,100 metres. Station and metre-calibrated scale. All-world reception. Low H.T. consumption. With all valves. Normal list value, 5 gns. OUR PRICE, £3 12/6, or 5/- down and 12 monthly payments of 6/9. We Save You £1/12/6. ALL-WAVE 7-Stage S/HET. Battery Model 902. Sensitive and selective 4-valve circuit. All-waves, 18-2,000 metres. Pentode output. Station-name and metre calibrated scale. Complete with 4 valves. Normal list value, £8/16/6. OUR PRICE, £4/17/6, or 5/- down and 18 monthly payments of 6/1. We Save You £1/19/0. Complete Chassis List FREE.

HOW, FOR 17 6 ONLY, you can cut out that interference. Invest now in a Peto-Scott Anti-Noise All-Wave Aerial outfit, complete with instructions, 17/6 or 8 monthly payments of 2/8.

**7 WATT AMPLIFIER**

A.C. You pay a third of the usual price for this powerful unit. Employs 4 valves, two in push-pull providing 7 watts undistorted output for Club or P.A. use. Wide sound range. Connections for Mike or Gramo. Our price £3/10/0, or 5/- down and 11 monthly payments of 6/9. GUARANTEED!



**PETO SCOTT CO., LTD.**

77, (P39) City Rd., London, E.C.1. Tel. GLIssold 9875  
41, (P39) High Holborn, W.C.1. Tel. HOLborn 3248

SEND FOR COMPLETE RADIO LISTS

# An Adjustable Slow-motion Drive

A Novel Device with Coarse Driving Spindle and Fine Driving Spindle for Receivers or Transmitters

**A**DJUSTING devices for rotating the condensers of a receiver having a coarse driving spindle and a fine driving spindle are already known. Either spindle may be set in rotation by an operating knob, as desired. In known arrangements of this type special reduction gears are provided between the two spindles, mostly ball reduction gears or friction disc gears. According to the device shown in the accompanying illustrations, a driving cable coupled with the condenser to be adjusted is taken round a pulley fixed to the coarse driving spindle and also round a pulley seated on the fine driving spindle, or round the fine driving spindle itself, in such a way that it is set in motion on rotating one of the two spindles of the condenser.

## Simple Operation

The advantage of the device lies in the great simplicity of the arrangement. The ratio of the reductions with coarse and fine drive may, within wide limits, be easily adjusted as desired. Figs. 1 and 2 show clearly how the device operates. Fig. 1 shows a cross-section through a receiver cabinet, through the panel G of which is led the coarse driving spindle W1, which is in the form of a hollow spindle, and which carries the coarse-tuning knob D1. The spindle W1 is seated in the bearing L, which is secured to the frame, and the pulley E is fixed to the free end of the spindle W1. The fine driving spindle W2

is led through the coaxial bore of the spindle W1 and carries the fine-tuning knob D2.

## Driving Cable

The driving cable, which is coupled with the condenser, is slung round the pulley E on the one hand by the part S1 and directly round the free end of the spindle W2 on the other hand by the part S2, in such a way that when one of the two operating knobs is rotated the cable drives the condenser with greater or smaller reduction.

The way in which the cable is led is shown more clearly in Fig. 2. In this, figure pulley B. On the long, stretched part of the

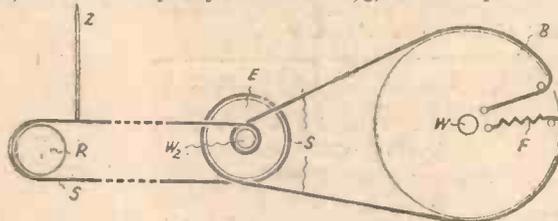


Fig. 2. Diagram showing how the driving cable is led round the pulleys.

B represents the large pulley fixed to the condenser spindle W, to which both ends of the cable S are secured. The spring F maintains the cable always taut. From the pulley B the cable first passes to the pulley E, fixed on the coarse driving spindle, thence over a guide roller R to the fine driving spindle W2, and finally back to the cable S between the roller R and the spindle W2 is fixed the pointer Z, which during

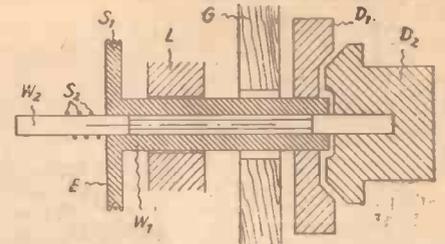


Fig. 1. Cross-section through a receiver cabinet and the slow-motion drive.

tuning moves to and fro in front of the receiver scale. Thus, in this case, a single cable serves to transmit the drive from the tuning knobs to the condenser, to produce two couplings having different reduction ratios between condenser spindle and each of the tuning knobs, and also to couple the rotating condenser with the scale pointer.

## Reduction Ratio

The ratio of the reductions with coarse drive and fine drive is given by the ratio of the diameter of the spindle W2 to the diameter of the pulley E. Naturally, instead of being led directly round the spindle W2, the cable may alternatively be led round a small pulley fixed on it. In this case, the diameter of this pulley will determine the reduction ratio.

The pulley B need not be fixed directly to the condenser spindle W, but may be coupled with the latter via any sort of reduction gear: in particular, the cable S may also serve to produce this coupling between the pulley B and the condenser spindle, the arrangement, approximating to one already known, being that on the spindle W are seated one fixed and several rotatable pulleys, round which the cable is slung according to the compound pulley principle, in such a way that one of the movable pulleys moves with double angular velocity, and hence the portion of cable which operates the scale pointer moves with double velocity. By this means not only is the attainable scale length doubled for the same diameter of pulley, but also the reduction ratio of each of the two driving spindles to the rotating condenser spindle is doubled. This development has arisen in the laboratories of Telefunken Gesellschaft für drahtlose Telegraphie m.b.H., of Berlin.

## Mayfly on the Colne

**JOHN SNAGGE**, of the B.B.C.'s Outside Broadcasts Department, himself a keen fisherman, is busily organising a fishing broadcast for "Springtime, which will take place in the late evening of May 19th on the banks of the Colne in Buckinghamshire. The Mayfly usually rises during this week of May in Buckinghamshire rivers, while the moon being full, all auspices should be propitious.

A strong team has been recruited, including Captain Edwards, the world's champion fly-caster, Howard Marshall and Freddie Grisewood. The latter, it will be remembered, conducted the fishing broadcasts on that Elysian trout river, the Test.

This broadcast, mainly designed for fishermen and country lovers, will also reflect the peace of the Colne's water meadows and of a Spring evening in England. The programme will be built around the actual fishing so that in any case a profitable 20 minutes should be spent discussing country matters. Talk will be general among these four experts, on tackle, the various methods of casting and about the character of the river and colour of the water.

## ITEMS OF INTEREST

Previous broadcasts were from the Test, a clear chalk river, beautifully weedy like a pre-Raphaelite picture.

As one of the fishermen hooks a trout, and that, on a Mayfly evening, should occur frequently, John Snagge will carefully approach with a portable microphone, describing the landing of the fish and catching the angler's enthusiasm.

## WLW Singers and Huskies

**DON** and Helen, "sweet singers of sweet songs," whose programmes are heard regularly over WLW (Cincinnati), last week received an unusual letter from a fan in the Far North.

The missive, postmarked New Liskeard, Ontario, was sent by one, "Cody E.," a trapper, who declares that he went into his lonely business as the result of an unhappy love affair. "If my signing seems odd," he said, "do not feel that I am someone hiding from the law, or an outcast, for I come from a good and popular Cana-

dian family and expect to return to civilization this year."

Cody E. wrote his letter to inform the WLW vocalists that the leaders of his dog team are a pair of huskies named Don and Helen. Helen is the leader of the team. Commented Cody E.: "Anyone who thinks a female of any kind should not have a say in leadership, no matter what it is, does not want to tell it to me or to Don, the second of my dogs."

Cody E. said that on his long trips he carries with him a portable radio, and has taught his dogs, on a given signal, to gather around it when Don and Helen come on the air from hundreds of miles away. The dogs have grown to like the idea, he noted. "Now they will sulk if they are not allowed in, or if we are on the trap line, and have to keep mushing on account of the weather. When I give the sign they stop dead and form their circle, and I tune in. You would never forget the expressions on their faces if you saw them like this, their ears cocked up, heads on first one side and then the other. If one dog sneezes or moves, he gets a bite from both sides and down he goes in disgrace."

# Harnessing the Electron Stream

RESEARCH engineers of the Westinghouse Electric and Manufacturing Company have made electrons obliging actors for the visitors to the New York World's Fair. To show what goes on inside a three-electrode vacuum and the effect of a magnetic field on a stream of electrons flowing through a vacuum, the engineers have built a triode 27in. high and 7in. in diameter. It is similar to a standard radio valve, except that it has two filaments and two grids on opposite sides of the plate so that the action is visible from both directions.

The surface of the plate is coated with fluorescent material, so that wherever electrons impinge on the plate, a green colour shows. By changing the negative biasing voltage supplied to the grid, the stream of electrons to the plate can be varied from zero to the maximum of which the valve is capable. A pattern on the face of the plate shows the area normally bombarded by electrons.

By placing a permanent magnet near the valve the electron stream can be deflected by the magnetic field. The effect of the field on the electron stream can be seen plainly. This effect varies according to the way the magnet is

applied to the valve. The circuit used is similar to that in audio-amplifiers. A 60-



This 27-inch triode was built by research engineers of the Westinghouse Electric & Manufacturing Company to demonstrate at the New York World's Fair what happens inside a three-electrode vacuum tube when a stream of electrons is affected by a magnetic field.

cycle frequency is applied to the grid, and the valve output is connected to a loud-speaker. The loudness of the audio signal corresponds to the area of the green glow on the plate of the valve.

## The Camera in Our Daily Lives

THE uses of photography are legion these days, but it is interesting to see how more and more it is being turned to practical account by people who are in no sense professional photographers. Just recently, for instance, one of the photographic magazines, called "The Home Photographer," has been publishing a series of articles contributed by those of its readers who, being themselves keen amateur photographers, have found ways of applying the camera to their businesses and professions.

Better cameras and gadgets make photographs easier and certain in these days, although perhaps the most striking development of all is the way in which the modern enthusiast can make his hobby pay for itself, no matter what type of camera he's got. Many amateurs now make quite a second income from fees for topical and "general interest" pictures submitted to the press, and every year there are interesting competitions for him alone (professionals barred) with substantial prizes. One of the first announced this season (run by "The Home Photographer," monthly magazine for amateurs) offers a first prize of £100, with a string of cash prizes to follow up.

## BOOKS RECEIVED

### B.B.C. Music Programmes

A NEW issue of the B.B.C. Music Programmes booklet containing details of music programmes, and other general information concerning music to be broadcast during the second quarter of 1939, has just been issued. The booklet includes details of the Beethoven Concerts to be conducted by Toscanini in the Queen's Hall; the Sunday evening and other studio concerts which will be devoted to orchestral and chamber music; and the most important "outside broadcasts." The booklet may be obtained on application by post to the B.B.C. Publications Department, 35, Marylebone High Street, London, W.1, price 2½d. post free, or on personal application to Broadcasting House, Portland Place, London, W.1, or to any B.B.C. Regional office, price twopence.

### Broadcast Talks

Full details of the new series of talks to be broadcast during the quarter April to June 1939, are given in the booklet, "Broadcast Talks," which is obtainable, price 2½d. post free, or price 2d., from the addresses given above.

## ● AROUND the SALES

### SPECIAL BARGAINS NOTED

SINCE introducing this feature for the benefit of "Practical and Amateur Wireless" readers, congratulations have poured in to the office. My advice about ORDERING EARLY still holds good because it is understood that some of the following offers may not be repeated.

It can't be helped, but in view of the importance of the short-waves in regard to communications and entertainment the N.T.S. Bandsread 4 Kit at 49/6 is still worth recommending as an amazing bargain. You obtain it complete with coils for 12-94 metres and FREE valves and the easyway deposit with order is only 3/6. It's also worth while illustrating (see below) a special N.T.S. 1-valve complete kit bargain. This is amazing value for money. ORDER EARLY.

MR. CAMM gave an excellent report a week or so ago on the N.T.S. PENTAKIT. This amazing-value kit comprises all parts for building alternatively a 1, 2 or 3-valve receiver for 9-2,000 metres, Adaptor or Converter and with each kit is presented FREE a complete set of valves (British), including a pentode output. This kit receiver, with coils, costs only 42/- cash or 2/6 with order and 12 at 3/9. Performance and value is certainly outstanding.

These Amplifier bargains are worth repeating again. There is the N.T.S. A.C.7-watt 4-valve model to clear at 70/-; A Push-Pull circuit is employed, giving an output of 7 watts; 5/- only is the deposit required. What about an N.T.S. 4-watt battery amplifier for P.A. work and boosting up low-powered battery sets? A 4-valve push-pull output model is now available at only 55/- (complete and ready for use). Terms are 4/6 down and 12 monthly payments of 4/9. Why not improve your microphone technique and buy a good mike for connection to your radio set or amplifier. The N.T.S. table model at 25/-; or the professional model at 42/- should be secured now; a deposit of 2/6 only is required for either microphone, balance over 12 months.

Never heard before of such a stupendous bargain which aptly describes this special valve offer. To pay only 5/6 for 3 new 2-volt valves—standard U.S.A. types in fact—together with 3 valveholders, data and diagrams, is to pay a fraction only of the real list price. Order NOW is really sound advice. Obtainable, by the way, only from N.T.S. and sent POST FREE!

**SEE IT FOR YOURSELF**



This is the amazing value for many one-valve short-wave kit mentioned above. You get everything illustrated for only 27/6—all first-class parts and coils for 12 to 94 metres, condensers, FREE valve, and a pair of sensitive (and very handy) headphones and all instructions, of course. Really astonishing value, and terms are as low as 2/6 down and 10 monthly payments of 3/-. Don't miss it!

Undoubtedly, your best chassis "buy" is still the N.T.S. 6-valve All-mains All-wave model at 6 gns. The waverange is 16 to 2,100 metres, it has illuminated station scale and pick-up sockets, and is an exceptional bargain for those who want to replace their old set. There is a guarantee of 12 months and to secure, you merely send a 5/- easyway deposit with your order. Buy this and be satisfied completely, is best advice. Note the following amazing N.T.S. chassis bargains. A Battery Straight 3 model at 12/6 (less valves), a Class "B" 4 (with valves) at 59/6, an A.C.4 (with valves) at 55/-, and an All-Wave A.C.4 chassis, complete with valves, at 79/6, or 5/- down and 15 monthly payments of 6/-. Thousands of these chassis have been sold of late. More details are available.

If you've got 6/6 to spare, send for the N.T.S. bargain parcel. There's 32 very useful parts in this lot for experimenters including coils, condensers, resistances, and a drilled chassis, etc. Marvellous value. Postage paid, "World Kits." Heard a lot about these which represent striking value. I think the best one is the 3-valve S.G., det., Pentode model, with FREE valves at 29/6 or 2/6 down and 12 monthly payments of 2/10. Really don't know how it's done at the price. You can get a set of 10 self-locating coils for 9-2,000 metres for 17/6 extra.

**BARGAINS only from N.T.S.**

You can only obtain real value-for-money bargains from N.T.S. We pass on all the benefits of favourable purchasing. But you must order EARLY.

**FREE** The following catalogues post free on request: 1939 Bargains, Chassis, Kits, Amplifiers, Valves and the N.T.S. revised short-wave book. N.T.S. cash prices are the lowest and terms are the easiest.

**NEW TIMES SALES CO.**

56 (Pr.W.39), LUDGATE HILL, LONDON, E.C.4  
Phone: City 5510 Est. 1924



May 13th, 1939.

Vol. 4.

No. 151.

### A Peculiar Situation

THE sailing of Baird technical experts to America, and the shipment of large-screen receiving apparatus for installation in certain of the New York theatres have, according to one newspaper report, brought to light a very peculiar but interesting legal aspect. When big-screen television is featured in any London cinemas the rediffusion rights have to be paid for to the promoter of the event to be televised, and the B.B.C.'s permission sought in order to be allowed to use their transmitted signal. In America, however, the situation appears to be quite different, for according to legal opinion, if any company chose to use any television pictures radiated by the networks existing in that country, the networks would have no excuse for action, since they are not engaged in the theatre exhibition business and so cannot ask for damages. It is said that once the programme matter is on the air the networks have lost their property rights to the subject. If this turns out to be the case, then it seems certain that big-screen television in cinemas and theatres, once started in the United States, should forge ahead more rapidly than in this country. Programme costs and any profits are already guaranteed in America by the sponsors before the transmission starts, whereas here every effort is being made to sell rights to sponsors at the receiving end. What will be the final outcome of this apparent tangle only time will tell, but in any case there does not seem to be the same financial restriction "across the water" as in this country, and this may allow America once more to steal a march on England in so far as big-screen development is concerned.

### Signal Modulation

OF late many interesting schemes have been suggested whereby light beams can be modulated by incoming television signals. One of the latest has emanated from Germany, and makes use of the principles of secondary emission. The light itself is focused on the photo-electric cathode, and the resultant primary electron stream is made to impact on a series of target electrodes so that electron intensification occurs by secondary emission. Now the incoming signals at carrier frequency are made to control the magnetic field, which in turn guides the electrons in their path down the tube. The effect of the modulation is to shorten, or lengthen, the

path of the electrons and influence the impacts on the target electrodes, with the result that the output signal from the device is said to conform to the signal generated at the transmitting end, and can be made to modulate an ordinary cathode-ray tube to reproduce a picture.

### America's Effort

IN assessing the value of America's effort for entering the television service field to coincide with the opening of the New York World Fair, it is sometimes overlooked that experimental field tests on a high-definition basis have been undertaken for a period of over three years by more than one company, particularly by R.C.A. One of the biggest troubles, however, has been in connection with settling the picture and transmission standards, and much valuable time for testing has been lost because of the late decisions. The Empire State Building has the R.C.A. transmitting aerial on its roof, and the picture signals are being radiated on a carrier frequency of 45.25 megacycles, with the accompanying sound on 49.75 megacycles. This gives a video to audio carrier spacing of 4.5 megacycles as against the 3.5 megacycles used by the B.B.C., and it will also be noticed that the sound carrier is higher than the vision, whereas the reverse holds in this country. If

television gets a really good start this spring in New York—at least eight manufacturers are proposing to offer receivers for sale—then the hope is expressed that other American cities will follow suit and install their own transmitters so as to extend rapidly the home net sales market. Many experiments have already been undertaken with a view to linking certain cities into a television network, and in this connection it is interesting to record the opinion of the R.C.A. engineers for it may have a bearing on the research work for provincial television extension now being expedited by the Post Office here. The American engineers are confident that television networks will be effected through the medium of automatic radio relays employing ultra-high frequencies. It is said that the practicability of such relays has already been established after exhaustive experiments. Since considerable work has already been undertaken with coaxial cables as well it would seem to show that the cable method has been abandoned.

### PATENTS AND TRADE MARKS

Any of our readers requiring information and advice respecting Patents, Trade Marks, or Designs, should apply to Messrs. Rayner and Co., Patent Agents, of Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.



David Sarnoff, president of the Radio Corporation of America, speaking before the microphones as he dedicated the R.C.A. building at the New York World Fair in a television broadcast to spectators in Radio City, eight miles away. Mr. Sarnoff is speaking in the garden of the building.

# 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.**  
Headquarters: 72a, North End Road, West Kensington, W.14.

Meetings: Friday evenings at 8.15 p.m.  
Hon. Sec.: C. W. Edmunds, 15, Cambridge Road, North Harrow, Middlesex.

On Wednesday, April 26th, a number of members of the above society attended a meeting of the Golders Green and Hendon Radio Scientific Society, held at the Regal Cinema, Finchley Road, at which Mr. Maurice Childs described his 40-metre direction-finding apparatus.

During the past three months the Radio, Physical and Television Society has made considerable progress. Several more members have now been granted full transmitting licenses, and it is claimed that this society now has more members with transmitting licenses than any other local club in the country. Many interesting lectures have been delivered from time to time; these have included "Rectifier Equipment," "Thermo-electric Instruments," and "Television Time Bases"; a transmitting evening was also held recently during which several distant stations were contacted.

Several meetings have been arranged for the near future. New members will be welcome; particulars may be obtained from the Hon. Secretary, at the society's headquarters, or prospective members may call any Friday evening without formality.

**SLOUGH AND DISTRICT SHORT-WAVE CLUB**  
Headquarters: 35, High Street, Slough, Bucks.  
Meetings: Alternate Thursdays, at 7.30 p.m.  
Secretary: Mr. R. J. Sly, 16, Buckland Avenue, Slough.

At the last meeting, held on April 27th, the first item on the agenda was the usual discussion on conditions, the general conclusion was that during the past fortnight DX signals had been noticeably absent on all bands, except for a short period from April 14th-16th. This was put down to the recurrence of the sunspot cycle on those particular dates. The construction of the club receiver was carried a stage further when Mr. Baldwin (2BVV) explained his design for the power pack. Members agreed upon final details of layout, and Mr. R. J. Sly undertook the task of putting a further heater winding on the mains transformer. Morse practice followed, members finding it very gratifying to see two members taking an interest for the first time in the slow morse class. It is hoped that all the beginners in morse will soon be up to the 10 word per minute standard, whilst more experienced members are reading and sending at speeds up to 17 words per minute.

The agenda for the next meeting, to be held on Thursday, May 11th, will include a lecture on "High Voltage Electrical Phenomena," given by a member and accompanied by a demonstration. The usual morse practice, construction of receiver, etc., will also be included. New members are welcomed at any of our meetings, where they will find much of interest to all radio enthusiasts. The annual subscription is 2s. 6d., with an extra 3d., payable at meetings, to pay for the hire of the club room.

**WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB**

Hon. Sec.: J. R. Williamson, 13, Harrow Grove, Bromborough.

Meetings: Last Wednesday each month, at 7.30 p.m. at H.Q., Beechcroft Settlement, Birkenhead.

At the annual general meeting, held on March 29th, the chairman expressed his pleasure at the financial position of the club in view of two additional ventures, i.e., the club mag. and morse class.

The net total of club members is 45, an increase of 11 over last year. Two members obtained full licenses—Mr. R. J. Murray (G3PT) and Mr. R. Barlow (43QX), while Messrs. E. Blocksidge (2FN1), N. Griffith (2KSN), G. Oxton (2DIB), and C. Burnham (2ABU), obtained A.A. licenses.

New members of committee are: Mr. W. E. Corbett, President, and Mr. W. Harding-Miller.

The following committee members were re-elected. Mr. W. O. Bretherton, chairman; Mr. R. Cumberlandidge, treasurer; Mr. J. R. Williamson, secretary.

## IMPORTANT BROADCASTS OF THE WEEK

**NATIONAL (261.1 m. and 1,500 m.)**

Wednesday, May 10th.—Midsommarvaka: Rhapsody of Swedish melodies relayed from Sweden.

Thursday, May 11th.—The London and Home Counties Individual Darts Championship, from the Royal Agricultural Hall, Islington.

Friday, May 12th.—Dance Band programme.

Saturday, May 13th.—Commentaries on Cricket at Lord's (M.C.C. v. West Indies) and Championship Cycling at Herne Hill.

**REGIONAL (342.1 m.)**

Wednesday, May 10th.—Roundabout No. 2, a Regional variety programme.

Thursday, May 11th.—The Duchess of Dantzic, an operetta.

Friday, May 12th.—Northern Music Hall: Variety from the Winter Gardens, Morecambe.

Saturday, May 13th.—Hugh the Drover, an opera from Sadler's Wells.

**MIDLAND (297.2 m.)**

Wednesday, May 10th.—Midland contribution to Roundabout: Inn-door Games.

Thursday, May 11th.—Choral programme.

Friday, May 12th.—Running Your Own Show: Our String Orchestra, a talk.

Saturday, May 13th.—Band programme.

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

Wednesday, May 10th.—The House and the Man: John Opie at Harmony Cot, a talk.

Thursday, May 11th.—Cocklemouth Comet, by R. F. Delderfield: No. 1, The Comet goes to Press.

Friday, May 12th.—A Children's Concert from the Colston Hall, Bristol.

Saturday, May 13th.—Instrumental recital.

**WELSH (373.1 m.)**

Wednesday, May 10th.—Instrumental and vocal programme.

Thursday, May 11th.—The Thin Red Line, No. 6, The Royal Welch Fusiliers, feature programme.

Friday, May 12th.—The Shadow Dance, a play by J. D. Strange.

Saturday, May 13th.—An Exchange programme with Scotland of Scottish and Welsh national airs.

**NORTHERN (449.1 m.)**

Wednesday, May 10th.—Religious Impressions: Pianoforte Recital.

Thursday, May 11th.—The Vale of Eden, the story of a walk.

Friday, May 12th.—Variety from the Winter Gardens, Morecambe.

Saturday, May 13th.—Saturday Concert Hall: Music by Arthur Bliss, conducted by the composer.

**SCOTTISH (391.1 m.)**

Wednesday, May 10th.—Men singing—3, In the Mountains: gramophone records.

Thursday, May 11th.—Variety from the Palace Theatre, Dundee.

Friday, May 12th.—Pipe Band programme.

Saturday, May 13th.—Songs of Wales and of Scotland: An Exchange programme with Wales.

## ELECTRADIX

CRYSTALS AS SPECIFIED FOR

"STAND-BY" CRYSTAL SET

Enclosed 2 Crystal Permanent Detector 2/-

"EXPERIMENTERS" CRYSTAL SET

Carborundum Marconi Army Detector 2/6

**HEADPHONES.** Lightweight for Crystals. Famous makes. 2,000 ohms, 4/6. Single high res. earpieces, 2/6. Sullivan 120 ohm. W.D. model. Aluminium body and headbands. Maker's price 4/6. Our price 2/9 per pair. 3d. postage.

**CRYSTAL SETS.** Model B, Pol. Mahog. case 9in. x 10in. 2 tuning condensers, plug-in coils, Permanent Detector, 7/6. 4,000 ohms. Phones, 4/6.

**MIDGET 49 CRYSTAL SET** complete with Perm. Detector, 6/9. M.111 Army Double Crystal All-wave Receiver, very rare. Cost £20. 56/-, M.111 Station Finder W.D. Crystal Sets, double Detector, wave range calibrated in enclosed mahog. case, 24/6.

**CRYSTALS RECEIVING.** Super Detector, glass cover, fine adjustment, 10/-, Enclosed 2 crystal permanent Detector, 2/- Carborundum Marconi Army Detector, 2/6. Galena point Detector, mounted, 1/6. Galena and Neutron Crystals, 4d., 6d., and Perikon, 1/- Carborundum mounted, 8d.

**CRYSTAL OR BATTERY SET BUILDERS.** Fitted Table Cabinets, polished oak 13in. x 7in. x 6in., oval aluminium 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/-.

**SLOPE FRONT TEAK CABINETS.** New, make fine instrument panel, 10in. x 7in. x 11in., 3/- each.

**COILS.** S.W. Coils, plug-in, 1/6 ea. L.W. 2-pin, 1/- Reaction, various, 8d. H.F. Twin Chokes, 2/- Spark Emergency Transmitter short-wave sets for remote control, 25/-.

**S.W. COMPONENTS.**—Coils, 1/9. Chokes, 9d. Ceramic Valveholders, 1/-, Crossteader aerial blocks, 6d. Bephrine Insulators, 6d. Glass Insulators, 6d. Frequentite 6in. rods, 8d. Screened flex, 4d. yd. Twin 6d. yd.

**NEW PANELS.** Polished aluminium, 18 in 16 gauge, bright or enamelled, 12in. x 12in., 3-. 18in. x 18in., 5/6. Ebonyite 3in. panels 24in. x 24in. for 5/6.

**WIRE WOUND POWER RESISTANCES.** 5 watt 8,000 ohms, 10 m.s., 10d. 5 watt Potential Dividers, tapped 50,000 ohms, 1/6. Mains Transformers, 3/6. 1-mfd. Condensers, 4d.

**CONDENSERS.** Variable low-loss F type, .0005, 1/9. J.B. .0003, 2/- Reaction varia, 1/3. Pvc. .0003 with S.M. dial, 5/- 2-gang varia, all aluminium, 3/- only. Fixed Condensers, 2 mfd. 250 v., 6 for 4/-, 3/- doz. 4,900 v. 1mfd., 6/-, etc.

**MICROPHONES.** Table Model "N.W.11." For home broadcasting. Bakelite square body on bronze base, containing transformer, switch and plugs; is a marvellous production at a low price. Worth 2 guineas. Only 15/- Lesdix No. 10B Pedestal, 10in. long, 12/- Lesdix Superior No. 12BB Ring, 14in. pedestal, 18/6. Hand mikes in 2in. case, No. 11 at 5/6. Superior type, No. 11a, 7/6. Home microphone No. 11 is a solo general-purpose robust mike, with solid bakelite body, back terminals, front metal grille, hand or sling design, 5/6.

**VALVES.** Midget Peanut 1 volt, 4-pin, 1/1in. long, new 2/- each, or 12/- dozen. 6 volt 20 watt Transmitting Valves, 4/6.

**STAND-BY PETROL OR GAS ENGINES** with Dynamos, 150 watts to 4 kw.

**EMERGENCY EDISON Steel Storage Cells, DYNAMOS and Switchboards** from 50 watts to 5 kw. Hundreds to select from. Morse chains and wheels, 25/- set. Skewgear boxes, 1/6 p. 10/-

**MOTORS.** MOTORS. Motors. Tiny, Small and Medium. A large stock of really fractional horse-power motors have been released at bargain prices. 6 volts, 50 volts, 100 volts and 230 volts.

**A.C. MAINS MOTORS.** Enclosed, self-start on load. A.C. repulsion, 1/80 h.p. with pulley, Type 36, 1,500 revs., 18/6. Ditto 1/18 h.p., G.E.C., 3,500 revs., 27/6. Induction 1/10 h.p., 2,500 revs., 35/- 1/6 p. 1,425 revs., 49/-

**D.C. MAINS MOTORS.**—1/40 h.p., 110 v. or 220 v., K.E.B. series, 1,750 revs., 15/- Ditto 1/40 h.p., G.E.C., 230 v. series, 2,000 revs., 18/- Ditto 1/12 h.p., Croydon 110 and 230 v. shunt, 1,700 revs., 30/-

**HOME SOUND RECORDING** at low cost.

The FEIGH RECORDER fits any Radiogram, positive drive, worm gear and rack. Complete, ready for use, only 37/6. Super Feigh Fidelity Set, 42/6. Tracking Gear only, 21/- Either 4/- dozen metal blanks can be used or the glass-coated simpels, 10in., 3/- each. Pre-amplifiers for Recording Mikes, 1-valve Battery Model in cabinet, 25/- A.C. Mains pre-amplifiers, with valve rectifier, steel-cased model, 60/-

**PARTS** 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 1939 List "N."

**ELECTRADIX RADIOS**

218, UPPER THAMES ST., LONDON, E.C.4.

Telephone: Central 4611.

## PLAN A CAMPING HOLIDAY WITH NEWNES CAMPER'S HANDBOOK

By David Balfour

Everything the camper wants to know

From all Booksellers 2/6, or by post 2/9 from the Publishers,

GEORGE NEWNES, LTD. (Book Dept.), Tower House, Southampton Street, London, W.C.2.

GEORGE NEWNES, LTD. (Book Dept.), Tower House, Southampton Street, London, W.C.2.

# TELEVIEWS

## The Television Questionnaire

A PRELIMINARY analysis has been made of some of the 4,000 entries recently received by the B.B.C. regarding television programmes. One thousand two hundred of these have been examined to provide a basis for the first report, and some very interesting facts have emerged from these. The B.B.C. state that it is obvious that the present proportions and the types of programme material are well in line with viewers' preferences. Ninety per cent. of viewers voted for plays and variety programmes direct from theatres; news relays; and picture page.

Outside broadcasts of sporting and other events came next, followed by full length plays, cartoon films, demonstrations and talks. It transpired from the replies to the questionnaire that viewers prefer plays to last about 1½ hours, with occasional intervals. Forty-four per cent. of viewers appear to have no marked preference for men or women announcers, the remainder voting overwhelmingly, for women announcers. Television announcers appear to give complete satisfaction to viewers—they don't talk too much as has been suggested in some quarters. The average number of people who watch television programmes regularly on each set is four. Many of these figures will, no doubt, come as a surprise to those who have not yet seen television programmes, and the final result of the analysis of the questionnaire will, no doubt, prove of very great interest both to the B.B.C. and viewers.

## Television for the Provinces

THE offer made by the television manufacturers to the Government with the hope of speeding up the provincial extension of television has caused not only a great deal of public interest, but also some confusion. It should, therefore, be made clear that there is no attempt by the trade to subsidise or control the transmitting side of television, nor has there been a promise of funds with which to continue provincial extension.

The Government Committee said in effect that while they agreed that television must eventually expand to the provinces they were unable to make up their minds whether to do it by means of a radio link or by means of the co-axial cable until their experiments were completed.

## Radio Link Method

THE manufacturers replied that they did not care what method was used, so long as it worked, but it was important that some action should be taken quickly. The manufacturers declared themselves in favour of the radio link method and they were so certain that it did not need any further experiments to show it would work that they were prepared to pay for any equipment that had to be scrapped, if only the Government would go ahead at once on this method.

The total cost of extending the system to the Midlands area by using the radio link method is estimated at something well under £100,000, and this would include the transmitter itself at Birmingham. The transmitter can in no sense be described as experimental, since it would be equally suitable for use with either the radio link or the co-axial cable, and it will, therefore, be required sooner or later in any case.

It will be seen, therefore, that the manufacturers are not asking the Government to risk very much in going ahead with the radio link method straight away, but it is to overcome any qualms that the Government may still have that the offer is put forward.

What are the technical difficulties that still have to be overcome before the radio link method is an established fact? So far as the manufacturers know, there are none that would be insurmountable, although the first practical steps in a project of this nature naturally bring problems which can only be answered by the kind of development work that has already given Britain its two year lead in television.

If we want to keep this lead, the manufacturers argue, we must still do the pioneer work, and there can be no doubt that other countries are following hot on our heels.

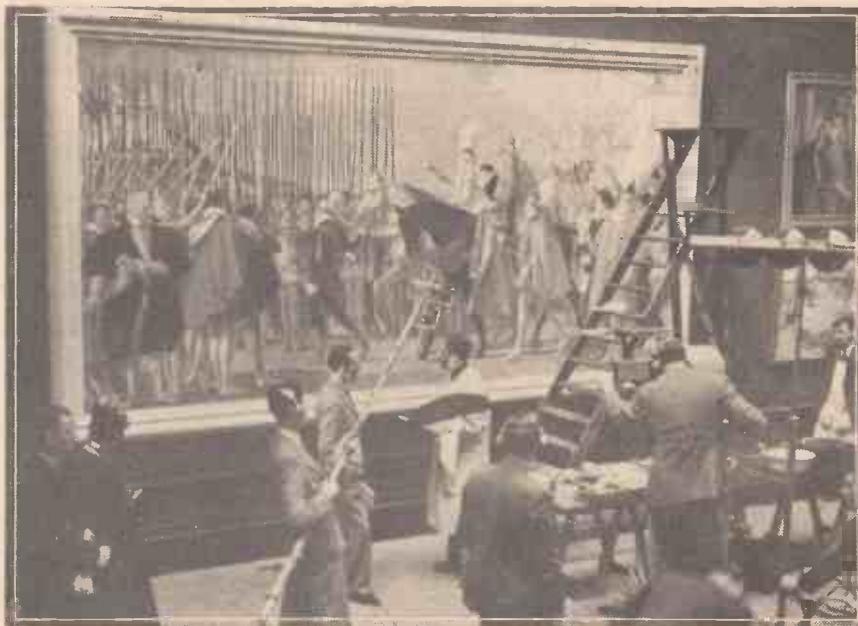
## Linking American Cities

RALPH R. BEAL, the Research Director of the Radio Corporation of

one day sweep the world in the same way as radio, and in urging the immediate expansion of the British system, the manufacturers are looking a few steps ahead. They remember the stranglehold that America established on radio, thanks to the enterprise of their manufacturers in the early twenties. They have seen the British motor industry faced with ferocious competition both at home and in world markets, and they are anxious to build up their own resources of knowledge, research and commercial experience into a force that will keep this country in the position to which its pioneer efforts entitle it.

## Disagreement with the C.E.A.

A SHORT time ago mention was made in these columns of a technical report which had been put forward by the C.E.A. in connection with recent big-screen television demonstrations. It is learned that the conclusions advanced in that report are being disagreed with in some quarters, and not without apparent justification. For example, on the question of comparative screen brightness between the Baird and Scophony pictures it is difficult to be dogmatic, because the former screen is six



A private view by television, in advance of the actual event, was afforded the public recently when a pre-view of the famous "Varnishing Day" at the Royal Academy, Burlington House, London, W., was held. The illustration shows Mr. A. K. Lawrance, the artist, being televised during the varnishing of a giant work depicting Queen Elizabeth with her troops.

America, wrote the other day: "R.C.A. engineers are confident that plans for linking American cities into a television network will logically follow the city-by-city establishment of transmission facilities. They are confident, moreover, that such networks will be effected by means of automatic radio relays employing ultra-high frequencies. The practicability of such relays has been proven by exhaustive experiments with equipment developed in the R.C.A. laboratories."

This is ample evidence that America is already convinced of the possibilities of the radio link method. France is not lagging behind in television development, with provincial stations planned at Lyons and Lille, while it is now learned that German television apparatus will be displayed at the Wireless and Television Exhibition in Buenos Aires.

Nobody can doubt that television will

times the area of the latter, while auditorium illumination has to be taken into consideration as well. According to some measurements which have been furnished, however, the Scophony picture may be nearly double the screen brightness of the Baird one, but the latter is receiving nearly three times the light flux to distribute over its bigger area. As far as the new form of projection cathode-ray tube is concerned, the improved efficiency is attributable to many factors, among which mention can be made of the increased aperture lenses employed, the large fluorescing screen area, and the direct reflection from the screen, which is not attached to the glass face, and therefore necessitates illumination passing right through the screen powder with its attendant losses. Any transmission defects arising from inherent camera faults are more readily apparent on a big-screen television picture.

# 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.)

## Television Transmissions

**SIR**,—It is generally understood that high-definition television cannot be radiated on longer wavelengths than at present used.

For many years I have been considering the matter from a theoretical standpoint, but I cannot obtain particulars of practical experiments which prove that it is so. I wrote to the Television Advisory Committee last December, suggesting that the assumed difficulties of radiating television transmissions on comparatively long wavelengths may be purely theoretical—but no reply has been received.

If it is a fact that high-definition television can be radiated on considerably longer wavelengths than at present, it would be a simple solution of the question of covering the whole country; and also the receiving apparatus would be more simplified, and less liable to instability. I am aware that this is impossible in theory—but is it impossible in fact?—D'ARCY FORD (Exeter).

## Correspondent Wanted

**SIR**,—I have been a regular reader of PRACTICAL AND AMATEUR WIRELESS for about five months, and owe practically all my radio knowledge to it. I should very much like to correspond with any young reader living in the South Seas, or in U.S.A., I will also gladly accept correspondents from other parts of the world. I shall try and answer all letters wrote to me.—ALEXANDER BERGOL, 294, Brookvale Road, Erdington, B'ham, 23.

## The Prefect S.W. Three

**SIR**,—I wish to thank you for the useful book presented to me for solving problem 342. I think that PRACTICAL AND AMATEUR WIRELESS becomes more interesting and instructive every week.

I don't know if it is exceptional, but I manage to obtain at loudspeaker strength the television sound programme on your Prefect S.W. Three, with the windings on one of the coils cut down, and retaining the usual tuning condensers.—A. CARTER (Shoreditch).

## "Audible Radiations"

**SIR**,—I fear my letter on the above subject was misunderstood, at least by one reader. The curious radiations I heard were not caused by a pick-up acting as grid inductance. I was using a crystal set in the place of a pick-up, when I switched on with only the aerial and earth connected to grid and filament negative in that order. There was no grid inductance whatever, and the signals were not received without the aerial connected. The signals seemed to consist of two programmes. One from the B.B.C., and one foreign. The local "relay" wires run within 20ft. of my aerial at several angles. The same relay station supplies two programmes. High frequency

can get to the output circuits of some sets and cause trouble.

If high-frequency currents can stray out of a "relay" amplifier what a wonderful opportunity they have of affecting radio apparatus!

Will Mr. Yalden (London) please state the efficiency and wavelength of the ordinary pick-up when used as grid inductance or tuner? Also, what rectified the signals, if not a superhet, straight or relay, radio set?—A. W. (Bridlington).

## Station HCJB

**SIR**,—On April 20th I received a letter from Mr. C. W. Jones, Director of Radio station HCJB in the Andes, South America, asking me if I would pass on the information regarding the following tests. The effect would be to increase the extent of listeners' reports. Beginning on May 1st until May 30th, HCJB will broadcast in the English language on a wavelength of 24.8 metres (12.460 mc/s). Transmission 1 (for Australia, New Zealand, West Pacific), time about 10.00 p.m. Transmission 2 (for India and the East), time 7.00 p.m. Transmission 3 (for England and Atlantic), time 8.00 p.m.—G. T. EUSTACE (Reading).

## CUT THIS OUT EACH WEEK.

# Do you know

—THAT special automatic Morse sending apparatus may be obtained on hire from various firms.

—THAT special slow morse transmissions are carried out regularly by amateurs for speed practice.

—THAT push-pull transformers may be improvised by shunting the primary by a centre-tapped resistor or two resistors in series.

—THAT automatic grid bias may be applied to a battery set even if there are two or more L.F. stages.

—THAT screening a component or lead will not prove effective unless the screen is effectively earthed.

—THAT a severe shock may be obtained from the heater circuit of the rectifying valve in a mains set, although there is nominally only 4 volts on that circuit.

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.

## Wallington Enthusiasts Please Note!

**SIR**,—I should like to place on record the fact that there is not enough amateur spirit in this town. Two or three times a short-wave club has been started here, but each time it has faded out owing to the fact, I think, that the intending members lived mostly about two miles from Wallington.

I believe this difficulty could be overcome if really local enthusiasts co-operated, and therefore I invite local short-wave enthusiasts to get in touch with me with a view to starting a club.—T. G. GIBBS, 18, Bandon Rise, Wallington, Surrey.

## A 20m. Log from Ilkeston

**SIR**,—Some weeks ago you published a 20m. log submitted by myself. Since then I have received several DX amateur stations in countries not heard hitherto at this QRA. Incidentally, the results here have been far better since I directed the main antenna NNE-SSW, instead of N and S. The following stations were received on 20m. (phone):

CX2CO, KA3KK, LU3HK, PY1IM; 2BH; SU1CH, UK3AH, VP3CO, VQ2CM, 4ECJ; VS7RA, VU2CA, 2FA; YL2CD, YV5AK, 5ABS; ZB1E, ZE1JA, and ZS6AJ.

The receiver is a 4-valve superhet.—A. HART (Ilkeston).

## Why Keep Television Separate?

**SIR**,—It seems to me to be a very grave mistake for the B.B.C. to endeavour to keep the sound and television programmes so distinct from each other. I know that it has on occasions incorporated both systems—to the tune of a handful of sporting events!

I very much doubt whether one per cent. of ordinary listeners ever tune-in to the television sound wavelength, yet the majority of listeners always long to see the expressions on the faces of those at the microphone. I honestly think that the present childish display of rivalry between both services should cease, and that a larger number of television fans would be the direct result of closer co-operation.

There appears to be little reason to fear that ordinary listening folk would miss the point of television programmes, because if sporting events can be radiated via the television transmissions, plays and other features can be equally as well received and understood.—ERIO. L. ADLEM (Notting Hill, W.11).

## EMPIRE FLYING BOAT ACCIDENT

The Postmaster-General announces that the first-class mails for the Union of South Africa, Southern Rhodesia, Nyasaland and South West Africa posted between about noon on April 21st and 4.30 p.m. on April 25th at the Head Post Office, London, E.C.1, and corresponding times elsewhere, were on board the flying boat *Challenger* which met with an accident at Mozambique, Portuguese East Africa, on May 1st. Air mail correspondence for Portuguese East Africa posted between 7 p.m. on April 21st and 7 p.m. on April 25th at the Head Post Office, London, E.C.1, and corresponding times elsewhere, were also on board. So far as is known at present, all the mails have been salvaged though some may be damaged.

## PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM

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

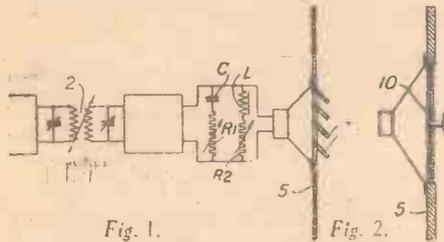
# LATEST PATENT NEWS

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 5s. per Group Volume or in bound volumes price 2s. each.

**Abstracts Published.**

**LOUD-SPEAKERS.**—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. No. 399108.

Means for varying the radiating aperture of a loud-speaker, operated in conjunction with electrical band-width control means,



comprises louvres 7. Fig. 1, or a rotary apertured disc 10, Fig. 2, mounted in a baffle 5.

**DIAPHRAGMS.**—Marguerat, R., and Chevrier, M. No. 497692.

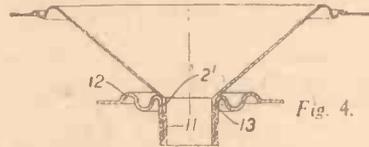
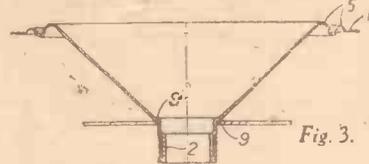
In a loud-speaker diaphragm comprising a diaphragm portion proper and a flange 2, Fig. 3, for carrying a speech-coil moulded therewith, a shoulder 9 is provided between the diaphragm portion and the speech-coil flange to constitute an abutment for the location of a spider. The diaphragm has a flat peripheral portion 1 and a number of concentric corrugations 5 and is preferably made by the processes and apparatus described in Specifications 440543 and 440544 (both in Group V).

The Specification as open to inspection under Sect. 91 includes a construction, Fig. 4 (Cancelled), in which the centring spider 12 has an integral flange 11 carrying the

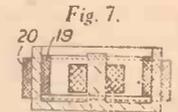
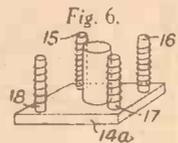
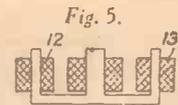
speech-coil and a cylindrical portion 13 into which is fitted a cylindrical extension 2' of the diaphragm portion. The thickness of the diaphragm portion may decrease gradually from the apex to the periphery. This subject-matter does not appear in the Specification as accepted.

**LOUD-SPEAKERS.**—Telefunken Ges. Fur Drahtlose Telegraphie. No. 498470.

Relates to an electro-dynamic loud-speaker of the energised type employed in conjunction with a television receiver of



the cathode-ray type and in which means are provided to prevent or reduce the stray magnetic field in the region of the magnet. As shown in Fig. 5, the field magnet is E-shaped and windings 12, 13 supplied with direct current are mounted on the outer limbs of the field magnet. In a modification, Fig. 6, the base 14a of the field-magnet is connected to the annular pole-piece (not shown) by a number of separate members 15, 16, 17, 18, each provided with a separate



auxiliary winding. In a further modification, Fig. 7, having a pot-shaped magnet, auxiliary concentric windings 19, 20, are provided within and without the wall of the pot. Additional windings may be provided on the inside and outside of the base of the pot and are concentrically arranged with regard to the core carrying the energising winding of the magnet (not shown).

**New Season's Programme:— HIGH-QUALITY A.C. AND BATTERY TABLE GRANDS BY McMICHAEL**

**D**URING the past season there has been a steady swing-over in public demand from the inexpensive to the medium-priced superhet. McMichael have accordingly concentrated their first 1939-40 production arrangements on the medium-priced market, in which the McMichael reputation for quality and workmanship makes a strong appeal. They announce the release of two moderately priced all-wave superhets of excellent all-round performance and exceptionally attractive appearance. Housed in identical table grand cabinets, the model 391 costs £12 5s. for the A.C. mains, the corresponding model 398 costing £11 5s. for battery operation, batteries being extra. Both sets use the new Clear-Curve tuning scale, occupying the whole width of the speaker aperture and following a semi-circular shape between the speaker and the control panel; the wave-bands are arranged



One of the new McMichael table grand models.

in side-by-side sections, only the band in use being illuminated, whilst the pointer moves behind both stations and wave-lengths. In the same way, the usual tone control is replaced by a four-way super-fidelity control, incorporating variable selectivity and controlled negative feedback and giving best possible reproduction on practically any strength transmission.

The cabinets are considerably larger than usual, attractively modern, and distinctive by reason of the unusual recessed speaker. The circuit is an 8-stage (7-stage in model 398), 3-wave-band design covering from 16.5 metres upwards, with band-pass tuning, high-peak constant-gain aerial coils, pick-up and extra-speaker sockets, etc. Batteries for Model 398 are supplied separately at 21s.

**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. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

**Latest Patent Applications.**

- 11286.—Dierks, C. H.—Radio-receivers, etc. April 13.
- 11749.—Dix, W. T.—Simplified junction unit assembly for and ultra short-wave di-pole receiving aerial, etc. April 19.
- 11537.—Eckersley, P. P., and Howard, R. E.—Wire broadcasting systems. April 15.
- 11582.—General Electric Co., Ltd., Aldous, W. H., and Edwards, G. W.—Apparatus for receiving television. April 17.
- 11279.—Gollnow und Sohn, J.—Mast aerials. April 13.
- 11181.—Midgley, A. H., and Midgley, A. M.—Electrical production of musical tones. April 13.
- 11658.—Pearce, A. F.—Cathode-ray tubes. April 18.
- 11281.—Rudkin, E. P.—Wireless receiving system. April 13.
- 11345, 11480.—Semper, A. E.—Wireless, etc., aerials. April 14.
- 11382.—Woodley, W. E.—Tuning devices for radio receiving-apparatus. April 14.

**Specifications Published.**

- 503589.—Scophony, Ltd., and Lee, H. W.—Optical systems.
- 503520.—Radioakt.-Ges. D. S. Loewe.—Cathode-ray tubes operated with high tension.
- 503596.—Hromadko, J. F.—Tuning-indicators for radio-receivers.
- 503598.—Ropohl, F.—Electrical musical instruments.
- 503600.—Browne, C. O.—Optical-projection apparatus.
- 503762.—Baird Television, Ltd., and Jones, V. A.—Electron multipliers.
- 503529.—Baird Television, Ltd., and Gilbert, A. H.—Television and like systems.
- 503555.—Blumlein, A. D.—Television transmitting and receiving systems.
- 503876.—Cole, Ltd., E. K., and Bradford, G.—Superheterodyne radio-receiver.
- 503560.—General Electric Co., Ltd., and Bloch, A.—Optical-projection apparatus.
- 503638.—Cole, Ltd., E. K., and Brooke, H. A.—Radio receivers with automatic volume control.
- 503692.—General Electric Co., Ltd., and Espley, D. C.—Apparatus for transmitting television and the like.
- 503698.—Mayr, H.—Coupling systems for wireless aerials.

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.



# QUERIES and ENQUIRIES

## D.C. or Universal 4

"I wish to build a 3 or 4-valve mains set, D.C. or Universal, with a mains energised loudspeaker, to receive the long and medium-wave programmes. Have you described such a receiver lately? If so, I would be pleased if you would kindly mention in which issue I shall find it, or whether you are about to do one in the future."  
—J. R. F. (S.W.13).

WE have not described such a receiver recently, but can supply a blueprint, P.W. 47. This is the Universal Hall Mark 4, which, although described first in 1935 is still standard for a receiver of the "straight" type. There is one H.F. stage and a push-pull output stage employing pentode valves. A permanent magnet speaker is used in this receiver owing to the difficulty with D.C. and Universal receivers arising from the limited voltage input.

## Energised Speaker

"I am building a mains receiver which draws about 120 mA and gives about 10 watts output. Can I use an energised speaker or will I have to use a smoothing choke and P.M. speaker? If I can use an energised speaker, could you tell me where I can get one and what price they run about? The receiver requires 250 volts on the anodes of the output valves."  
—A. G. S. (Edinburgh).

IF you have not already designed the mains section of the receiver, it should be possible to use the energised speaker. There will, of course, be a voltage drop across the field of about 100 volts and thus the mains section must deliver 350 volts or more. If you have designed the section for 250 volts output, you will have to employ a small smoothing choke and P.M. speaker. A field with a D.C. resistance of 2,500 ohms would drop 300 volts and a 1,000 ohm field would drop 120 volts. These figures may enable you to decide upon a suitable speaker and rectifier for the mains section. Speakers vary in price according to the size and general design.

## Chassis Problems

"I recently bought a ready-drilled (ex-makers surplus) chassis, intending to use this for a home-made set. I built up a design, but find results very poor and wonder if you can give me any idea where to look for the trouble. I used all odd parts to a published circuit, but the chassis was bare of parts and thus there should be no question of dud parts on it. What are the pitfalls most likely to be met with in this connection?"  
—L. E. (N.9.).

WITHOUT a circuit diagram or voltage or current test it is not possible to give you any definite advice. One point which you may have overlooked with a chassis of the type mentioned, is that it may be painted or enamelled and you may thus have used components or connections which are intended to be earthed via the chassis. Unless the contact points have first been thoroughly scraped to remove the

protective surface you will thus be unable to rely upon the connections and this is the commonest fault met with. If these points have been attended to, we suggest that you send us a diagram with voltage and current readings at various points and this may enable us to help you.

## Superhet Oscillator Fault

"I recently made a superhet, but cannot obtain any signals. I have made many tests and have adjusted all trimmers until I am tired of trimming. I wonder if there is any way of knowing whether or not it is due to the frequency changer not working.

### 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.

I assume that unless the oscillator is actually oscillating no signals would be received and I am not certain how to test this point in the set."  
—D. R. A. (Cardiff).

THE trouble mentioned is a fairly common fault in home-made apparatus, but it is not a difficult matter to ascertain whether the oscillator is in fact oscillating. Simply connect a milliammeter in the anode circuit of the oscillator stage and then touch the grid of the oscillator with a finger. This may be moistened to increase the effect. If the valve is oscillating the needle will rise when the grid terminal is touched, due to the fact that under the oscillating condition the current falls and earthing the grid (through the body capacity) prevents oscillation and thus current returns to normal. If there is no change in anode current, then the valve is not oscillating and tests should accordingly be carried out to ascertain the reason. The H.T. applied to the valve, the coupling between grid and anode windings, and similar points should be attended to.

## Coil Design

"I was thinking of making up a coil for a simple one-valver, but am rather uncertain regarding the type of aerial coil to use. The secondary will be wound in two sections for medium and long waves. The reaction is to be placed between these and will also be split. So far as the aerial winding is concerned, however, I wonder whether to split this also and fit a wave-changing switch across a portion, or whether to use a single winding for both medium

and long waves. Could you explain the merits of the two schemes, please?"  
—A. S. S. (Wisbech, Cambs).

IF you wind a single coil for the aerial this will have to be so placed that it will provide good coupling on both medium and long waves. On the other hand, by using a split winding you can arrange this to offer maximum coupling on medium and also on long waves. A single winding may be too small for the long waves or too large for medium waves, and therefore a switched winding may be regarded as offering maximum results. Unfortunately it is not always a simple matter to dispose the two sections of the winding in such a position that when one portion is short-circuited it does not affect the efficiency of the remaining portion, and therefore a lot depends upon the design of your coil.

### 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. B. (Walton-on-Thames). We regret that we are unable to supply layout or other details of the circuit in question.

H. W. C. (E.7). An output transformer would enable you to match the speaker correctly, or alternatively you could obtain one of the special extension speakers which have multi-ratio transformers fitted. These would be better than your old type unit.

E. V. W. (Enfield). We can supply blueprints of mains amplifiers, but you should obtain results with your apparatus if correctly connected. Perhaps you could give further details as to the method of connecting when we may be able to suggest the cause of your failure. A stamped addressed envelope should be enclosed if you require a postal reply.

T. W. W. (Aberdeen). We regret that the blueprint is now out of print and we are unable to supply any details. The design has, of course, been superseded.

W. J. W. (Caernarvon). We cannot supply a blueprint and do not know where you could get one as the paper is no longer on the market. We did not design the receiver.

F. G. T. (Cranwell). Your connections were in order, and it would therefore appear that the unit is defective.

W. A. J. (Newbridge-on-Wye). Have the valves tested by a dealer who has a proper valve tester. If they are in order, communicate with the makers of the receiver who may be familiar with the particular difficulty you are experiencing.

R. K. (Edinburgh). We could not recommend any of our blueprints to enable you to make a set from parts dismantled from your old receiver. You might be able to replace the coil by modern all-wave components, but as the set is not one of our designs, we are unable to give precise instructions for this purpose.

D. J. L. (Penygraig). The device is sold by Messrs. Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.

J. B. (Much Wenlock). The best procedure is to take a course at one of the Technical Training Colleges and on obtaining a Diploma or similar certificate you could apply to one of the well-known firms.

P. B. (Cheadle). Your sketch was too skeletonised to enable us to judge for certain, but we should imagine that you cut out the reaction winding and the reaction condenser was earthed. If the reaction winding was in the wrong direction the direct reaction condenser might have given better results and this could account for the effect.

M. J. K. (Londonderry). Upon receipt of a list of the receivers in which you are interested, and a stamped envelope, we will let you have the details you require.

S. McD. (Manchester, 12). We regret that we are unable to supply a blueprint for your particular arrangement.

L. W. (Birmingham). The coils may be unsuitable—there are Unigen, Universal, and Universal Type A, and the switching will have to be modified according to the coils you are using.

W. G. (Holyhead). An S.G.4 is a "straight" set. What modifications do you require?

W. C. S. (Siccup). Could you make an anode-current test? This would undoubtedly reveal the cause of the trouble.

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

# Practical and Amateur Wireless BLUEPRINT SERVICE

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.

**PRACTICAL WIRELESS**  
**CRYSTAL SETS.**

Blueprints, 6d. each.  
 1937 Crystal Receiver .. — .. PW71  
 The "Junior" Crystal Set .. 27.8.38 .. PW94

**STRAIGHT SETS. Battery Operated.**

**One-Valve: Blueprints, 1s. each.**  
 All-Wave Unipen (Pentode) .. — .. PW31A  
 Beginner's One-Valver .. 19.2.33 .. PW85  
 The "Pyramid" One-valver (HF Pen) .. 27.8.33 .. PW93

**Two-valve: Blueprints 1s. each.**  
 Four-range SuperMag Two(D, Pen) .. — .. 1W36B  
 The Signet Two (D & LF) .. 24.9.33 .. PW70

**Three-valve: Blueprints, 1s. each.**  
 The Long-range Express Three (SG, D, Pen) .. 24.4.37 .. PW2  
 Selectone Battery Three (D, 2 LF (Trans)) .. — .. PW10

Sixty Shilling Three (D, 2 LF (RC & Trans)) .. — .. PW34A  
 Leader Three (SG, D, Pow) .. 22.5.37 .. PW35  
 Summit Three (HF Pen, D, Pen) .. — .. PW37

All Pentode Three (HF Pen, D (Pen), Pen) .. 20.5.37 .. PW39  
 Hall-mark Three (SG, D, Pow) .. 12.6.37 .. PW41  
 Hall-mark Cadet (D, LF, Pen (RC)) .. 10.8.35 .. PW48

F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) .. 13.4.35 .. PW49  
 Genet Midget (D, 2 LF (Trans)) .. June '35 .. PM1  
 Cameo Midget Three (D, 2 LF (Trans)) .. 8.6.35 .. PW51

1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) .. — .. PW53  
 Battery All-Wave Three (D, 2 LF (RC)) .. — .. PW55  
 The Monitor (HF Pen, D, Pen) .. — .. PW61

The Tutor Three (HF Pen, D, Pen) .. 21.3.36 .. PW62  
 The Centaur Three (SG, D, P) .. 14.8.37 .. PW64  
 F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) .. 31.10.36 .. PW69

The "Colt" All-Wave Three (D, 2 LF (RC & Trans)) .. 18.2.39 .. PW72  
 The "Rapid" Straight 3 (D, 2 LF (RC & Trans)) .. 4.12.37 .. PW82  
 F. J. Camm's Oracle All-Wave Three (HF, Det., Pen) .. 23.8.37 .. PW78

1938 "Triband" All-Wave Three (HF Pen, D, Pen) .. 22.1.38 .. PW84  
 F. J. Camm's "Sprite" Three (HF Pen, D, Tet) .. 20.3.38 .. PW87  
 The "Barricade" All-Wave Three (SG, D (Pen), Pen) .. 30.4.38 .. PW89

F. J. Camm's "Push-Button" Three (HF, Pen, D, (Pen), Tet) .. 3.9.38 .. PW92  
 Four-valve: Blueprints, 1s. each.  
 Sonotone Four (SG, D, LF, P) .. 1.5.37 .. PW4  
 Fury Four (2 SG, D, Pen) .. 8.5.37 .. PW11

Beta Universal Four (SG, D, LF, Cl. B) .. — .. PW17  
 Nucleon Class B Four (SG, D (SG), LF, Cl. B) .. 6.1.34 .. PW34B  
 Fury Four Super (SG, SG, D, Pen) .. — .. PW34C  
 Battery Hall-Mark 4 (HF Pen, D, Push-Pull) .. — .. PW46

F. J. Camm's "Linit" All-Wave Four (HF Pen, D, LF, P) .. 20.9.36 .. PW67  
 All-Wave "Corona" 4 (HF Pen, D, LF, Pow) .. 9.10.37 .. PW79  
 "Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B) .. 12.2.38 .. PW83  
 The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC)) .. 3.9.38 .. PW90

**Mains Operated.**

**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 (D, Pow) .. — .. PW19

**Three-valve: Blueprints, 1s. each.**  
 Double-Diode-Triode Three (HF Pen, DDT, Pen) .. — .. PW23  
 D.C. Ace (SG, D, Pen) .. — .. PW25  
 A.C. Three (SG, D, Pen) .. — .. PW29  
 A.C. Leader (HF Pen, D, Pow) .. 7.1.39 .. PW35C  
 D.C. Premier (HF Pen, D, Pen) .. 31.3.34 .. PW35B  
 Ubique (HF Pen, D (Pen), Pen) .. 28.7.34 .. PW36A  
 Armada Mains Three (HF Pen, D, Pen) .. — .. PW38

F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D) .. 11.5.35 .. PW50  
 "All-Wave" A.C. Three (D, 2 LF (RC)) .. — .. PW54  
 A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) .. — .. PW56  
 Mains Record All-Wave 3 (HF Pen, D, Pen) .. 5.12.36 .. PW70  
 All-World Ace (HF Pen, D, Pen) .. 23.8.37 .. PW80

**Four-valve: Blueprints 1s. each.**  
 A. C. Fury Four (SG, SG, D, Pen) .. — .. PW20  
 A.C. Fury Four Super (SG, SG, D, Pen) .. — .. PW34D  
 A.C. Hall-Mark (HF Pen, D, Push-Pull) .. 124.7.37 .. PW45  
 Universal Hall-Mark (HF Pen, D, Push-Pull) .. 0.2.35 .. PW47  
 A.C. All-Wave Corona Four .. 6.11.37 .. PW81

**SUPERHETS.**  
**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 "Vitesse" All-Waver (5-valver) .. 27.2.37 .. PW75

**Mains Sets: Blueprints, 1s. each.**  
 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 .. PW59  
 F. J. Camm's Universal £4 Superhet 4 .. — .. PW60

"Qualiton" Universal Four .. 16.1.37 .. PW73  
**Four-valve: Double-sided Blueprint, 1s. 6d.**  
 Push-Button 4, Battery Model .. 22.10.38 .. PW95  
 Push-Button 4, A.C. Mains Model .. — .. —

**SHORT-WAVE SETS.**

**One-valve: Blueprint, 1s.**  
 Simple S.W. One-valver .. 0.4.38 .. PW83  
**Two-valve: Blueprints, 1s. each.**  
 Midget Short-wave Two (D, Pen) .. — .. PW39A  
 The "Fleet" Short-wave Two (D (HF Pen), Pen) .. 27.8.33 .. PW01

**Three-valve: Blueprints, 1s. each.**  
 Experimenter's Short-wave Three (SG, D, Pow) .. 30.7.33 .. PW30A  
 The Perfect 3 (D, 2-LF (RC and Trans)) .. 7.8.37 .. PW63  
 The Band-Spread S.W. Three (HF Pen, D (Pen), Pen) .. 1.10.33 .. PW68

**PORTABLES.**

**Three-valve: Blueprints, 1s. each.**  
 F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) .. — .. PW65  
 Parvo Flyweight Midget Portable (SG, D, Pen) .. 19.6.37 .. PW77

**Four-valve: Blueprint, 1s.**  
 "Imp" Portable 4 (D, LF, LF, Pen) .. 19.3.38 .. PW36  
**MISCELLANEOUS.**  
 S.W. Converter-Adapter (1 valve) .. — .. PW48A

**AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.**

Blueprints, 6d. each.  
 Four-station Crystal Set .. 23.7.38 .. AW427  
 1934 Crystal Set .. — .. AW444  
 150-mile Crystal Set .. — .. AW450

**STRAIGHT SETS. Battery Operated.**

**One-valve: Blueprints, 1s. each.**  
 B.B.C. Special One-valver .. — .. AW337  
 Twenty-station Loudspeaker One-valver (Class B) .. — .. AW449

**Two-valve: Blueprints, 1s. each.**  
 Melody Ranger Two (D, Trans) .. — .. AW389  
 Full-volume Two (SG det, Pen) .. — .. AW302  
 Lucerne Minor (D, Pen) .. — .. AW426  
 A Modern Two-valver .. — .. WM409

**Three-valve: Blueprints, 1s. each.**  
 Class B Three (D, Trans, Class B) Pan and Family Three (D, Trans, Class B) .. 25.11.33 .. AW410  
 £5 5s. S.G.3 (SG, D, Trans) .. 2.12.33 .. AW412  
 Lucerne Ranger (SG, D, Trans) .. — .. AW422  
 £5 5s. Three: De Luxe Version (SG, D, Trans) .. 19.5.34 .. AW435

Lucerne Straight Three (D, RC, Trans) .. — .. AW437  
 Transportable Three (SG, D, Pen) .. — .. WM271  
 Simple-Tune Three (SG, D, Pen) .. June '33 .. WM327  
 Economy-Pentode Three (SG, D, Pen) .. Oct. '33 .. WM337  
 "W.M." 1934 Standard Three (SG, D, Pen) .. — .. WM351  
 £3 3s. Three (SG, D, Trans) .. Mar. '34 .. WM354  
 1935 £6 6s. Battery Three (SG, D, Pen) .. — .. WM371  
 P.T.P. Three (Pen, D, Pen) .. — .. WM389  
 Certainty Three (SG, D, Pen) .. — .. WM393  
 Minutube Three (SG, D, Trans) .. Oct. '35 .. WM396

All-Wave Winning Three (SG, D, Pen) .. — .. WM409  
**Four-valve: Blueprints, 1s. 6d. each.**  
 65s. Four (SG, D, RC, Trans) .. — .. AW370  
 2HF Four (2 SG, D, Pen) .. — .. AW421  
 Self-contained Four (SG, D, LF, LF, Trans) .. Aug. '33 .. WM331  
 Lucerne Straight Four (SG, D, LF, Trans) .. — .. WM350  
 £5 5s. Battery Four (HF, D, 2 LF) .. Feb. '35 .. WM381  
 The H.K. Four (SG, SG, D, Pen) .. Mar. '35 .. WM384  
 The Auto Straight Four (HF Pen, HF Pen, DDT, Pen) .. Apr. '36 .. WM404

**Five-valve: Blueprints, 1s. 6d. each.**  
 Super-quality Five (2 HF, D, RC, Trans) .. — .. WM320  
 Class B Quadrydye (2 SG, D, LF, Class B) .. — .. WM344  
 New Class B Five (2 SG, D, LF, Class B) .. — .. WM840

**Mains Operated.**

**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  
 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 .. WM320  
 Harris' Jubilee Radiogram (HF Pen, D, LF, P) .. May '35 .. WM336

**SUPERHETS.**

**Battery Sets: Blueprints, 1s. 6d. each.**  
 Modern Super Senior .. — .. WM375  
 "Ardity" Four .. Oct. '35 .. WM305  
 The Request All-Waver .. June '36 .. WM407  
 1935 Super Five Battery (Superhet) .. — .. WM379

**Mains Sets: Blueprints, 1s. 6d. each.**  
 Heptode Super Three A.C. .. May '34 .. WM359  
 "W.M." Radiogram Super A.C. .. — .. WM366

**PORTABLES.**

**Four-valve: Blueprints, 1s. 6d. each.**  
 Holiday Portable (SG, D, LF, Class B) .. — .. AW393  
 Family Portable (HF, D, RC, Trans) .. — .. AW447  
 Two H.F. Portable (2 SG, D, QP21) .. — .. WM363  
 Tyers Portable (SG, D, 2 Trans) .. — .. WM367

**SHORT-WAVE SETS—Battery Operated.**

**One-valve: Blueprints, 1s. each.**  
 S.W. One-valver for America .. 15.10.33 .. 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 .. AW433  
 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. Simplified Short-wave Super .. Nov. '35 .. WM397

**Mains Operated.**

**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. .. — .. WM308  
 "W.M." Long-wave Converter .. — .. WM380

**Three-valve: Blueprint, 1s.**  
 Enigrator (SG, D, Pen) A.C. .. — .. WM362

**Four-valve: Blueprint, 1s. 6d.**  
 Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) .. Aug. '35 .. WM391

**MISCELLANEOUS.**

S.W. One-valve Converter (Price 6d.) .. — .. AW320  
 Enthusiast's Power Amplifier (1/6) Llatener's 5-watt A.C. Amplifier (1/6) .. — .. WM392  
 Radio Unit (2v.) for WM392 (1/-) .. Nov. '35 .. WM398  
 Harris Electrogram (battery amplifier) (1/-) .. — .. WM399  
 De Luxe Concert A.C. Electrogram (1/-) .. Mar. '36 .. WM403  
 New Style Short-wave Adapter (1/-) .. — .. WM383  
 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/-) .. — .. WM405  
 Wilson Tone Master (1/-) .. June '36 .. WM406  
 The W.M. A.C. Short-wave Converter (1/-) .. — .. WM408

**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.

**SOUTHERN RADIO'S Bargains.**

**5/-** BARGAIN Parcels of Useful Radio Components, coils, transformer resistances, condensers, wire, circuits, etc., value over 20/-; 5/- per parcel.

**7/6** ELSEN W349 Midget Iron Core Coils, 3/6; dual range coils, 2/6; with aerial series condenser W76, 3/3.

**A** C./D.C. Multi-meters, 5-range, 8/6; Ace "P.O." microphones, 4/-.

**2/6** ORMOND Loud Speaker Units, new and boxed, 2/6 each.

**36** ASSORTED 1-watt Wire-ended Resistances, 5/6; 24 tubular condensers, assorted capacities up to 0.5 mfd., 6/-; volume controls, assorted capacities (less switch), 7/6 dozen; with switch, 11/6 dozen; mica condensers, assorted, 1/0 dozen; Mains-bridge type condensers, 1 mfd., 2 mfd., 4 mfd., 8 mfd., 8/- dozen; valveholders, 5-pin, 7-pin, 9-pin, 2/6 dozen; battery leads, multi-way, 4/6 dozen; parcel of assorted servicing components comprising resistances; tubular, mica, variable, electrolytic and block condensers; wire; sleeving; volume controls; valveholders, etc., etc., 10/- each; parcel containing all 100 articles.

**SOUTHERN RADIO**, 46, Lisle Street, London, W.C. Gerrard 6653.

**RESISTANCES!**—Parcels of 50, 1-watt to 2-watt consisting of 20 useful values, only 1/0 for 50—Harrison & Co., 89, Great Portland Street, London, W.1. Langham 2471.

**Vauxhall.**—All goods previously advertised are still available. send now for latest price list, free.—Vauxhall Utilities, 163a, Strand, W.C.2.

**CONVERSION UNITS** for operating D.C. Receivers from A.C. Mains, 100 watts output, £2/10/0. 150-watt Model for operating Radiogramophones, £3/10/0. Send for lists.—Chas. F. Ward, 46, Farringdon Street, London, E.C.4. Tel.: Holborn 9703.

**LOUDSPEAKER REPAIRS**

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

**NEW LOUDSPEAKERS**

**3,000** SPEAKERS from 6/6 each, P.M. and energised 4in. to 14in., including several Epoch 18in.—Sinclair Speakers, Alma Grove, Copenhagen Street, N.1.

**NEW RECEIVERS, COMPONENTS AND ACCESSORIES**

**BANKRUPT Bargains.**—Brand new 1938 Philco model 847—Empire 8. Finest 8-v. All-wave Superhet available. Exceptional short-wave performance. 4 W.B. in maker's sealed carton with guarantee. List price, 20 guineas: cash price, £13 13s. 0d. Send 1½d. stamp list of other bargains.—261-3, Lichfield Road, Aston, Birmingham.

**"STAND-BY"** Crystal Set. Specified coil 2s., case 9d., or complete kit of parts 10s. 3d., post free.—T. W. Thompson and Co., 176, Greenwich High Road; S.E.10.

**BANKRUPT BARGAINS.** New Goods. Crosley 5v. press-button car radios, £5/15/0. 1939 Truphonic all-wave superhets, 10½ gms. list, 6 gms. Many others up to 10v. Valves, components, etc. Write for quotations.—Butlin, 6, Stamford Avenue, Brighton.

**PREMIER RADIO**

1939 Premier Short-Wave Kits

Complete to the last detail including all Valves and coils, as well as theoretical and wiring diagrams and lucid instructions for building and working. Each kit is supplied with a steel Chassis and Panel and uses plug-in coils to tune from 13 to 170 metres.

1 Valve Short-Wave Receiver or Adapter Kit 17/6  
1 Valve Short-Wave Superhet Converter Kit 20/-  
1 Valve Short-Wave A.C. Superhet Converter Kit 22/6

2 Valve Short-Wave Receiver Kit 25/-  
3 Valve Short-Wave Screen Grid and Pentode Kit 58/6

**PREMIER U.S.A. QUARTZ TRANSMITTING CRYSTALS.** 7 mc-Band, 10/- each, with Calibration Certificate. Enclosed holder and Base, 3/-.

**PREMIER MOVING COIL METERS**  
Guaranteed Accuracy within ± 2 per cent.  
Model No. 21. Model No. 311.  
3in. square case. 3in. diameter round case.

0-1 mA	18/6	0-1 mA	22/6
0-10 mA	17/6	0-10 mA	20/-
0-50 mA	17/6	0-50 mA	20/-
0-100 mA	17/6	0-100 mA	20/-
0-250 mA	17/6	0-250 mA	20/-

Model 311. 0-1 mA movement, with calibrated scale, volts-ohms-mA., 25/-.

**VOLTAGE MULTIPLIER RESISTANCES**, guaranteed accuracy ± 2 per cent. All standard ranges, 1/3 each.

**TAPPED SHUNT** to provide readings of 5 mA., 25 mA., 250 mA., and 1,000 mA., 5/6.

**PREMIER A.C./D.C. MOVING IRON METERS.** 2½in. diam. Flush Mounting. All ranges. 10 mA./30 mA. 50 mA./100 mA./250 mA., 5/9 each.

**AMMETERS.** 1, 3, 5, 10 or 30 amps., 5/9 each.

**SHORT-WAVE COILS.** 4- and 6-pin types, 13-20, 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.

**ULTRA S.W. COILS.** 4-10 metres Wound silver-plated Wire. Mounted on Tritoluit base. Inside diam. coils ½in., 3, 4, 5, 6 or 7 turns, complete with base, 1/- each.

**UTILITY Micro Cursor Dials,** Direct and 100 : 1 Ratios, 3/9.

**PREMIER Short-Wave Condensers**, all-brass construction with Tritoluit insulation. 15 mmf., 1/6; 25 mmf., 1/7; 40 mmf., 1/9; 100 mmf., 2/-; 160 mmf., 2/3; 250 mmf., 2/6.

**TROLUIT DOUBLE SPACED TRANSMITTING CONDENSERS.** 15 mmf., 2/9; 40 mmf., 3/6; 160 mmf., 4/6.

**NEW TROLUIT SPLIT STATOR CONDENSERS,** 50 x 50 mmf., 10/6.

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

**NEW PREMIER MULTI-RATIO OUTPUT TRANSFORMERS,** 21 ratios from 15 : 1 to 150 : 1; Suitable Class B or Push-Pull, 5/9 each.

**AMERICAN VALVES.** We hold the largest stocks of U.S.A. tubes in this country and 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.

**EUROPA MAINS VALVES,** 4 v. 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 H. ex. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 3½-watt D.H. Triode, 7/6. 350 v. and 500 v. F.W. Rect., 5/6. 13 v. 2 amps. 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, 5/6 each.

**CARDBOARD ELECTROLYTIC CONDENSERS,** 4 mf. or 8 mf. 500 v., 1/8 each, 8+4 mf. 500v., 2/3, 8+8 mf. 500 v., 2/8, 4+4+4 mf. 500 v., 2/6, 16+8 mf. 500 v., 3/6.

**TUBULAR METAL CAN ELECTROLYTICS** by famous makers. 4 or 8 mf. dry, 500 v., 2/6 each. 8 mf. wet, 450 v., 2/3. 8 mf. 650 v., Peak dry, 4/-.

**OIL-FILLED HIGH VOLTAGE CONDENSERS.** 1,000 volts working : 1mf. 5/-, 2mf. 7/-, 4mf. 10/6. 2,000 volts working : 1mf. 8/-, 2mf. 12/-, 4mf. 14/-.

**BIAS CONDENSERS,** 6 mf. 50 v., 6d.; 50 mf. 12 v., 1/-; 25 mf. 25 v., 1/-; 50 mf. 50 v., 1/3.

**TUBULAR CONDENSERS,** all values from .0001 to .5 mf., 6d. each.

**U.S.A. VALVE HOLDERS,** 4, 5, 6 and 7 pin., 6d. each. Octals 9d.

**CERAMIC U.S.A. VALVE HOLDERS,** all fittings, 1/- each.

**PREMIER BATTERY CHARGERS.** Westinghouse Rectification. Complete. Ready for use. To charge 2 volts at ½ amp., 10/-; 6 volts at ½ amp., 15/6; 6 volts at 1 amp., 19/6; 12 volts at 1 amp., 21/-; 6 volts at 2 amps., 32/6.

Orders 5/- and over sent Post Free. Under 5/-, please add 6d. Postage.

Have you had our 1939 Catalogue, Handbook and Valve Manual? 90 pages of Radio Bargains and Interesting Data. **Price 6d.**

**ALL POST ORDERS TO:** Jubilee Works, 167, Lower Clapton Road, London, E.5. Anherst 4723.

**CALLERS TO:** Jubilee Works or our NEW PREMISES, 169, FLEET ST., E.C.4. Central 2833 or 50, High St., Clapham, S.W.4. Macaulay 2381.

**VALVES**

**AMERICAN Valves in Sealed Cartons**, all types 5/6 post paid.—Valves, 661/3, Harrow Road, N.W.10.

**NEW RECEIVERS AND CHASSIS**

**ARMSTRONG IMPORTANT ANNOUNCEMENT:** For the convenience of our customers we have moved to modern offices and showrooms at Walters Road, Holloway. Walters Road adjoins Holloway Arcade and is readily accessible from all parts of London. ARMSTRONG CO. will gladly demonstrate 1939 range of Radio chassis at the new premises. Kindly note in future all correspondence to Armstrong Manufacturing Co., Walters Road, Holloway, London, N.7.

**AGENCIES**

**THOSE** who want to find a progressive market for their radio sets should send their catalogues to Yunis Ahmad, Medan School, Mosul, Iraq.

**SITUATIONS VACANT**

**ROYAL AIR FORCE.** Men of good education required for enlistment and training as WIRELESS OPERATORS and ARMOURERS. Age limits 17-35—Write or call: R.A.F. Recruiting Depot, Victory House, Kingsway, London, W.C.2, or any R.A.F. Recruiting Depot.

**MISCELLANEOUS**

**THERE'S MONEY IN RADIO!**—If you understand radio you can make substantial profits in spare time. For hints and ideas get MONEY-MAKING MADE EASY, by L. Harvey Wood. Available from all booksellers, 2/6 net, or by post, 2/10, from the Publisher, C. Arthur Pearson, Ltd., Tower House, Southampton Street, London, W.C.2.

**"THE OUTLINE OF WIRELESS."** by Ralph Stranger. Fifth Edition, 8s. 6d.—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, or by post 9s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

**EVERYMAN'S WIRELESS BOOK,** by F. J. Camm, 3s. 6d. An invaluable book of reference, explaining the operation, upkeep and overhaul of all types of wireless receiver. 200 illustrations. From all Booksellers and Newsagents, or by post 4s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

**THE 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, or by post 4s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

**FREE ADVICE BUREAU**

**COUPON**

This coupon is available until May 20th, 1939, and must accompany all Queries and Wrinkles.  
**PRACTICAL AND AMATEUR WIRELESS,**  
13/5/39.

**ENGINEERING OPPORTUNITIES**

**Free!**

268 PAGES

This unique Handbook shows the easy way to secure A.M.I.C.E.E., A.M.I.Mech.E., A.M.I.E.E., A.M.I.A.E., A.M.I.W.T., A.M.I.E.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 today FREE and post free.

**British Institute of Engineering Technology,**  
409, Shakespeare House, 17, 18, 19, Stratford Pl., W.1

**New.. FROM COVER TO COVER.**

# "COMPLETE ELECTRICAL ENGINEERING"

**S**TUDY the information contained in this great new work and you will add considerably to your earning capacity in the electrical engineering world! **COMPLETE ELECTRICAL ENGINEERING** is offered to you at a price you can afford to pay. It is a complete library—a ready reference to the thousand and one applications of present-day electrical engineering. Its contents are absolutely comprehensive and deal with everything you can possibly want to know—from Electrical Power Supply to Talking Picture Equipment; from the Wiring of Modern Flats to Electrical Timing Instruments; from Emergency Storage-Battery Systems to Testing Electrical Machinery; from Lift Operation and Control to Garage Electrical Testing Equipment; from Time Switches and Time-Delay Devices to Electrical Welding Plant; from Refrigeration to Electric Meters and Cookers, etc. It is impossible in this space to include details of the 160 Sections, but the special brochure which is yours for the asking—and without obligation to purchase—will show you that **COMPLETE ELECTRICAL ENGINEERING** is the very work you have been looking for. It can be yours within a few days!

**63 EXPERT CONTRIBUTORS**

**OVER 3,000 PAGES** of Exclusive, Practical, Worth-While Information

**OVER 2,500** Action Photographs, Plans, Tables and Calculations.

**SPECIAL CHART CASE** containing 48 Invaluable Electrical Data Charts.

**TWO YEARS' ELECTRICAL POSTAL ADVISORY SERVICE**

**FREE**

The Electrical Engineers' Pocket Book presented to every purchaser.

Complete in 8 Vols.

Read what satisfied buyers say!

### Valuable Information

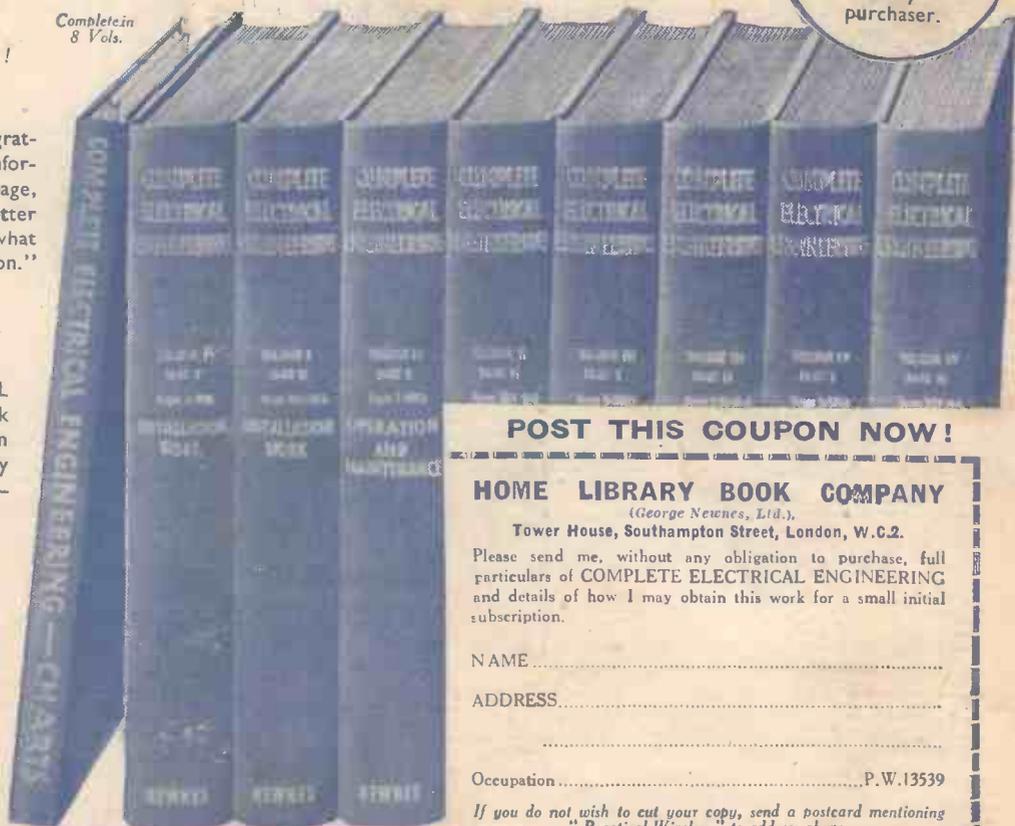
"I cannot refrain from congratulating you. . . . The valuable information is given in simple language, which achieves its aim far better than if it had been written in what I would call a high-brow fashion."  
—J. L. P. P. (Hull).

### Meets Requirements

"**COMPLETE ELECTRICAL ENGINEERING** is just the book I have been looking for. I am pleased to say that it meets my requirements admirably."  
—C. B. (Colindale, N.W.9).

### Electrical Education

"I have gained much pleasure and most valuable education from reading **COMPLETE ELECTRICAL ENGINEERING**. It has already repaid me its cost."  
—T. A. (Southport).



**POST THIS COUPON NOW!**

### HOME LIBRARY BOOK COMPANY

(George Newnes, Ltd.),

Tower House, Southampton Street, London, W.C.2.

Please send me, without any obligation to purchase, full particulars of **COMPLETE ELECTRICAL ENGINEERING** and details of how I may obtain this work for a small initial subscription.

NAME .....

ADDRESS .....

Occupation ..... P.W.13539

If you do not wish to cut your copy, send a postcard mentioning "Practical Wireless" to address above.

George Newnes, 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.

# MAKING A COIL-TESTING UNIT —

See Page 225

# Practical and Amateur Wireless

3<sup>d</sup>  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 14. No. 348.  
May 20th, 1939.

AND PRACTICAL TELEVISION



Making  
a

## TRANSVERSE-CURRENT MICROPHONE

Every Practical Wireless Service Man Should Have This Book

### PRACTICAL WIRELESS SERVICE MANUAL

By F. J. CAMM.

A Complete, Practical and Up-to-date Work on the Testing of all Types of Wireless Receivers. 288 PAGES and OVER 220 PHOTOGRAPHS, DIAGRAMS and PLANS.

From all Booksellers 5/- net or by post 5/6 direct from the Publishers, George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, London, W.C.2.

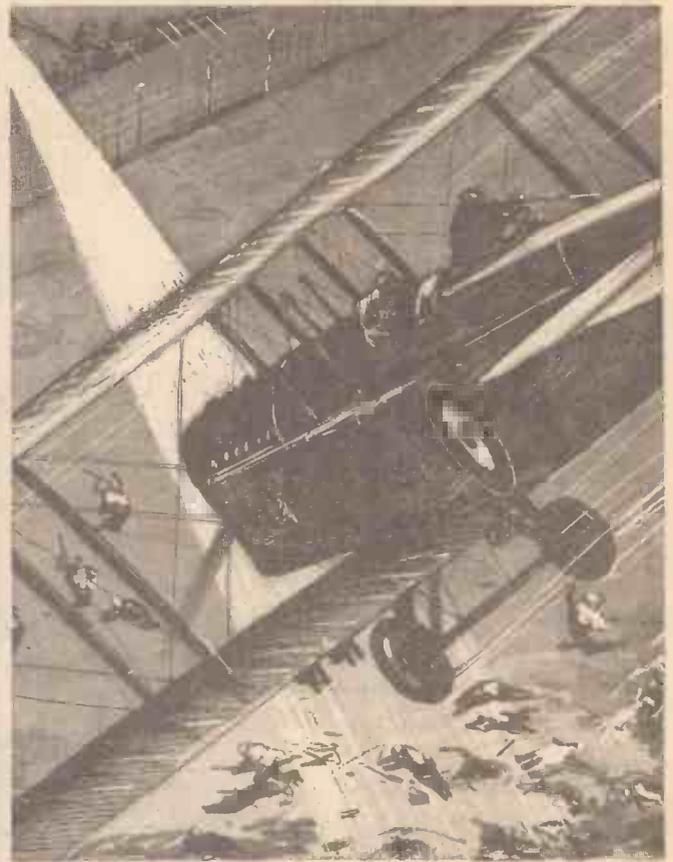
*Player's  
Please*

**EVERYONE**

**MEDIUM or MILD**  
BOTH BLENDS ARE  
CORK-TIPPED or PLAIN  
10 for 6½d. 20 for 1/0½d.



N.C.C.451E



Pelham handled the big day bomber as though it were a fighter.

*Standard Wireless Books  
for the Serious Amateur*

**EVERYMAN'S WIRELESS  
BOOK**

By F. J. CAMM

A Radio Consultant for the Listener, Expert and Amateur Constructor, with Special Chapters on the Principles of Radio Telephony, Installation and Systematic Fault-finding. With 200 illustrations and Diagrams. General Principles of Wireless Receivers. Testing. Special Remedies for local conditions. Noises, their Cause and Remedy. Equipment Troubles. Short-Wave Troubles. Improving the Quality of Reproduction. Accumulators and Batteries, etc. 3/6 net. (By post 4/-)

**SIXTY TESTED WIRELESS  
CIRCUITS**

By F. J. CAMM

Modern circuits of every type. Diagrams and instructions for assembling and wiring. Details of components and notes on operation.

Including Chapters on Circuits for Battery and Mains-Operated Receivers, Adaptors, Units, Portables, Short-Wave Receivers, All-Wave Receivers, Amplifiers, and a Room-to-Room Communicator. 2/6 net. (By post 2/10)

Available from all booksellers or by post direct from the publishers

**GEORGE NEWNES, LTD. (Book Dept.),**  
Tower House, Southampton St., Strand, London, W.C.2

**The COLONEL  
REMEMBERS**

By Stanley Pelgrave Brown

A story of warfare in the desert, and of a debt to the Royal Air Force that was handsomely repaid.

Also many other thrilling  
Air Adventure Stories and  
Features.

IN THE  
JUNE **AIR  
STORIES**

Of all Newsagents and Bookstalls



# Superhet Faults and Remedies—See page 234



# 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. XIV. No. 348. May 20th, 1939.

## ROUND *the* WORLD of WIRELESS

### Microphones

FOR public address work or experimental work with amplifiers a microphone is a most important item, and many constructors have attempted to make up apparatus of this type without being highly successful. Ordinary carbon granules poured into a containing case with a diaphragm fitted in front forms the basis of a microphone, but for good results it is essential to watch a number of points. Noise is one of the main drawbacks of a poorly designed mike, and sensitivity is another point which has to receive careful attention. The ordinary simple carbon mike is probably the most sensitive but suffers from the background noise which is generated. Coming next to this type of instrument is the transverse-current mike, and when properly made up this is almost as sensitive as the simple carbon instrument and should be absolutely noiseless in use. In this issue we describe a small mike of this type, and a suggestion is made for housing it in a small car side-lamp obtainable from most car scrap dealers. Alternatively it may be mounted in any form of holder, and if the back and sides are closed it may be used on a stage or platform without any difficulty from feed-back effects.

### Norwegian Imports

THE Norwegian Department of Commerce has issued an order whereby no complete wireless receiver or components of foreign make may be imported without a special licence. The order does not apply, however, to single loudspeakers.

### Broadcast of Trials

FROM Poste Parisien important legal trials are being broadcast as an experiment, the process being carried out in a reconstruction in the studio. Skilled reporters give verbatim accounts of the trials and procedure, and the B.B.C. are stated to be watching the results with interest.

### U.S.A. and Switzerland

IN the past Switzerland has had to rely upon a link through England in order to communicate with the U.S.A., but a new S.W. station has now been put into operation whereby it will be possible to obtain direct communication between the two countries.

### New Generator

SIR AMBROSE FLEMING, D.Sc., F.R.S., recently announced a new method of generating electric currents. The idea is to pass silica powder through a perforated metal sheet, and it is stated that this causes the metal to become electrified positively—the powder becoming negative. It is anticipated that some important developments may result from this idea.

### On Other Pages

	Page
This Year's Radiolympia ..	219
Making a Transverse Current Microphone ..	220
On Your Wavelength ..	221
Short-wave Section ..	223
A Coil Testing Unit ..	225
Readers' Wrinkles ..	227
Practical Television ..	228
Radio in Aviation ..	229
Mastering the Morse Code	232
Some Superhet Faults and Remedies ..	234
Practical Letters ..	237
Queries and Enquiries ..	239

### Manx Air Race

COMMENTARIES on the Manx Air Race are to be broadcast again this year, and the date is Saturday, May 27th. Regional listeners will first of all at noon hear a commentary recorded earlier in the morning when the 'planes make their start from Hatfield. Twice during the afternoon "live" commentaries are to be broadcast describing the progress of the competitors, and the finish of the race at Ronaldsway aerodrome in the Isle of Man. The race is to be a non-stop event and the turning point for the last lap over the sea to the Isle of Man will be over Blackpool's Stanley Park aerodrome, where Donald Avison will be the commentator. Alan Goodfellow will be the commentator in the Isle of Man.

### The Royal Tour

THE B.B.C. announce that in addition to the broadcasts of the six main events of their Majesties' tour of Canada and America, Mr. Richard Dimpleby, of the B.B.C. News Department, will broadcast descriptions, about three times a week, of the receptions and functions along the route and throughout the visit.

These reports will be supplemented by recordings made on the spot.

The B.B.C. commentator will travel in the pilot train and will observe the scenes of welcome on the journey from Quebec to Victoria, eastwards to Niagara, through Washington and New York and, finally, to Halifax, the point of departure for England

### British Amateur Golf Championship

COMMENTARIES straight from the links by Henry Longhurst are to be broadcast at intervals during May 26th and May 27th on the British Amateur Open Golf Championship, which is being played on the Royal Liverpool Golf Club's course at Hoylake, Cheshire.

### Speed Aces at Play

MIDLAND contributes another of its "Inn-door Games" to "Roundabout" on May 17th (Regional).

This time the inn chosen is "The Plough" at Coventry, a popular resort of a number of crack motor-racing drivers, whose favourite game is "nomination bagatelle."

### British Amateur Dancing Championships

LONDON and other Regional listeners, as well as those in the North, will be able to hear a running commentary on the British Amateur Dancing Championships finals from the Empress Ballroom, Blackpool to be given by P. J. S. Richardson, on May 18th. Music will be provided by Norman Newman and his band, with Horace Finch at the organ.

### English Light Music

JOSEPH LEWIS will conduct a section of the B.B.C. Orchestra in a programme of contemporary English Light Music on June 3rd, when Joseph Farrington (Bass) will be the soloist. The programme will include the first performance of a "Valse Caprice" by Denys Grayson.

# ROUND the WORLD of WIRELESS (Continued)

## Gala Broadcast from Belgium

ON the occasion of the visit of the Queen of the Netherlands to Brussels on May 23rd-26th, the I.N.R. radio stations will transmit several special programmes with a running commentary on the arrival of Her Majesty at the North Station of the Belgian capital. Amongst the broadcasts made to commemorate the event, the stations will relay the gala performance given at the Brussels Opera House on May 24th at B.S.T. 21.30.

## Radio Ardennes

A SMALL private broadcasting station installed at Libramont (Belgium) works daily on 367.4 m. (1121.6 kc/s), from B.S.T. 07.00-09.00.

## A Super-power Station at Tunis

IN view of the international political situation the French authorities have decided to carry out immediately a complete reconstruction of the Tunis broadcasting transmitter in order that its power may be increased to 120 kilowatts. The cost of the improvement will exceed seven and a half millions of francs.



Miss Rita Cave, of Birmingham, the British Broadcasting artist, who recently featured in the "Alpine Hut Series," has now joined the A.R.P., and is attached to the London Volunteer Ambulance Service at the North-Western Ambulance Station at Hampstead. Our illustration shows Miss Cave, complete with gas-mask, undergoing training.

## New Belgian Transmitter

IN order to counteract the propaganda broadcast by the German Reich through the Langenberg (Cologne) station, the Belgian Government is seriously considering the installation of a small transmitter in the vicinity of Liege to broadcast in the German language to the inhabitants of the Eupen, Malmédy and St. Vith regions.

## John McCormack Recital

COUNT JOHN McCORMACK, who, it may be remembered, appeared in "Scrapbook for 1903" last December, will

## INTERESTING and TOPICAL NEWS and NOTES

broadcast from a B.B.C. studio on May 27th (National). His programme will include two Irish songs arranged by Herbert Hughes, "The Old House," by Frederick O'Connor, and songs by Handel, Martini

## Tunes from Famous Musical Plays

"FROM THE FIRST ACT," a Northern programme to be broadcast on May 21st, will present music from famous musical plays including "The Grand Duchess," "Catherine," and "The Student Prince." The B.B.C. Northern Orchestra, the Grosvenor Singers, Norah Moore (soprano) and A. Bell Walker (tenor) are to take part. Arthur Spencer will conduct.



One of the most important parts of any ship at sea is the wireless cabin, and this applies especially aboard the "Empress of Australia," on which the King and Queen left England recently for Canada. Here is a view of the wireless cabin of the liner.

and Hamilton Harty. This will be his first recital broadcast in this country.

## Gounod—The Man and His Music

TO the life and work of Gounod, one of the foremost French composers during the latter half of the last century, the B.B.C. Music Productions Section is devoting a programme on May 21st (National) that should appeal strongly to music lovers everywhere.

Musically, the broadcast has been arranged by Max Robertson, the young man whose programmes of unfamiliar opera have been so successful.

## Opera from Covent Garden

"IL TROVATORE" will be broadcast in its entirety on May 23rd, Acts 1 and 2 on the Regional, and Acts 3 and 4 on the National wavelength.

## New Spanish and Portuguese Bulletins

THE B.B.C. inform us that a daily service of news bulletins, broadcast in the Spanish and Portuguese languages, and designed for reception in Spain and Portugal, will shortly be inaugurated. The bulletins will be transmitted on short waves only from the Daventry station of the Corporation. The date on which transmissions will start, the times at which the news will be broadcast, and the wavelengths to be used, will be announced as soon as these have been arranged.

## SOLVE THIS!

### PROBLEM No. 348

Atkins built an A.C. four-valve receiver which gave very good results. He was not perfectly satisfied with the quality of reproduction, however, and whilst passing a "Radio Surplus" store, noticed some well-known energised speakers for sale at a low price. He purchased one with a view to giving improved results compared with his existing model and connected the field in place of his existing smoothing choke. Results were very poor. He thought the speaker must be defective, but when this was tested by the supplier it was passed as perfectly in order. What was Atkins' trouble? Three books will be awarded for the first three correct solutions opened. Entries must be addressed 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. 348, in the top-left-hand corner and must be posted to reach this office not later than the first post on Monday, May 22nd, 1939.

### Solution to Problem No. 347

Jackson overlooked the fact that when using an A.C. meter with one side to chassis he would obtain a reading on either rectifier heater terminal, equivalent to the total output of the two secondary windings. His test should have been made across the two heater terminals, not across heater and anode.

The following three readers successfully solved Problem No. 346, and books have accordingly been forwarded to them: J. Wright, Coronation Way, Keighley, Yorks; E. Walker, "Courban," 153, Argyll Avenue, Luton, Beds; D. Chelsons, 18, Hillcrest Avenue, Edgware, Middlesex.

# THIS YEAR'S RADIOLYMPIA

Advance Details of Plans and Designs for the Radio Exhibition

**E**ACH year we are told that the Radio Exhibition will be the best yet, and changes are made each year to endeavour to attract more visitors. It can truly be said that this year the exhibition should exceed in popularity all previous shows which have been held in this connection. Special arrangements are being made on all sides to make this the "greatest yet" and from the advance plans which we have received we believe that the attempts will succeed. Visitors will find that a most important change has been made in the lay-out of show, and contrary to the schemes which have hitherto been in force, all stands this year will be standardised. The general impression will thus be one of orderliness and uniformity—the interior of the stands being, of course, designed according to the particular-makers' ideas. The west end of the hall will be dominated by the well-known façade of Broadcasting House, whilst the east end will portray the Alexandra Palace television tower. This latter feature will not only be a decorative one, but it will house the main amplifier which will supply the television and sound programmes to the stands, and provide also direct access to a cinema hall and a novel Tea Garden situated round the gallery. The amplifier room, with its monitor television screens and speakers, its array of dials and pilot lights, and the white-coated engineers moving quietly and efficiently about their work, will provide visitors with an interesting aspect of broadcasting in action.

## "Side Shows"

As distinct from the various manufacturers' stands which form the main part of the exhibition there will be numerous "side shows" as in previous years, with the addition of a Model Factory. In this Palace of Industry, by co-operation with the Radio Component Manufacturers

Federation, visitors will be able to watch such interesting processes as bakelite moulding; repetition press work; coil winding; condenser manufacture; valve making and loud-speaker testing. The complete build-up of a radio chassis will be shown by a reconstruction of a typical assembly line, with actual chassis in the various stages of assembly and large-scale photographic reproductions illustrating each stage step by step.

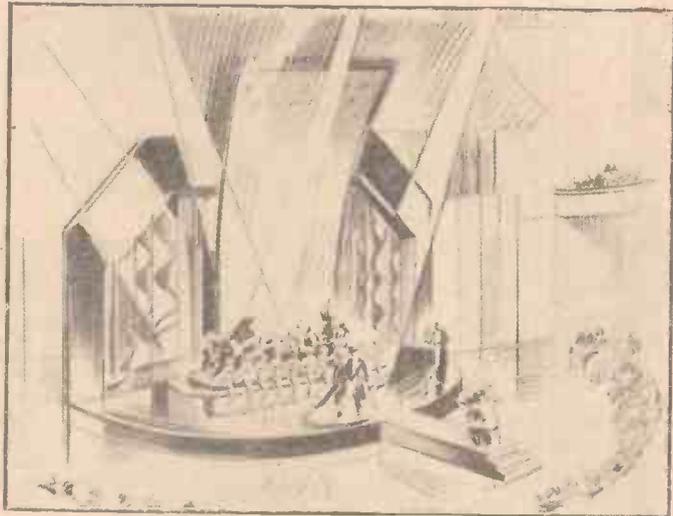
## The Fiddler's Ground

An enthusiast's happy hunting ground, full of exhibits of a technical nature—test gear, manufacturing processes, laboratory apparatus, etc.—will form an attraction for those who like to have knobs to turn, dials to watch, and otherwise indulge in the practical side of the hobby. The Service branches and Post Office Research exhibits will be better than at previous shows, and in the Cinema visitors will be able to rest and at the same time see various aspects of radio in the service of the community through the medium of interest and documentary films from the G.P.O. Film Unit and other non-proprietary sources.

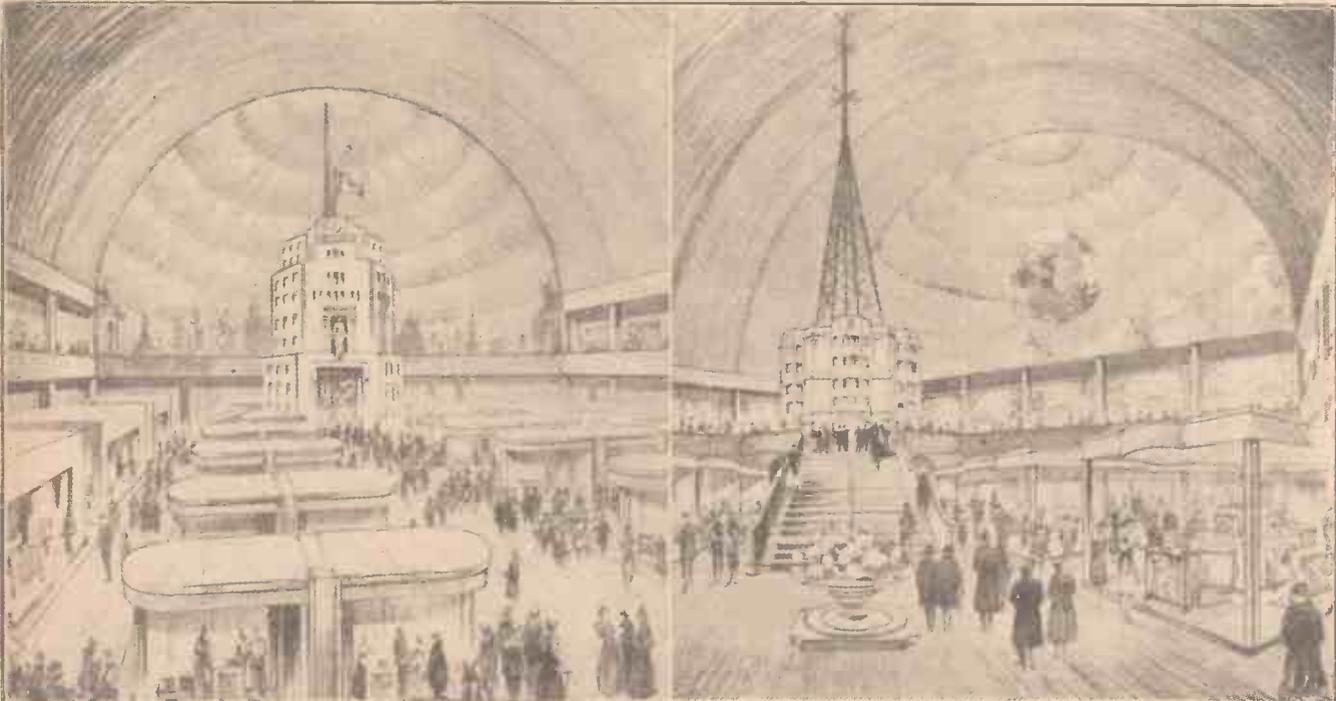
## The Stage Show

There will be a stupendous stage show, telling how artistes and producers and technicians achieve the miracle of radio

entertainment. Flesh-and-blood rehearsals, feature stars of microphone and camera, television in full view of the audience, a cavalcade of radio entertainment from pioneer days till now, personations of radio, these and a hundred other intimate, behind-the-scenes glimpses of broadcasting will be put on the stage at Radiolympia with the co-operation of the B.B.C. leading stars and producers. This will not be a sixpenny "peep-show," nor a west-end revue at west-end prices, but a live, stuff-of-radio entertainment with four or five compact sessions daily, put on in a vast amphitheatre designed for the purpose, and showing you just what you want to see—how radio and television looks from the inside. Once more, make a note of the date—August 23rd to September 2nd inclusive.



An artist's impression of the stage.



The dominant feature of the west end at Radiolympia is a replica of Broadcasting House, while the east end is surmounted by a representation of the Alexandra Palace television tower, which houses the main amplifier for supplying television and sound programmes to the stands.

# Making a Transverse Current Microphone

Complete Constructional Details of an Efficient General-purpose Microphone are Given in this Article. By L. O. SPARKS

WITH the development of the moving-coil, crystal and ribbon microphones, the once very popular transverse current type has been forced, so to speak, into the background, and many constructors have obtained the impression that it is therefore no longer suitable for serious work. While it cannot be denied that the modern types have more satisfactory characteristics as regards frequency response, when the matter is taken to fine limits, it would be incorrect to state that a good make of transverse current microphone cannot put up a very satisfactory performance when it is properly used in conjunction with a good amplifier and by an operator who has, at least, a fundamental knowledge of acoustics.

In common with many other pieces of apparatus, the transverse current microphone has been subjected to more than its fair share of abuse in the hands of inexperienced users and, unfortunately, the name has been applied to very inferior types of microphones whose design and construction could not allow them to even approach the performance usually associated with a model produced by a firm of repute.

It is not surprising, therefore, that the popularity of this type of microphone has waned, and it is all the more regrettable when one appreciates that it *does* offer many advantages over some of the more modern types, especially in so far as the average amateur is concerned.

In the first place, it is invariably more sensitive; secondly, it requires fewer stages in the associated amplifier, and allows less complicated and costly apparatus to be used; and thirdly, it is not so super-critical regarding its feeder lines or input control circuits.

From the point of view of home construction, it is about the only type which lends itself to this sphere of radio activity, unless, of course, one is blessed with a fairly well equipped workshop, a good stock of patience, and the ability to undertake precision work. As regards cost, the transverse current type is usually much cheaper than the others mentioned.

## Important Points

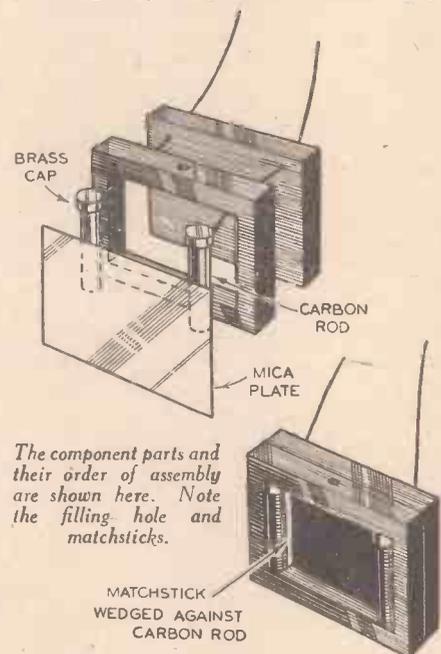
It must not be assumed from the above remarks that little or no care is required with the constructional work. As a matter of fact, it is very important for every consideration to be given to this, if an efficient job is to result.

For example, the carbon rods must be handled with care, and although they have to be rubbed down to make them a perfect fit in the body of the microphone, they must be kept free from the slightest trace of grease, such as that which can be deposited by the fingers. It is always

advisable, after giving them the final cleaning, to hold them in paper, or a piece of rag, and so prevent them from being touched by bare fingers.

Their connecting contacts must be positive, and free from any acid flux and possible intermittent connections. The body of the microphone must be perfectly air-tight when it is completed, and rigid and solid enough to be free from any tendency to vibrate or be susceptible to vibrations in its immediate vicinity.

The thickness of, and the material selected for, the diaphragm are very important items, as they can directly affect the frequency response and sensitivity



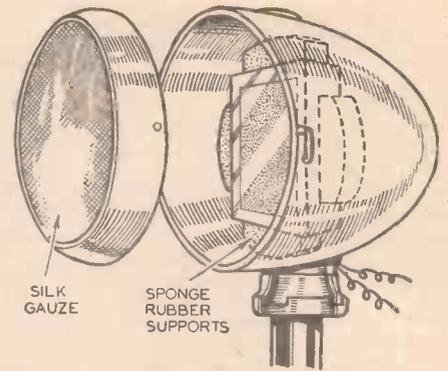
The component parts and their order of assembly are shown here. Note the filling hole and matchsticks.

of the completed microphone. The carbon granules must be of suitable high grade, and on no account should they be handled by the naked hand or left exposed to the atmosphere. Moisture and dust must be avoided at all costs.

The surface to which the diaphragm is to be fixed must be perfectly flat so that an air-tight joint can be formed without creating stresses or strains which would tend to produce distortion of the diaphragm.

## Constructional Details

The overall dimensions of the actual microphone in question are 1.9in. by 1.4in. by .5in. This size was decided upon as it has been proved from past experience that it is not necessary to make a huge, ungainly piece of apparatus to obtain



A suggested method for housing the microphone. The rubber supports are essential.

sensitivity or quality, and secondly, as it was intended to fit the completed microphone into the casing shown in the illustrations.

The body of the original model was constructed from  $\frac{1}{4}$ in. sheet ebonite, one piece being cut out 1.9in. by 1.4in. to form the back, and another piece of the same size for the front to hold the carbon rods and granules. In the front piece, an aperture 1.4in. by 1in. was cut and then the two pieces of ebonite stuck together by means of suitable adhesive.

A word of warning is necessary at this point; it is not easy to find an adhesive which will form a perfect joint between two pieces of ebonite; therefore it is advisable to rough the contacting surfaces by scribing diagonal lines with a pointed bradawl, so that the adhesive can get a firm grip. When the two pieces are ready for joining they should be put under pressure and left for as long as possible. A good shellac varnish was found to be a very satisfactory adhesive. As it is rather a tedious job trying to fix small diameter carbon rods by means of bolts, it was decided to try to eliminate this snag by using rods to which a soldered connection could easily be made. As this necessitated fixing small metal caps to the rods to enable the soldered connection to be made, the writer utilised the small rods used in dry cells.

Two cells which go to form an ordinary three-volt torch battery were broken open and the rods removed, and as the cells were practically new, little or no deterioration of the surfaces could be noted, so after one or two tests they were embodied in the microphone.

They were cut slightly over 1in. in length, measuring from the metal capped end, and gently rubbed down until they were a firm push fit into the aperture of the body. Frequent tests should be made during this reducing process, as if a shade too much is taken off they will become a loose fit, and unsuitable for the purpose. When they reach the required length, the brass caps must be cleaned with fine emery cloth, and a short length of thin, insulated wire soldered carefully to each. In the two corners where the metal caps will rest, a 1-32nd in. hole is drilled right through the back plate to enable the connecting wires to pass through, and while using the drill, another hole of 1-16th in. diameter can be drilled in the centre of the top of the aperture, i.e., the front plate, as this will be required for filling with the carbon granules.

After giving the carbon rods a final cleaning with very fine sandpaper or emery cloth, they can be fixed in position, but before passing the wires through their respective holes, put a drop of adhesive in

(Continued on page 235.)

# ON YOUR WAVELENGTH



By *Thermion*

## The Television Campaign

THE Wireless Retailers Association recently addressed a letter on the subject of television to the Archbishops of Westminster, Canterbury, and York. Additionally, the letter has been sent to the Bishops, and to the British and Foreign Bible Society. The letter solicits their support for the campaign which is being carried on for the extension of television to the provinces, and points out that the Church is directly interested in television by reason of its effect on the home life of this country. The letter states that there is indisputable evidence to show that where television receivers have entered the home, the knitting together of family life for the purpose of taking entertainment at home in preference to seeking it elsewhere is very marked. An interesting point mentioned in the letter is that many licenced houses in which television receivers were installed are now having them removed because the interest created in viewing the programme adversely affects the sale of alcoholic liquor. The possibilities and intellectual uplift by television programmes is stressed.

## The B.B.C. Questionnaire

IT is stated that over 4,000 viewers filled and returned to the B.B.C. the questionnaire on television programmes which they issued. A preliminary analysis shows that the majority of viewers are of the opinion that the programmes are satisfactory and improving. I do not know how it is possible for a thing which is satisfactory to improve. The most popular items appear to be plays and variety programmes direct from the theatre, newsreels, picture-page, and light entertainment. The present length of the evening programme, namely,  $1\frac{1}{2}$  to 2 hours, was considered sufficient. The women announcers appear to be more popular than men.

## All-dry Battery Set

THERE is evidently going to be a push on the part of the manufacturers to further the sale of portable sets this summer, and there seems a possibility that there will be a spate of all-dry battery

portables. It will be remembered that the portable of the no-accumulator type was introduced last January, and I learn that four other set manufacturers propose to market sets of a similar type very shortly. The battery firms have co-operated, and are already producing  $1\frac{1}{2}$ -volt L.T. units and combined L.T. and H.T. units. It is claimed that such units give a little over 200 hours use, and that the set can be put aside for eight weeks, and still be fit for use. The cost of such L.T. units is about 2s. 6d.

## Amateur Radio and A.R.P.

THE omission of amateur radio from the A.R.P. schemes has come in for a great deal of comment, in view of the increasing attention being given to civil defence, and as one of my correspondents points out, although the Home Office previously rejected offers of radio assistance for A.R.P. purposes, it is desirable that the matter should now be considered. When the amateurs first offered their services for A.R.P. the international situation was somewhat different to what it is to-day, and speaking generally, A.R.P. was not in full swing. Now, however, local authorities all over the country have received instructions from the Government to press on in A.R.P. schemes. Further, the Government has issued instructions to put A.R.P. on a permanent basis, therefore if evidence is available that amateur transmitters, listeners, radio and electrical engineers, and other qualified persons could operate satisfactory radio communication links, the necessary permission may be forthcoming. Interested readers should get into touch with their local councils without delay, and I am obliged to A. C., of Rawtenstall, for raising the point.

## The Soap Box Derby

ON Saturday, May 20th, viewers will be able to see the first "Soap Box Derby" ever organised in this country. The occasion is the Race Meeting arranged by the Road Racing Club, who are members of the British Motor Racing Organisers Association at the Crystal Palace, and the "Derby" has been arranged by the Editor of *The Scout*.

In America these miniature cars with their boy drivers attract enormous crowds, but the races are gravity races as the competitors start from the top of a specially built ramp and merely steer their cars to the winning-post. It was felt that the British boys were tougher, so *The Scout* Speedster competitors will race on the actual track and propel their cars by foot! All the cars have been built to specification, and are miniature facsimiles of racing cars.

A second preliminary trial is to be held at Donington Park on June 10th, and the finals are at Brooklands a week later.

*The Scout* is offering a certain number of free tickets for boys—and fathers!—for the latter meeting, and full particulars will be found in this week's issue.

## A Reader's Offer

C. H. P., of Tynemouth, tells me that he has a number of issues of *Amateur Wireless*, *Practical Wireless*, and PRACTICAL AND AMATEUR WIRELESS, complete with all issued blueprints, which he will supply free to anyone agreeable to pay the cost of carriage. I shall be glad to forward on the first request, which should be accompanied by 2s. 6d. for carriage.

## Running a Wireless Club

MR. H. H. GARNER, of the Stratford-on-Avon Church of England Central School, together with a number of other scholars, ex-scholars and friends, wish to undertake the formation of a wireless club, and they wish to have some practical information on how to go about it. Accordingly, in next week's issue I will publish some information on how to form and run a wireless club. In the meantime, if local readers would like to get into touch with Mr. Garner

they should do so at the address given.

### Chungking Broadcasting Station

THE Japanese invasion of China has given added importance to the Chungking Broadcasting Station which has just been built by the Marconi Company for the Central Broadcasting Administration of the Central Executive Committee of the Kuomintang. This station is designed for telegraphy and telephony, and in addition to four omni-directional aerials has directional aerials orientated on Europe and America. Apart from its telegraph services to other parts of China its broadcasting services are now the principal means of disseminating information by the Chinese Central Government.

Many readers may be interested in the following table of broadcasts from this station and reports should be sent in to the Marconi Company, Electra House, London, W.C.2.

#### CHUNGKING BROADCAST TRANSMISSIONS

Transmitter: Marconi SWB9. Power: 35 kW. Call Sign: XGOY.

Operating on 25.51 metres (11.9 megacycles) during Vernal Equinox to Autumnal Equinox. 31.58 metres (9.5 megacycles) during Autumnal Equinox to Vernal Equinox.

Local Time, 4.00 a.m. to 6.30 a.m. equivalent to London and Paris Time 9.00 p.m. to 11.30 p.m. and Berlin and Rome Time 10 p.m. to 00.30 a.m. the night before.)

Local Time	London & Paris Time	Berlin & Rome Time	Programme
4.00 a.m.	9.00 p.m.	10.00 p.m.	(15) National Anthem, Chinese Music, Time and Programme Announcement (Chinese, English, French, German).
4.15 a.m.	9.15 p.m.	10.15 p.m.	(20) Daily News Bulletin (Chinese).
4.35 a.m.	9.35 p.m.	10.35 p.m.	(15) Chinese Opera or Modern Chinese Music.
4.50 a.m.	9.50 p.m.	10.50 p.m.	(10) News of the Day or Speech (German).
5.00 a.m.	10.00 p.m.	11.00 p.m.	(15) Western Music.
5.15 a.m.	10.15 p.m.	11.15 p.m.	(10) News of the Day or Speech (French).
5.25 a.m.	10.25 p.m.	11.25 p.m.	(15) Western Music.
5.40 a.m.	10.40 p.m.	11.40 p.m.	(10) Daily News Bulletin (Italian).
5.50 a.m.	10.50 p.m.	11.50 p.m.	(10) Chinese Songs.
6.00 a.m.	11.00 p.m.	12.00 p.m.	(10) Daily News Bulletin (English).
6.10 a.m.	11.10 p.m.	00.10 a.m.	(5) Western Music.
6.15 a.m.	11.15 p.m.	00.15 a.m.	(10) Comments or Speech on Current Topics (English).
6.25 a.m.	11.25 p.m.	00.25 a.m.	(5) Time and Announcement (Chinese, English, French, German).
6.30 a.m.	11.30 p.m.	00.30 a.m.	Close Down.

### New Plans for B.B.C. Features

I AM informed that plans have now been completed to give a new drive and direction to the output of B.B.C. feature programmes. These have been worked out by Laurence Gilliam, head of the Feature Section of the Features and Drama Department, in collaboration with feature producers in all parts of the country. From their own experience, producers felt that their work would stand a better chance of getting and holding the attention of an increasing

## Notes from the Test Bench

### Earthing Screened Leads

IN many modern receivers certain leads are taken through stranded sleeving intended for earthing purposes. Some constructors attempt to solder tinned copper wire to this screening for the earth connection, but in doing so the internal insulated sleeving becomes charred and a short-circuit may eventually result. This difficulty may be overcome, if you are not very good at soldering, by adopting the following procedure. Cut off the length of sleeving slightly longer than is needed for the lead which is to be screened. Then carefully withdraw the internal insulated sleeving for about 1 in. to 1½ in. Bend over the spare length of outer screening material and make a hole through the side out of which the insulated sleeving may be pushed. The lead may then be passed through the insulated sleeving and the short hanging piece of screening material may be flattened and held beneath a bolt or nut on the chassis and thus be effectively earthed without soldering.

### Oscillator Note

WHEN using a practice oscillator (such as that described in the article in the issue on learning morse) the note will be governed, not only by the H.T. but by the transformer characteristic. For practice purposes it is often found desirable to change the note from day to day to avoid becoming familiar with one note when trying to read signals picked up on the radio. If the core of the transformer is removed entirely, a very high-pitched note will be obtained, and therefore by making up a small transformer with a sliding core, or merely by removing odd laminations as desired, the note obtained may be varied over a very wide range.

### Rack Construction

SOME readers have expressed disagreement with the principle of designing a transmitter on the rack system, it being argued that an unnecessary amount of space is wasted. It should be remembered that the reason for adopting this method of construction is that each section of the transmitter may be built on a separate chassis with its own panel and meters or controls, and thus should it be necessary at any time to make a change, for instance, in the P.A., this may be carried out and the amplifier connected to the remainder of the apparatus when completed. The effects of the change may thus be noted as the remainder of the circuit will remain unchanged. It also facilitates fault finding.

audience if it could be planned on a co-operative basis. It is hoped thus to present to listeners planned features — programmes with a broad continuity of appeal and the widest possible variety of subject and treatment.

This extension of feature programme work is the result of five years' experiment and expansion. As recently as 1933 only five feature programmes were broadcast in the course of the year. In 1938 over 200 full-length feature programmes were broadcast in the National and main Regional programmes.

Feature programmes now find a regular weekly place in the programmes, on Fridays between 8.0 and 9.0 p.m. In addition, an average of three features a week will be found in the programmes at other popular listening times.

The feature programmes for the coming year have been planned to carry out two main themes—the first is included under the comprehensive title of "The Face of Britain"; the second under the title of "International Understanding." Although these two themes will form the backbone of the year's feature programmes, other categories will not be neglected. Miscellaneous programmes, such as the "Famous Trials" series and "The Thin Red Line" series, will continue, and also many programmes of a light and popular appeal.

Under the heading of "The Face of Britain," it is hoped to give listeners a series of programmes reflecting the varied, complex and fascinating aspects of life in Britain to-day. Programmes descriptive of great towns and the countryside will be included and also special programmes whose aim it is to mirror the character of the people in these islands—their institutions, their occupations and the background against which their life is lived.

## PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM

400 pages, 6/- or 6/6 by post

from

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



# SHORT-WAVE SECTION

## USING YOUR OWN RECEIVER

How an Existing Receiver May be Used to Give Improved Results with other Short-wave Apparatus.

ONE of the commonest queries which we receive runs to the effect that "I have an 'X' All-mains Receiver. How can I use this to improve the results I get on my home-made short-wave one-valver?" In some cases the existing receiver is a battery model, but the main point in any case is that the reader wishes to use some part of that receiver as an addition to short-wave apparatus. Firstly, there are two ways in which this may be carried out—

times prevent a converter from functioning at its best, and therefore if you have a commercial superhet, before building a short-wave converter you should ascertain from the makers that it is suitable for use with that combination.

There are cases, however, where a reader builds either a one-valver or a multi-valver especially for short-wave work, and then wishes to make use of an existing receiver, and it is this with which we are more concerned here.

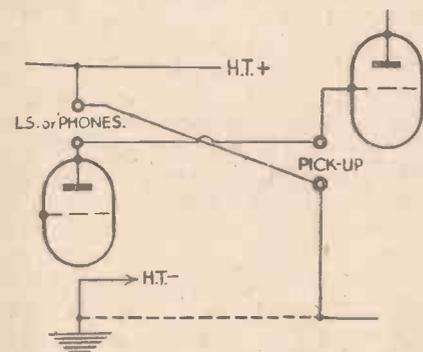


Fig. 1.—If a direct connection is made, the H.T. supply may be short-circuited as shown here.

### Pick-up Precautions

Most receivers are provided with pick-up sockets, and these are for high-impedance inputs. Thus the output of a one-valver or a receiver with L.F. stages could, theoretically, be connected to the pick-up sockets on any receiver, but there are one or two precautions to be observed. The output circuit of the normal receiver is fed from the anode of the last valve and from H.T., one output terminal being connected direct to the latter point. Consequently, this could not be joined to a normal pick-up input arrangement as in one position the H.T. would be short-circuited (Fig. 1) and in the other position H.T. positive would be

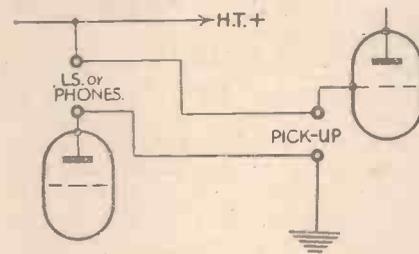


Fig. 2.—If the leads are reversed signals will not be obtained, as the anode is "earthed" and the L.F. valve receives positive bias from H.T.

applied to the grid of the L.F. valve, thus preventing signals (Fig. 2), apart from

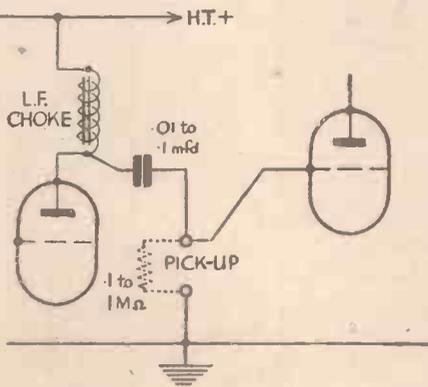


Fig. 4.—Choke-coupling may be used as a substitute for the transformer arrangement shown in Fig. 3.

the fact that the anode of the output valve would be earthed.

Both of these difficulties are easily overcome, however, merely by using a standard 1/1 output transformer to couple the two together as shown in Fig. 3. An ordinary L.F. transformer of low-ratio may be used in some cases, but to avoid overloading difficulties in the L.F. stages, it is preferable merely to use a 1 to 1 ratio.

### Choke Coupling

To avoid the expense of a transformer, and where you have a number of odd components available, it is in some cases possible to make use of choke coupling, as shown in Fig. 4. In this case an L.F. choke is joined to the output terminals, and this choke may be the primary of an old L.F. transformer, or the primary and secondary joined in series. From the anode terminal of the output pair a fixed condenser is connected to one of the pick-up terminals, and it is essential that this is the one which is joined to the grid of the valve. An

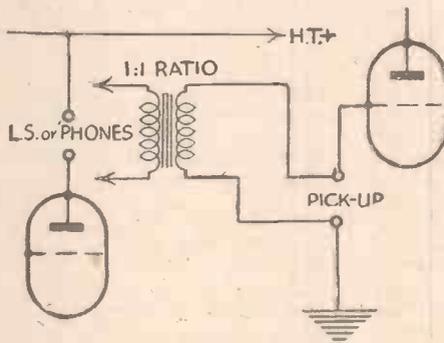


Fig. 3.—The troubles shown in Figs. 1 and 2 are avoided by using a transformer for coupling as shown here.

either by using an adaptor or converter in front of the set, or by using only the L.F. portion of the existing broadcast receiver. In the case of a short-wave adaptor, of course, the L.F. section is also used, but in this article we are more concerned with the method of adding the L.F. stages other than by means of an adaptor plug. For the benefit of new readers it may briefly be stated that a short-wave adaptor is simply a short-wave one-valver, the unit being provided with a 4 or 5-pin plug which is inserted into the detector valveholder of an existing set, and the valve from that stage then being used in the adaptor. This system permits the adaptor to receive H.T. and L.T. from the receiver with which it is used and simply employs the remaining (L.F.) stages to amplify the signals in the short-wave unit. A short-wave converter, on the other hand, is added in front of an existing broadcast receiver, and consists merely of a frequency-changer. Thus, all the valves in the existing broadcast receiver are used, the H.F. stages, which are essential when using a converter, acting as L.F. stages, and the complete combination is thus a superhet.

### Double Superhets

Unfortunately, apart from the fact that a converter can only be used with a receiver employing H.F. amplification, it is not always possible to use it with a superhet receiver. A superhet can, of course, be regarded as a receiver with H.F. amplification, and normally may be used with a converter, but certain commercial superhets on the market are provided with whistle-interference eliminating circuits and other special aerial input circuits and these some-

examination of the receiver may be necessary in order to find which terminal this is. Another point in this particular arrangement is that the grid circuit must be completed, and this may mean that a fixed resistance will have to be joined across the pick-up terminals, as shown in Fig. 4. A great deal depends upon the circuit, however, and it is not always found that the pick-up sockets or terminals are joined between grid and earth, as shown in any of these illustrations. In certain modern superhets a multi-valve, generally a double-diode-triode is used as second detector and first L.F., and a volume control is joined to the grid of the L.F. portion. The pick-up sockets are generally then joined across the volume control, and the operation of the radiogram switch breaks the preceding circuits to avoid radio breakthrough. In this case you can use either the arrangement shown in Fig. 3 or in Fig. 4, in the latter case, of course, the grid leak not being needed as the volume control takes its place.

### Circuit Changes

Suggestions have been made by some readers for changing the H.F. stages into L.F. so that all valves could be used, but in general this step should not be taken for several reasons. Apart from the unsuitability of the H.F. valves for L.F. amplification (without distortion) the circuit changes may be such that the standard of performance on the broadcast band may be seriously upset, and in most cases the change-over will not be worth while. In this connection it is also important to remember that if your short-wave set has

(Continued at foot of next page)

## Leaves from a Short-wave Log

### Warsaw on Increased Power

IT is reported from Poland that two 50-kilowatt transmitters are under construction at Warsaw to replace the 10-kilowatt plants now used by SPD (26.01 m., 11.535 mc/s) and SPW (22 m., 13.653 mc/s).

### Spain's Principal Short-waver

ON 9.88 mc/s (30.36 m.) you may now tune in lengthy musical programmes emanating from General Franco's Madrid station towards B.S.T. 22.00. The call is *Radio Nacional de España*. The station closes down with a military march which is sometimes followed or accompanied by a rattle closely resembling the staccato discharge of a machine gun.

### Amateurs Operate World's Fair Transmitter

THE special radio apparatus installed in the Communications Building of the New York World's Fair comprises 14 transmitters covering all amateur short and ultra-short wavebands. Three of these work on the five-metre band, two on 10 metres, two on 20 metres, one on 40 metres, two on 75 metres, and two on 160 metres. The call used so far is W2DKJ, and the power is 400 watts. During the entire period of the Fair the station will be on the air at B.S.T. 03.45 on the five-metre band for communication with radio amateurs in the two Americas, and with those dwelling overseas.

### China's Extra Channel

IN addition to the transmissions which are being carried out by the Chungking 35-kilowatt station XGOY on 25.21 m. (11.9 mc/s), this station also carries out a broadcast under call-sign XGOX, on 16.85 m. (17.8 mc/s), nightly between B.S.T. 03.00-04.00. Man and woman announcers. The languages used for these broadcasts are English, French, German, Japanese and Chinese, including the Malay, Canton and Amoy dialects. The studio opens and closes with the Chinese National Anthem.

### Another Romanian Broadcast

THE Polytechnic School of Bucarest (Romania) now operates a transmitter every evening towards B.S.T. 21.00 on 24.67 m. (12.16 mc/s). Occasionally the call is given in three or four European languages.

### The Best French Short-waver

IF you wish to listen to the Paris Radio Mondial programmes the best channel is 41.21 m. (7.28 mc/s), which may be tuned

in nightly as clearly as the local station. Although on the edge of the amateur transmitting band, it is seldom that the station is subject to any serious interference.

### Guadeloupe Changes Wavelength

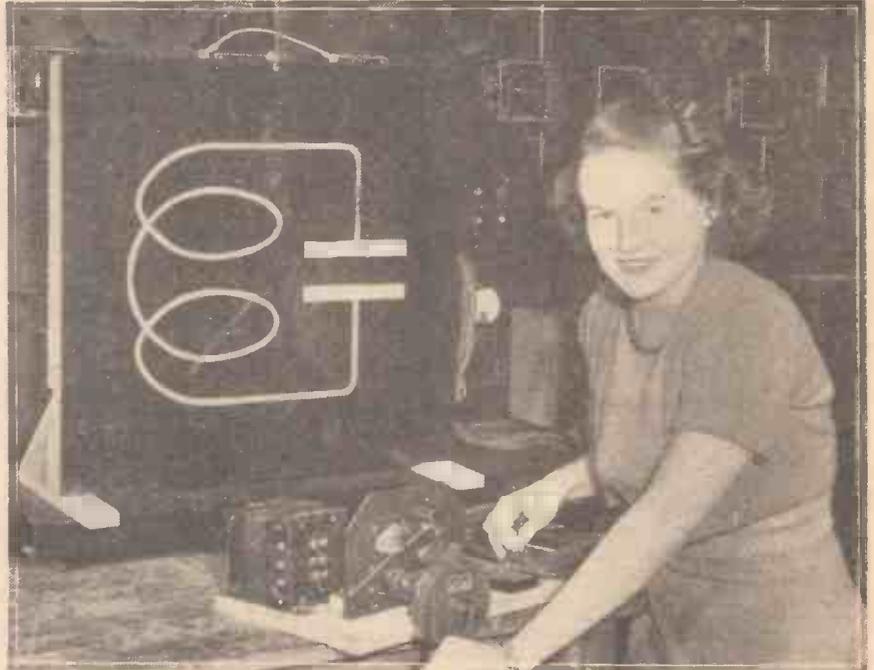
FG8AA, Pointe-à-Pitre, Guadeloupe (French West Indies), formerly on 42.5 m. (7.058 mc/s), is now logged on its new channel, 40.32 m. (7.44 mc/s). Music and speech may be heard almost nightly between B.S.T. midnight and 01.30. Ad-

### Experimental Broadcasts from Hungary

TEST transmissions on 25.32 m. (11.85 mc/s), emanating from a transmitter giving the call HAAQ2, Budapest (Hungary), have been recently heard between B.S.T. 21.00-22.00.

### Some Interesting Harmonics

HARMONICS from a medium wave transmitter frequently lead one to believe that a short-wave broadcast is being captured direct and in these cases identification is not always easy unless the call is actually heard. On channels above 50 metres the following are particularly insistent: 4th harmonic of Poste Parisien on 78.2m (3.836 mc/s) and the fifth of the



Kathryn Hutchinson, 16, one of the famous "Flying Hutchinson Family," hard at work with a unit of the amateur radio display which will be a feature of the Westinghouse Exhibit at the New York World's Fair, 1939. Preparing for a flight around the world, Kathryn is studying at R.C.A. Institute in New York, to qualify as a radio operator. She is an enthusiastic amateur and a member of the American Radio Relay League, which is preparing the display for the Westinghouse Building.

dress: Posto de Radiodiffusion FG8AA, Boite Postale, 125, Pointe-à-Pitre, Guadeloupe.

### Portugal's New Call-signs

THE Lisbon (Portugal) short-wave station Emisora Nacional now works on the following frequencies: CSW1, 11.84 mc/s (25.34 m.); CSW2, 11.04 mc/s (27.17 m.); CSW3, 9.94 mc/s (30.18 m.), and CSW4, 15.32 mc/s (19.58 m.).

same station on 62.56 m. (4.595 mc/s). The 5th harmonic of Rennes P.T.T. is also heard on 57.7 m. (5.2 mc/s). Radio Normandy possesses two powerful harmonics, namely, 7th on 39.14 m. (7.665 mc/s) and the 8th on 34.25 m. (8.76 mc/s).

**WORKSHOP CALCULATIONS, TABLES AND FORMULÆ**  
3/6, by post 3/10 from  
George Neunes, Ltd.,  
Tower House, Southampton St., Strand, W.C.2

### SHORT-WAVE SECTION

(Continued from previous page)

two or more L.F. stages it may be impracticable to connect it to another receiver, owing to the fact that the signal put out by the S.W. set may be too great to be handled by the first valve in the L.F. circuit of the broadcast receiver. In most cases this valve is only called upon to handle a very small grid swing, and is probably fed from the detector—if it is not actually the detector stage, changed to an L.F. for pick-up work. Consequently, it cannot be expected to handle a large input such as would be obtained from two or three L.F. stages. It is true that an L.F. volume control would overcome this difficulty, but the resultant amplification, after the control has been adjusted to avoid overloading will

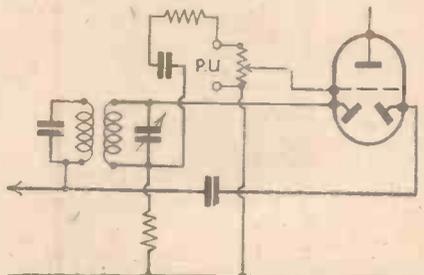


Fig. 5:—Pick-up connections are generally arranged as shown above in a double-diode triode circuit.

be no better than could be obtained with a single L.F. stage, and thus there is a waste

of L.T. and H.T. current. A similar effect will be met if the short-wave set has a pentode output stage. This will generally deliver enough volume on most stations to overload a small L.F. valve, and therefore when extra stages are added it would be desirable to replace the pentode by a small L.F. valve, modifying the grid bias accordingly.

The question of using the H.F. stages of a broadcast set is, of course, not worthy of consideration as these must be tuned to the frequency or wavelength of the station it is required to hear and this means that existing coils would have to be replaced and this amounts to rebuilding or converting the broadcast receiver into an all-wave model, a point which has been previously dealt with in these pages.

# A COIL-TESTING UNIT

## A Handy Tester for Checking Home-constructed Coils Under Working Conditions

**E**VEN if an inductance bridge or calibrated oscillator is to hand for the designing of home-constructed coils, it is most desirable to have some means for checking the coils under working conditions which at least very nearly approach the conditions in the receiver for which the inductances have been designed.

In the test unit described here, the conventional constants for a leaky-grid triode detector were chosen as being most suitable for the majority of "straight" receiver requirements.

It will be apparent that any similar piece of apparatus could be constructed for operation in conjunction with coils of shorter wavelength, but it must be pointed out here that although for normal medium and long waves, little error will be introduced in the system of coil-connecting fly leads, wavelengths considerably below this will require a closer form of coil coupling if stray capacities and high H.F. resistance paths are to be prevented.

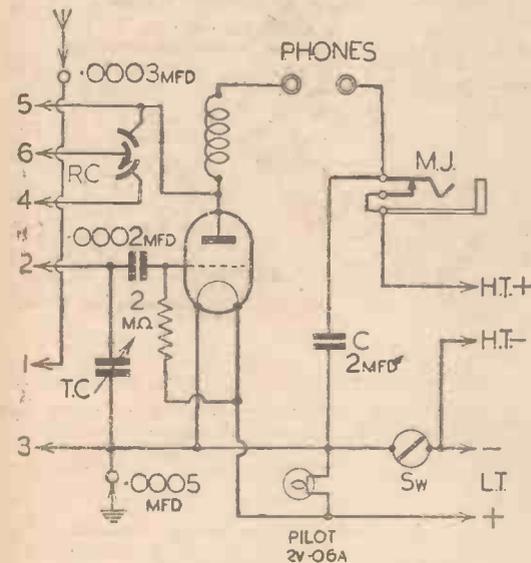


Fig. 1.—Theoretical circuit diagram of the tester.

### The Circuit

The circuit of this tester, as will be seen on referring to Fig. 1, is, in fact, that of a single-valve leaky-grid detector having all points which would normally be connected up to a tuning coil, taken to short fly leads conveniently located at the back of the chassis and terminated in crocodile clips.

The numerals 1 to 6 should not, however, be confused with the designations for standard four and six-pin coils, these numerals only serving in this instance as a guide to connections, and it is proposed that, as in the model pictorially illustrated in Fig. 2, these numbers will be stamped or suitably marked over the appropriate grumets through which the fly leads pass in the rear chassis runner.

Tuning and reaction condensers of the air-spaced type are chosen owing to their greater efficiency over the mica dielectric type, whilst to obtain slightly smoother reaction, a differential reaction condenser was decided upon.

When connecting the crocodile clips to, say, a dual-range coil having either aperiodic aerial coupling or simply a tapped grid winding, the normal sequence of connections which would be made when wiring up the receiver can be made by comparing the numbers depicted; this will be quite clear from the diagrams, and should be the matter of a few moments after a little practice with the tester to memorise the different

question; in fact, it may often prove desirable to insert a fixed condenser of approximately the same value (.0003 mfd.) as the differential section between the anode of the receiver detector and earth, as is frequently done, to obviate reaction "plop."

Such considerations will automatically arise during experiments, and to quote a further example it may be found that by spacing one or two turns of a winding, sensitivity will be improved to an appreciable extent, but to prevent instability occurring through inductively-coupled fly leads, the grid and reaction circuit leads should be kept as clear of each other as is possible, without resorting to longer connections.

It is immaterial whether a combined series medium and long-wave reaction winding is being used with or without a switching scheme, these two reaction

windings being simply treated as one, and with switching, the medium and long-wave sections being connected by transferring the earth clip, which may be a "duplicate," as mentioned previously.

In cases where the moving vanes of the reaction condenser are "live" in respect of earth, leads Nos. 4 and 5 can be ignored

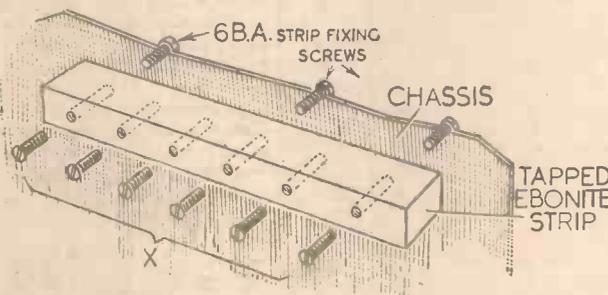


Fig. 3.—Ebonite strip and screws for holding crocodile clips.

points in the circuit.

By taking the aerial and earth lead-in wires to terminals on the chassis, the usual objection in the nature of these heavy leads being clipped to the coil directly is obviated.

Whilst only one clip is shown fitted to the common earth lead No. 3, it will be realised that more than one clip and lead could be connected to save twisting the ends of different coil windings together, provision also being made for other clip-holding screws in the ebonite strip; see "X" in Fig. 3.

As it is a simple matter to transfer clip No. 3 from the junction of the medium and long-wave windings to the earth end of the long-wave winding, it was considered unnecessary to incorporate a wavechange switch in the tester, but this is one of the many optional features in this design.

### Reaction Considerations

Difficulties need not arise owing to the use of a differential reaction circuit in the tester when a straight reaction system is used in the receiver in

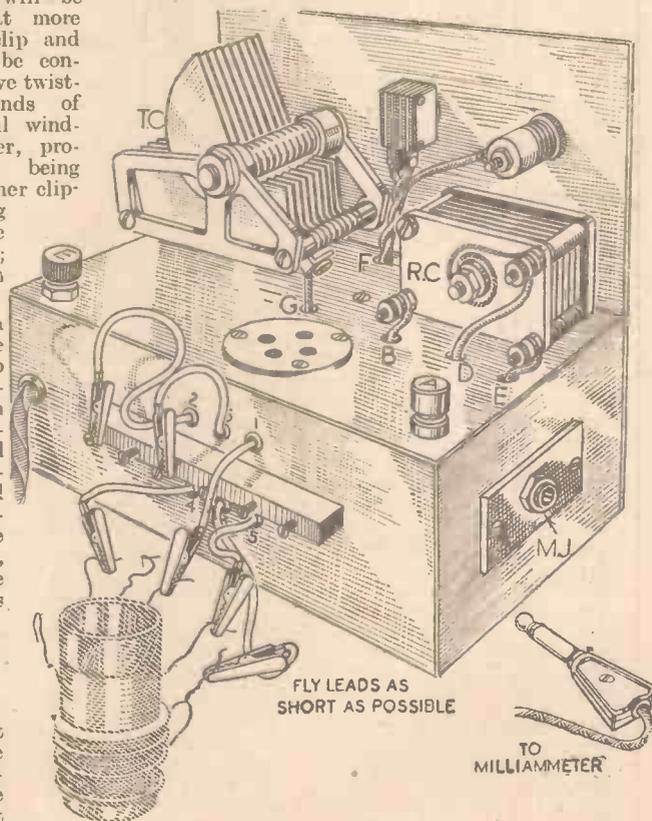


Fig. 2.—Rear view of the completed tester.

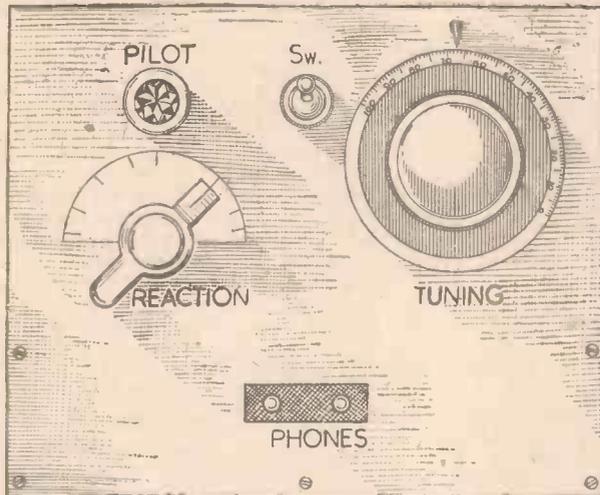
**COIL-TESTING UNIT**

*(Continued from previous page)*

and the other end of the winding (the anode end) taken to No. 6 only.

The anode H.F.C. may be screened or unshielded, but should be of the type having a reputable characteristic.

The meter jack, M.J., is a refinement which was considered useful from the point of view of determining, visually, different degrees of reaction and sensitivity since, as will be apparent to most readers, when the valve goes into a state of oscillation, the anode current falls, so that in this way with an appropriate meter scale, a visual as well as audio indication is obtained; this is characteristic of a leaky-grid detector.



**Suppressing Instability**

Instability through feed-back is likely to occur during this state of the valve, and for this reason a low-impedance path to earth is provided in the connection of a large by-pass condenser "C" connected across the H.T. circuit, this also serving the purpose here of shunting the milliammeter which is plugged in through the medium of the circuit-interrupting jack, thus any tendency for instability arising at this point will be suppressed.

The valve should be of the high-impedance type, and for most requirements operated at a potential of about 75 volts.

It is important to see that the crocodile clips do not short-circuit with each other when the tester is switched on as this can result in the indirect short-circuit of the H.T. as a series condenser is not wired between No. 5 lead and the anode of the valve. The pilot light is included for this reason, serving as a reminder that the switch is still on.

The chassis detailing is not of a critical nature, and although 16 gauge aluminium was used for this particular model, there is no reason why ply-wood, either plain or metallised, should not be employed, but it is preferable to use a metal front panel to guard against hand-capacity effects.

As illustrated in Fig. 4, a paper dial can be used to advantage, so that marking limits for different types of home-made coil can be readily checked, otherwise a neat dial plate of the Bulgín type IP8 could be used, the various settings being logged in the coil-data note book.

Any suitable slow-motion dial can be used for the tuning condenser, and for neat and compact front panel layout the plain

ebonite vernier knob is recommended as depicted in Fig. 4.

**Under-chassis Wiring**

Referring now to the under-chassis wiring diagram in Fig. 5, it will be seen that the majority of the connections can be carried out with rubber covered flex, the black wires shown representing tinned copper wire covered with Systoflex, and for the newcomer it advised that these latter connections be made before the flex.

There are two final considerations to be made; the first concerns the meter jack mounting.

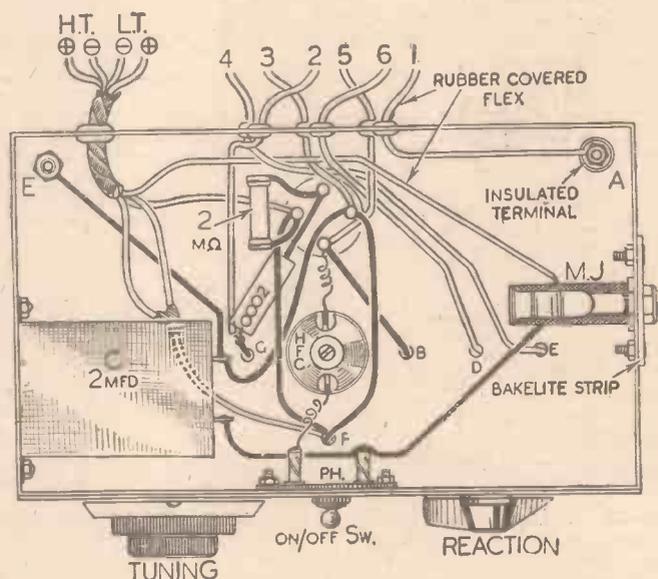
As this jack is wired in the positive H.T. feed, and the bush (in the Bulgín type J.6 used) is live to one contact, a suitable clearance hole should be cut or drilled in the chassis, and the jack mounted on a strip of bakelite or ebonite for insulation.

**'Phone Socket Strip**

The second consideration is the 'phone socket strip. This may conveniently be fitted behind the chassis runner with countersunk screws before fitting the front panel, the hole cut in the front panel being arranged to cover the fixing screws.

Fig. 4 (above).—Panel layout showing the arrangement of controls.

Fig. 5 (right).—The wiring diagram.



**U**NFORTUNATELY the novice is often under the impression that the wiring of a receiver is too complex for him to tackle with equanimity. It does appear complex, because there is a tendency to look at the wiring as a whole without any attempt to analyse the work. When the attempt is made systematically it is really very simple.

If an experienced man is watched undertaking this work, the first thing to notice is that he commences the wiring with the filament circuit. Usually the earth wire is the first in this section to claim his attention. It is connected to every point it is supposed to pick up. This wire in most cases is the negative side of the accumulator or filament circuit. The beginning is made at the negative terminal of this battery lead and, if a filament switch is included, the line is connected to one side of the switch. The opposite side of the switch is then picked up and connected to all points which it is intended it should touch. Before going over to the positive side

**POINTS ON WIRING A SET**

of the filament circuit the negative side should be checked in order to make sure every part touching it has been properly connected.

**Testing the Circuit**

Now start from the L.T. plus terminal and run it to each valve socket. Should the switch be in positive lead, run the wire from the L.T. plus terminal to one side of the switch and then pick it up on the other side of the switch as was suggested in the case of the negative side. Check over and test the correctness of the circuit by using either a voltmeter or valve. Of course, the battery must be connected before attempting the test. When a voltmeter is used

almost the entire voltage of the battery should be shown on the meter. The next point to wire covers the grid circuits. Start at the grid of the first valve and make the connections shown on the circuit diagram, until the grid-return lead has been fastened to the negative side of the filament battery line, or to some other point having the required positive or negative bias. It is important to make sure every grid circuit is continuous from the grid to the correct connection in one of the filament lines, care being taken to see there is no short in the circuit. Now test the grid circuits for continuity and freedom from shorts. After the grid sections have been wired and checked, the plate circuits claim attention. Here again one should be wired and tested at a time. When the filament, grid, and plate circuits are wired and tested, the circuit may be said to be electrically complete unless it should contain valves of the S.G. type, in which case the extra circuit must receive the same attention as the others.

A PAGE OF PRACTICAL HINTS

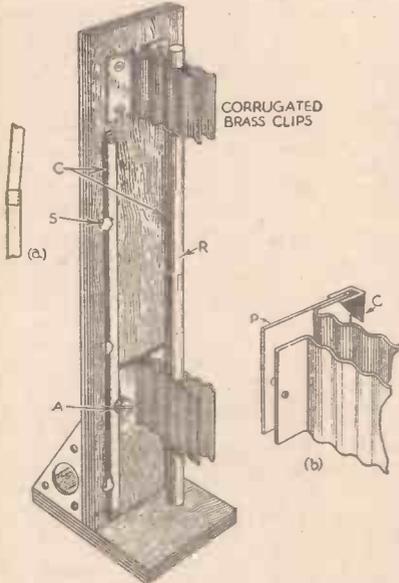
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Handy Soldering Clamp

WHEN making up various radio parts and movements, the necessity often arises for a mechanical "third hand" to



A novel clamp for holding articles whilst soldering.

obtain alignment during fixtures and soldering, so I contrived the jig shown in the accompanying sketches. Having made up a ply-wood vertical mount with a reasonable short base so that the jig could be used horizontally if desired, I next shaped four springy brass clips, corrugating these by moulding over a suitable piece of brass rod in a small vice. I then cut two equal lengths of "U" channelling (C) to act as a runway for the clip assembly detailed in the inset (b). These lower clips were soldered to the back mounting plate "P," and a tapped hole was provided in each flange for a locking, or binding bolt "A." 4BA bolts were used. Two end wood screws secure the channels, and strengthening is afforded by extra screws driven into the wood mount, the heads of these being soldered to the channelling at equidistant points. The rod "R" depicts one typical use to which this jig has been frequently put, in this case to assure correct alignment of two jointed portions which are finally soldered together. The inset diagram (a) illustrates the type of error which is prevented here.—W. E. GEOFFRIES (Pinner).

A Twin-element Potentiometer Unit

HAVING two rather old-fashioned potentiometers of indifferent value

THAT DODGE OF YOURS!

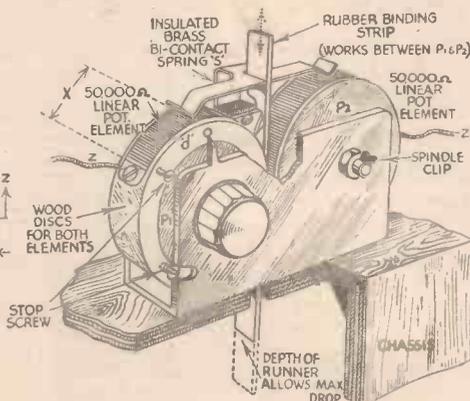
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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 235

and awkward size, I decided to examine the elements to see whether I could put them to better purpose, discarding the mouldings. The result is shown in the sketch. The idea is to provide a series resistance action so that the total value of the two elements could be used at any desired setting within their respective limits. Each potentiometer element was of approximately 50,000 ohms value, so this gave me a maximum setting of 100,000 ohms. It also occurred to me that by constructing this on a fairly open sort of framework, each end of each element could be used at once if desired, although provision had to be made for the connecting flex movement during the rotation of the wood disc element mounts.

An aluminium mount



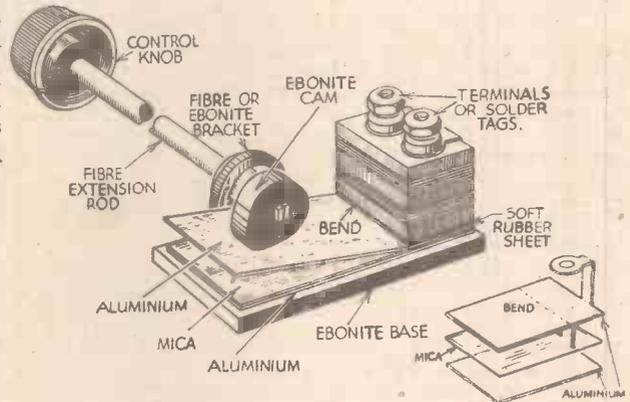
A handy arrangement for a twin-element potentiometer unit.

bent into "U" form served in this respect, and on the driving disc I glued a paper scale, "d," marked with the extremities of rotation, and one or two logged resistance values, although these values are not shown in the drawing.

A rubber strip served well as a means for "binding" the two discs so that they worked accurately in unison, and a slot was provided in both the bi-contact wiper and the baseboard of the chassis on which this unit was mounted, this permitting ample clearance at the limits of this rubber strip. The indication "X," shows the effective resistance range during the potentiometer movement, and applies, of course, for both elements, "X" and "XI." The inset theoretical diagrams show the action electrically, and from these it will be seen how, for example, a bridge circuit balancing arrangement can be utilised in connecting up the other ends of the elements "K" as well as the outside ends "Z."—G. T. RAWLING (Romford).

Small Capacity Condenser

A BOOK-TYPE aerial condenser can be made quite easily with a few oddments from the junk box.



A book-type aerial condenser of small capacity.

Two pieces of aluminium sheet cut to size and shape and a piece of mica between are mounted on a base of ebonite by laying them flat. The whole assembly is fastened by placing a pile of fibre strips previously drilled, and passing 6BA screws from the bottom up, and finishing with a terminal head.

The top plate is then bent up so that the ebonite cam when turned closes the plate in book fashion. An ebonite bracket with two brass nuts, one either side, supports the cam and extension rod. The extension rod should be a good fit in the bracket, thus preventing possibility of slip by vibration.—G. RAYMENT (Poole).

The CYCLIST - - 2d.  
Every Wednesday.



May 20th, 1939.

Vol. 4.

No. 152

### Support for Provinces Claim

THE provincial campaign which is being undertaken with a view to securing at least one television transmitting station outside the London and Home counties area, has received support in many quarters, and it is now gratifying to see that Lord Hirst has lent his influence in the same connection. This was revealed in a letter which he wrote to the editor of *The Times* at the beginning of the month. The arguments which he put forward for an extension of the present B.B.C. television service, beyond the area now covered, were based on a lifetime's experience in furthering the cause of British industry. As he pointed out, quite rightly, it is not often that a new British industry emerges which has a clear opportunity of gaining a lead over all the other countries in the world.

Television, if developed on imaginative lines, could rapidly establish itself over the whole country, but unless steps are taken promptly, it is conceivable that the pioneer work undertaken in this country will be lost to foreign competition as was the case in the motor-car, silent film, talking film and sound broadcasting industries. Until extension to the provinces is secured via the recommendations of the Television Advisory Committee to the Government, experience of a very vital nature will be denied to the industry.

Certain problems of research must remain theoretical in character until the signal service area is materially extended, but once this is done, mass production can be planned with its benefits to manufacturer and viewer alike, coupled with the fact that it will then be equipped to enter overseas markets in no uncertain manner. It was not a case of fostering a new form of public entertainment, but an investment of capital on behalf of a new British industry which, in addition, is capable of having important defence implications.

The sum of money required is small in comparison to the benefits it will confer in many directions, and Lord Hirst is to be congratulated in coming forward in such a direct manner and with such forceful arguments.

### A Problem of Definition

ALTHOUGH very considerable improvements have been brought about at the transmitting end of the television chain, it is generally agreed that at the moment reception is ahead of transmission. This is due partly to the line definition of the picture, for whereas a picture, if analysed

carefully, appears to be reasonably satisfactory in the direction of line trace, there is room for improvement in the vertical direction. A material increase in the number of lines per picture would, of course, provide an immediate solution, and there is no doubt that this step forward would be welcomed by those companies who are at present engaged in the development of large screen television. With a screen 12ft. deep, and assuming the scanning lines just touch, each individual line of the picture scan is just over a third of an inch deep, and minimum viewing distance becomes an important feature of cinema seating. In looking ahead to future development, however, there is one matter which

Baird's crude equipment in 1928. Picture speed had only to be doubled, and not trebled as theory would suppose, because so many sections were common in a three-coloured television picture. The same phenomenon prevailed with the more recent big-screen colour work which Baird showed at the Dominion Theatre about fifteen months ago. With only 120-line definition, and employing blue/green and red filters, the resultant picture's pictorial effect was far more pleasing than the black-and-white pictures which had been shown by the same apparatus a few months before. It seems certain, therefore, that a changeover to colour would, apart from the complications brought in its wake, bring



Thomas S. Lee, owner of the West's only television station, with Otto Faulkner, and L. E. Christensen, both of the Long Beach Police Department (shown left to right), in the broadcasting studio at Los Angeles recently during a test to determine the advisability of transmitting fingerprints, by means of television. In the Los Angeles studio the photograph of a set of fingerprints was transmitted to Long Beach, where it was received by special equipment set up for the test. Police in Long Beach then made a correct identification and telephoned the result to the broadcasting studio. The demonstration was witnessed by police officials from several Southern California cities, who expressed the belief that telecasts may prove of value to law-enforcing agencies in cases where immediate identification is imperative, thereby eliminating the delay caused by mailing the fingerprints.

should be remembered, and this may have a slight influence in bringing colour television to the fore earlier than is at present anticipated. Careful measurement has shown that a colour television picture can be tolerated when a monochromatic version of the same subject, using the same degree of definition, would have no entertainment value. This fact even came to light with

about an improvement in the impression made by viewers' sets.

#### PATENTS AND TRADE MARKS

Any of our readers requiring information and advice respecting Patents, Trade Marks, or Designs, should apply to Messrs. Rayner and Co., Patent Agents, of Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.

# RADIO IN AVIATION—4

This Week Telephones and Various Forms of Interference are Dealt With

**A**NOTHER effect of noise is its direct action on the hearing of the operator. Noise is "heard" not only through the normal agency of the outer ear, but also more directly through the cranial bones. From the earliest days, noise has been kept in check by wearing a helmet in which the telephone receivers were inserted. The relief afforded by this practice is considerable, but the gradual increase in noise level has made it more and more imperative to ensure an excellent fit and to provide substantial padding. This latter feature, however, has made the problem of ventilation of the outer ear increasingly difficult. The design of the helmet itself has had to receive special consideration in order that eddies round the receiver-pad might be reduced to a minimum. As a matter of quantitative interest it may be mentioned that noise level at the operator's or pilot's unprotected ears has already grown to the value of 135 phons, which is the threshold of physical or, shall we call it, mechanical sensation. This energy level is about one million times that observed in the carriage of an express train.

The proximity of the pilot to the magnetic compass caused considerable trouble in the form of magnetic deviations occasioned by the presence of the small but relatively strong magnets in the earpieces. Deviations of the order of 20 degrees with the headphones at a distance of 18in. were quite usual. Advantage was, therefore, taken by the Air Ministry of a proposed redesign of this component to provide a soft-iron case in lieu of the usual brass one; by this means the deviation was reduced to about 1 degree at a distance of 6in.

## Magneto Noise

There is another class of "noise" which is not of acoustic origin, namely "magneto noise" and general electrical disturbances.

Magneto noise was first encountered during the War, when multiple-stage valve amplifiers were first employed. It appears as a steady purring sound of great intensity and penetrating power. It is caused by the production of highly damped high-frequency currents, generated principally in the H.T. ignition leads to the sparking plugs, but also to a quite important extent by the spark at the contact-breaker (which causes disturbances in the L.T. and magneto switch wiring) and by the spark at the distributor.

After some unsuccessful attempts at devising high-frequency chokes to be introduced into the receiver aerial connection, recourse had to be had to complete screening of the H.T. leads, and this was later followed by screening of the complete magneto system. The continued increase of receiver-gain and the tendency of radio towards shorter waves rendered this treatment of the magneto quite inadequate. A second step was taken when the braided screen was bonded to earth by the shortest possible path every 6in. or so of its length. Finally there has been added a complete metal screen round the sparking plug. This has resulted in practically complete elimination of magneto noise. To illustrate the point it may be stated that with a perfectly screened system of this kind it is possible to detect the presence of a town 2,000ft. below the aircraft. Magneto noise

is not generally sufficient to make it necessary to provide 100 per cent. screening when the operating wavelength is of the order of 1,000 metres or more. As the frequency is increased, so screening must be improved, until it is found necessary to provide the final refinements for aircraft on which very short waves are received.

The above remarks apply equally well to coil ignition, which, with a few appropriate modifications, is treated in the same fashion. This type of ignition necessitates that the supply battery be completely screened or fitted with suppressors at the magneto end.

## Electrical Interference

Perhaps the first appearance of electrical interference in aircraft was due to the vibrating-contact regulator which at one time was employed to maintain the genera-

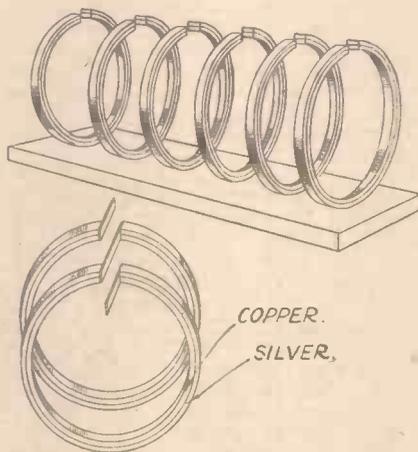


Fig. 10.—Typical examples of bi-metal coils.

tor voltage at a constant value. After some attempts to find a palliative in the insertion of chokes and condensers, this class of regulator was discarded.

In order not to labour a point which is now of universal experience in connection with ground installations, this class of interference will be dismissed with a mere reference to all the types of rotating or contracting electrical machinery to be found on aircraft. These are: general service generators, motor-generators for the radio-communication equipment, servo motors for the aircraft controls, relay circuits, etc. All these cases are dealt with by the normal method of inserting filters at each source of interference.

## Temperature

The effects of changes of temperature on the performance of radio apparatus for aircraft were not felt until the need for a high order of frequency stability had arisen. In recent years this has become an acute problem in view of the steady and general narrowing-down of radio-communication channels and the increased height at which aeroplanes are flown. Apparatus which is of a sufficiently high order of frequency constancy for use on the ground is often affected to a serious extent by the temperature variations met with during flight. Roughly speaking, it

can be said that this temperature variation frequently reaches a value of 60 degrees C., i.e., from +20 degrees C. on the ground to -40 degrees C. at an altitude of 30,000 feet. In the case of closed-cockpit aircraft the range of temperature is usually 10 to 20 degrees C. less. This large range of temperatures may be covered in the course of half an hour, allowing for the partial protection of apparatus by the surrounding fuselage. With the early designs of inductances and condensers it was not at all exceptional to meet with temperature coefficients of 150 parts in 10<sup>6</sup> per degree C., which, at a wavelength of 50 metres, represents a change of 1,000 cycles per degree C. or a possible total variation during one flight of 60 kc./sec. Before the close packing of channels it was necessary for the receiving operator to search more or less continuously over a frequency band of the above order, and although reliability of communications suffered there did not result any serious interference with other users of neighbouring frequencies.

With tightened restrictions and the use of master oscillators, it became essential to reduce these effects to the lowest possible value. A detailed examination of components showed that the greater part of the variation was due to the designs of the inductances, especially of the self-supporting tubular type used in transmitters, but in many cases fixed condensers also played an important part. By careful selection of commercial condensers of the tightly clamped type the part played by this component was considerably reduced, and coefficients of the order of 20 parts in 10<sup>6</sup> were fairly regularly obtained. Things were not so favourable in respect of the fixed type of condenser designed to carry relatively large high-frequency currents and to sustain high high-frequency potentials. These continued to give serious trouble until designers had to be reconciled with the provision of condensers of increased size and heavily clamped.

A very marked improvement in inductance coils was obtained by the use of copper tubing shrunk on to heavy supports built up of one single material. In some designs the helical tube was forced open on the inside of the support. These constructions reduced the temperature coefficient to the order of 40 parts in 10<sup>6</sup>, and overall stability of 60 parts in 10<sup>6</sup> was obtained. But this residual instability remained a source of difficulty in the case of transmitters, implying as it does a possible frequency-change of 10 kc./sec. in the most favourable cases, with quite frequent excursions up to 20 kc./sec. This drift caused annoyance to neighbouring channels and was, of course, detrimental to good reception on the ground. Many attempts were made to produce a form of inductance having sensibly zero temperature-coefficient, with the intention of removing not only long-period variations but also the variations due to heating of the master-oscillator coils by the high-frequency currents circulating in them. The rapid frequency-drift caused by ohmic losses is a particularly important question in connection with aircraft radio, where the master oscillator cannot be left permanently switched on during reception. Of the various forms tried, two may be

## RADIO IN AVIATION

(Continued from previous page.)

mentioned which, although never brought into regular use, showed a certain measure of success. The first one consisted in building up the helix of individual rings joined end to end by means of a flexible strip and maintained in a state of compression by an outer supporting frame. A more satisfactory scheme involved the use of suitably constructed bimetallic strips of silver and copper. With certain proportions of the two metals it is possible to arrange that expansion of individual rings as a whole is compensated by the curling-up caused by the difference of coefficient of thermal expansion of the two elements. By this means a very constant inductance could be obtained. It was marred, however, by mechanical defects which tended to produce sudden, though small, changes with sudden relief of stress. A typical coil of this description is shown in Fig. 10. It will be obvious that with suitable proportions for the two metals the individual rings can be made to contract and so compensate in a large measure for the changes in the remaining components in circuit. A typical case may be quoted in which the frequency-change at 10 mc./sec. was of the order of 200 cycles per sec. compared with 6,000 cycles per sec. in the case of a normal rigid coil.

The obvious cure for temperature effects is, of course, the use of crystal oscillators, and these were extensively used in America and are gradually growing in importance. Unfortunately, the use of crystals ties the service down to a pre-set frequency, with the consequent possibility of jammed communications. In this connection one may recall the breakdown of communications in certain foreign naval exercises, due to interference from transmissions by another foreign power. The important advantages conferred by the use of crystal-controlled oscillators have forced designers to incorporate in their designs a number of alternative crystals in order that rapid and accurate frequency-changes might be obtained. With the introduction of zero-coefficient crystals this form of oscillator is being rapidly brought into use both in transmitters and in superheterodyne receivers. In the author's opinion, however, crystals should not be used as an excuse for bad coils and circuits. Should it be necessary at any time to revert to uncontrolled master-oscillators, the fre-

quency must at least be of such stability as to produce a carrier-wave free of frequency modulation under conditions of vibration.

Another effect of lowered temperature is the serious falling-off of accumulator performance at temperatures below -30 degrees C. At these low temperatures, it is not always possible to draw the normal current demanded by the equipment, and, invariably, the ampere-hour capacity is seriously reduced. This effect has not, as far as the author is aware, caused sufficient curtailment of performance to warrant the taking of special measures to keep the accumulator warm, but is a point that may require attention in the case of aircraft flying regularly at high altitudes for long periods.

The relatively recent introduction of electrolytic condensers in aircraft apparatus, principally in smoothing circuits, has revealed the weakness of this class of component from the point of view of temperature. When the temperature is sufficiently lowered, chemical action practically ceases, and the condensers fail to perform their normal functions. This is a serious blow to the designer, who is thus prevented from using a component which is particularly valuable from the point of view of bulk, weight, and efficiency, unless he is prepared to provide artificial heating for the complete apparatus or at least for these sensitive components.

### Voltage Stability

Reference has already been made, in the section dealing with "Power Supply," to the question of voltage regulation. The necessity for constancy of supply voltage both for H.T. and for filament heating is not peculiar to aircraft radio, but the difficulty in ensuring it is more apparent in this class of installation owing to the lightness and small over-load factors of the equipment. Initially, it was the practice to employ accumulators for filament supply, and, considering the frequency tolerance that was then accepted by all, no trouble arose. But accumulators in aircraft are a source of inconvenience and danger. It is not possible to ensure that the containers shall be absolutely dry externally, and, in particular, free from acid. In consequence, electrical leakages to the crate are not unknown. Besides the risk of fire there is danger of damage to

the wooden structure, which may become acid-soaked and finally destroyed.

To avoid this difficulty, and at the same time to reduce maintenance, dual-purpose generators were designed in which a high standard of regulation was required. It was usual to call for 5 per cent. regulation both for the high-voltage windings and for the 12-volt supply. (It will be conceded that for a generator delivering 120 watts at high voltage and 48 watts at low voltage this figure is low.) Furthermore, it was considered essential to render the two outputs independent of each other, thus necessitating two armatures and two fields. This requirement further intensified the demand for constant speed at all loads, in order that sudden application of the H.T. load should produce no change in the L.T. voltage. Manufacturers have been able to produce generators satisfying completely these rather severe requirements. In this connection it should be noted that dynamotors and single-field machines fall far short of requirements.

For many years this class of machine gave satisfaction when used in connection with medium-wave transmitters. With increasing use of short-waves, however, and particularly for unmodulated telegraphy, the H.T. stability quoted above was insufficient to produce signals free from keying-chirp—the change of frequency which occurs immediately after pressing the key. This effect was intensified by the tank condensers and filter circuits which were habitually connected in the H.T. mains to absorb generator ripple.

Investigations showed that considerable improvement could be obtained by inserting in series with the anode feed a resistance equal to the circuit impedance, namely, the ratio of supply voltage to anode current, which, with the valves and circuits generally in use at that time, was about 30,000 ohms. This figure, however, was too large to be acceptable, as it involved heavy losses and overall inefficiency. It was also dependent on the transmitter adjustments, and so a compromise figure was adopted and a 10,000-ohm resistor was provided. The results were satisfactory, although somewhat imperfect. As motor generators or dynamotors began to take the place of wind-driven machines the dual-purpose requirement had to be dropped, and accumulators were re-introduced for filament heating.

## TENNIS FROM WEMBLEY

THE world's leading tennis players—Donald Budge, Elsworth Vines, "Bill" Tilden and Hans Nusslein—will again be televised in play direct from the Empire Pool, Wembley, on May 18th and 20th. A special "American" tournament for singles and doubles has been organised by Wembley Stadium, Ltd. All the players will be opposed to each other in turn, and the doubles event will be similarly arranged.

Play will be televised for half an hour on the evening of May 18th, and for a full hour on the final night, May 20th. Special lighting in the Empire Pool will ensure that no shadows are cast and that no direct rays fall across the camera lenses. The first television broadcast of this tournament was given on May 16th.

## "THE TORCH-BEARERS"

VIEWERS are promised an interesting afternoon on May 17th when George Kelly's satirical comedy "The Torch-Bearers" will be televised with Kitty de Legh and Charles Heslop in the leading rôles.

## TELEVISION FEATURES

The story revolves around the misfortunes of an amateur dramatic society in Barchester, with Mrs. J. Duro Pampinelli (Kitty de Legh) as the organising genius who can tackle anything from revue to "Hamlet" in one evening. But on this particular October evening everything goes wrong, and viewers will be taken backstage at the Barchester Horticultural Hall to see what happens when the prompter makes mistakes and the curtain sticks.

"The Torch-Bearers" gives great scope to Molly Rankin, as Mrs. Paula Towers, who becomes a "star" overnight, and Charles Heslop, who has the honour of appearing as her husband. Incidentally, this is Charles Heslop's first appearance in a straight part in television.

The play, which was first televised in the evening programme on May 13th, will be produced by Reginald Smith.

## "NIGHT LIGHTS"

CHARLES B. COCHRAN'S, "Night Lights," are paying a special visit to the television studios on the evening of May 17th. This fast-moving show from the Trocadero includes Mr. Cochran's Young Ladies, who will be seen in a forty-minute programme covering the history of entertainment on the "Troc" site since 1850, when the distinguished gentlemen and ladies in bustles enjoyed themselves in the Argyle Rooms.

The Trocadero Music Hall of the late 'seventies will next be featured, and the grand finale switches over to New York for the World's Fair. The show includes the Five Cleveres, balancing acrobats; McKay and Lavelle, a "dumb" pair, who "bring the house down"; and Gerald Nodin, as comère.

Immediately after the transmission the company will be rushed off to the Trocadero for their regular performance there. Television presentation will be by Pat Hillyard, Assistant Productions Manager at Alexandra Palace.



# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

**T**HE speedy success of Ivor Novello's latest musical play "The Dancing Years" is reflected in the issue of no less than five H.M.V. records by the original artistes. Three of them are contained in a decorated portfolio, for which there is a charge of sixpence.

On the first record—*H.M.V. B 8890*—Mary Ellis sings "Waltz of My Heart" and "I can Give you the Starlight." The second record—*H.M.V. B 8891*—contains two duets, in both of which Mary Ellis takes part: "My Dearest Dear" with Ivor Novello, and "My Life Belongs to You" with Dunstan Hart. Finally, we find "The Wings of Sleep" sung as a duet by Mary Ellis and Olive Gilbert on one side of *H.M.V. B 8892*, and "Primrose" sung by Roma Beaumont on the other.

Two more records complete the coverage of "The Dancing Years," both of which are by the Drury Lane Theatre Orchestra which has recorded the Selection on *H.M.V. C 3097*, under the leadership of Charles Prentice, who also directs the orchestra on one side of *H.M.V. B 8897*, the "Three Ballet Tunes." The other side contains "The Leap Year Waltz," conducted by Ivor Novello himself.

Coleridge-Taylor's "Three Dream Dances" are very pleasant music of the light orchestral type. These, with a dainty Intermezzo—"Demoiselle Chic," by Percy Fletcher—are played by the London Palladium Orchestra on *H.M.V. B 8876-7*.

Webster Booth, who has come to the fore recently as a singer of opera in English, adds to his reputation with an extremely fine record of the two famous Arias from Mendelssohn's Opera-Oratorio Elijah, "If with all Your Hearts" and "Then Shall the Righteous Shine Forth." They are sung to the accompaniment of the London Philharmonic Orchestra, conducted by Warwick Braithwaite on *H.M.V. C 3095*.

### Ballet Music

**E**ACH year sees an increase in the popularity of music for the ballet, and there has been a steady flow of recordings. Of the two suites issued this month, D'Erlanger's "The Hundred Kisses" is a first recording. It was written for the de Basil Ballet Company, in particular for the dancers Baronova and Lichine, and it speedily became one of the most popular in the repertory. The records are by the London Philharmonic Orchestra, conducted by Antal Dorati—*H.M.V. C 3098-9*.

The other ballet recorded this month is Falla's "Three Cornered Hat," originally produced by Diaghileff. It is full of delightful Spanish rhythms, and the records played by the Boston Promenade Orchestra under Arthur Fiedler, include "The Neighbours," the Miller's Dance and the Final Dance—*H.M.V. B 8887-8*.

Few records strike such an immediate note of gaiety as does a new one by the New Mayfair Novelty Orchestra on *H.M.V. BD 683*. On one side is Zez Confrey's "Buffoon" and on the other a "Doll"

medley. This record contains a number of brilliant accordeon and xylophone solos.

### Light Music

**S**CANNING the new H.M.V. record list, one is amazed at the variety of material that is being arranged for military bands. At one time it seemed that the repertoire for this popular combination was confined to the "William Tell" overture and such instrumental solos as "The Lost Chord." Now we see that A. O. Pearce has arranged Offenbach's "Orpheus in the Underworld" overture for the Black Dyke Mills Band on *H.M.V. BD 676*, and Dan Godfrey has made arrangements of selections from "Rose Marie" and "No, No, Nanette" which have been recorded by H.M. Coldstream Guards Band on *H.M.V. C 3096*. As well as these two records, there is one by the Band of H.M. Royal Marines which plays two marches, "Colonel Bogey" (there is no vocal chorus) and "The Thin Red Line"—*H.M.V. B 8885*.

### Swing Music

**S**WING fans will revel in a record by an All Star Band which contains America's most famous instrumentalists. No less than six band leaders are present in the personnel, including Benny Goodman, Tommy Dorsey, Bunny Berigan and Jack Teagarden playing "The Blues" and "Blue Lou" on *H.M.V. B 8896*. There are also two new records by Artie Shaw's orchestra: "Donkey Serenade" and "Carioca" on *H.M.V. B 8893* and "Black Boy Shuffle" coupled with "Jungle Drums" on *H.M.V. B 8894*.

Other new records in lighter vein include yet another new sequence dance. This is called "The Blackbird Hop"—*H.M.V. BD 5477*. New organ records are those by Reginald Foort on his giant organ playing "Light Cavalry"—*H.M.V. BD 680*, and his successor at the B.B.C., Sandy Macpherson, who plays "Annie Laurie" and "Loch Lomond" on *H.M.V. BD 682*.

### Decca

**T**HE Boyd Neel String Orchestra presents the first recording of the Adagio for string orchestra by the Belgian composer Lekeu, who died at the age of twenty-four. Had he lived on he would have been an outstanding European composer. The Adagio now recorded is quiet, restful music—*Decca X 236-7*.

America's biggest hit of the moment, "Deep Purple" has been recorded by Ambrose and his Orchestra on *Decca F 7029*. The coupling is "I have Eyes."

That enterprising ensemble, the Quintet of the Hot Club of France, present a fine recording of "Jeepers Creepers" on *Decca F 7027*. On the other side they play "Swing 39."

A newcomer to Decca is Renara, who specialises in piano variations. *Decca F 7040* comprises her version of two popular tunes, "Deep in a Dream" and "Sweethearts."

## More IMPORTANT N.T.S. BARGAINS and FREE OFFERS

### ALL WAVE CHASSIS—Speaker FREE!

**BATTERY MODEL.** 14-2,000 metres. Amazingly sensitive SG3 Pentode output circuit. Station names. Screened coils. Steel chassis. Low H.T. consumption. A really modern replacement chassis. Complete with all valves. Matched speaker FREE! List value £5 19 6. BARGAIN 77/- or 5/- down and 16 monthly payments of 5/8.

**A.C. MODEL.** Unbeatable N.T.S. offer. All-world reception on 18-2,000 metres. 4 valve S.G. bandpass circuit, providing 3 watts output. Station-name scale. Pick-up sockets. Fully tested. Complete with 4 valves and FREE matched energised-type speaker. List value £6 16 6. BARGAIN 89/6 or 5/- down and 15 monthly payments of 6/9.

**A.C. SUPERHET OFFER.** Brand new chassis. 18-2,100 metres. Powerful 4-valve model, giving 3 watts output. Modern station scale. Fully tested, complete with all valves and FREE matched speaker. List value 7 gns. BARGAIN £4 12 6 or 5/- down and 16 monthly payments of 7/-.

## RIGHT-PRICE PARTS

**BAR-TYPE 2-GANG CONDENSERS.** .0005 mfd. each section. Brightly plated, size 3in. x 2 1/2in. x 2 1/2in. New, with trimmers. Bargain, 2/3.

**METAL CHASSIS.** Steel, ready drilled for 1-8 valve-holders. Electrolytics and mains transformer. Size 15in. x 9in. x 3in. grey enamel finish, brand new. Bargain, 2/- each. Also, brand new heavy gauge Cadmium-plated steel chassis. 14 x 7 1/2 x 2 1/2in. ready drilled for 5 v.-holders, mains transformer, etc. Bargain, 2 Post 6d. extra.

**COILS.** Parcel of 4 assorted screened and unscreened coils for experimenting and replacements. Well-known makes. Bargain, 2/-.

**NEON LAMPS.** Beehive type. Ideal for testing and experimenting. 1/9.

**TRICKLE CHARGER.** 2v. 1 amp. Model. Metal Rectifier, 10/- For A.C. mains 200/250 volts.

**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.

**HEADPHONES.** Supersensitive type, 3/6 per pair. Post 6d. extra.

**RESISTORS.** All values, 1-watt, 4d.; 3/6 doz. 1-watt, 5d.; 4/6 doz. 2-watt, 8d.; 6/6 doz. 3-watt, 9d. 8/- doz.

**COSMOCORD PICK-UPS.** Brand new, complete with screened lead and rest. List 15/- Bargain, 6 6.

**B.T.S. ULTRA S.W. TUNING CONDENSER.** Maximum capacity 67 mmfd. heavily silver-plated vanes and spacers. Improved method for contacting moving vanes ensuring low impedance. Usual price, 7/6. BARGAIN, 3/6.

**B.T.S. ULTRA S.W. TUNING COILS.** Comprising 2 coils (1 3-turn and 12-turn) employing self-supporting 15 swg. copper wire silver-plated to reduce resistance to HF currents. Ready mounted with connections on low-loss block. Usual price 3/6. BARGAIN, 1/6.

**BARGAIN PARCELS.** Don't miss this opportunity. 1 each 2 and 3 gang variable condensers, 1 screened coil, 1 audio transformer, 3 valve holders, 6 fixed resistances, 6 fixed condensers, 1 doz. various control knobs and 1 brand-new ready-drilled plated steel chassis. List value, 45/- Bargain, 5/9. plus 9d. for special packing and postage. ORDER EARLY.



### ALL WAVE KITS—VALVES FREE

"**WORLD**" Kits are supplied less coils to accommodate those who already possess famous B.T.S. self-heating inductors. Matched and tested valves given FREE.

**ALL-WAVE WORLD S.G.3.** Wave-range 9-2,000 metres, slow-motion tuning. Station-name scale. Kit includes all parts with drilled metal chassis, transformer, etc., and FREE S.G. Det. and Pentode valves. List value of 34/5 0. BARGAIN 29/6 or 2 6 down and 12 monthly payments of 2/10.

**ALL-WAVE WORLD S.G.4.** Employs one more S.G. audio stage than the 3-valve model and all extra components. Station-name scale. 4 valves given FREE. Astounding BARGAINS at 42/- cash or C.O.D., or 2 6 down and 12 monthly payments of 3/8.

**COILS.** Complete set of 10 coils, 9-2,000 metres. List 27 6. N.T.S. BARGAIN, 17/6, or add 1/6 to World Kit deposit and to each monthly payment.

### AMPLIFIERS—BUY NOW

**7-WATTS A.C. MODEL.** For Dance Band and all P.A. work. Powerful model with wide sound range. Supplied on steel chassis complete with 4 valves. Volume control. Fully tested. Usual price £5/5/- BARGAIN 70/- or 5/- down and 12 monthly payments of 6/3.

**4-WATTS BATTERY MODEL.** 4-valve push-pull model for use as above amplifier and for boosting up existing battery sets also. Assembled on steel chassis, with valves. Fully tested. List 4 gns. BARGAIN £2/15/- or 4 6 down and 12 monthly payments of 4/9.

**N.T.S. FOR NEW VALVES** We save you up to 50% of usual list prices. All British, all types—battery and mains. Send now for BARGAIN VALVE LIST and your FREE copy of the N.T.S. Short-Wave Book.

**NEW TIMES SALES CO.,** 56 (P.W. 40), Ludgate Hill, London, E.C.4. Tel.: City 5516

# Mastering the Morse Code

How to Acquire Speed in Reading and Sending Morse Signals, with Especial Reference to the Amateur Transmitting Licence.

By W. J DELANEY

THE introduction of the C.W.R. has aroused in many amateurs a desire to take up the reading and sending of code signals, and an increasingly large number of amateurs are now applying for the amateur transmitting licence. In order to obtain a full (radiating) licence it is necessary to pass a code test, sending and receiving at 12 words per minute. This is by no means fast, and service operators can handle 30 w.p.m. quite comfortably. It is generally found, however, that unless you can attend a class or obtain the services of a trained teacher, it is difficult to acquire the necessary speed, but we have been carrying out some tests lately, and the following details will undoubtedly enable any reader to acquire the necessary speed without the aid of any outside assistance.

The first step is, of course, to acquire a knowledge of the code, and for those who have not yet done so we give here the alphabet, and also the grouping of the

necessary to acquire practice in reading and recognising them and in this connection there are two simple schemes. In the first you can obtain gramophone records; and in the second you can send the symbols by means of a key and oscillator—listening to your sending over a loudspeaker or in a pair of headphones. For the oscillator you need a valve of the General Purpose type, an L.F. transformer—any ratio will do—and the necessary H.T. and L.T. supplies. These are wired as in Fig. 2 and the key inserted in the H.T. negative lead. The H.T. voltage is critical, and if too low or too high an audible note will not be obtained when the key is depressed. Adjust the H.T. until a suitable note is obtained, and thus an H.T. battery tapped at frequent intervals should be used. The records are obtainable from Columbia (Nos. 3262/4), and from F. L. Masters. The former consists of a set commencing with the code and figures and passing on to commercial

messages all sent at a nominal speed of about 20 w.p.m. A book is supplied with the records giving the translation, but unless you have a clockwork gramophone motor capable of being slowed down considerably you may find these records a little too fast for a start. The majority

ALPHABET	FIGURES
A ---	1 -----
B ----	2 -----
C -----	3 -----
D ----	4 -----
E -	5 -----
F ----	6 -----
G ----	7 -----
H ----	8 -----
I --	9 -----
J -----	0 -----
K ----	
L ----	
M ---	
N ---	
O -----	
P -----	
Q -----	
R ----	
S ---	
T ---	
U ----	
V ----	
W ----	
X ----	
Y ----	
Z ----	

OPPOSITES	
A ---	N ---
B ----	V ----
D ----	U ----
F ----	L ----
G ----	W ----
Q ----	Y ----

Fig. 1.—The morse alphabet with opposites shown for memorising.

## Acquiring Speed

These records are mainly for reading practice, but both may be used for sending practice and at the same time will enable you to increase your reading practice or powers of concentration by adopting the following procedure. An amplifier with an input mixing circuit is needed so that the output from the pick-up and the output from an oscillator such as has already been mentioned may be mixed. If you do not possess an amplifier you can use your ordinary radio receiver, provided that it is provided with pick-up sockets or terminals. Two separate volume controls are needed, one across the pick-up and one across the output from the oscillator. These are connected as shown in Fig. 3, the two leads being joined to the pick-up terminals or sockets. Using, for instance, the first Columbia record in the set mentioned, adjust the volume control until the note from the record is approximately the same level as that delivered from the small oscillator when the key is depressed. With the copy of the message before you, start the pick-up and take hold of the key. The moment the message on the record commences, start to send and endeavour to read from the copy both the letter and the symbol as printed, at the same time sending the appropriate dots and dashes, keeping the note from the oscillator in step with the pick-up note. At first you will probably find it difficult to obtain one note from the speaker, but as your oscillator will undoubtedly be of a different pitch from the record note you will quickly see whether you are lagging behind or sending too fast. This practice will not only enable you to concentrate better, but will control your sending speed and ensure correct spacing and at the same time familiarise you thoroughly with the symbols for each letter.

## Speed Aids

The drawback normally with a record is that you will become familiar with the

(Continued on next page)

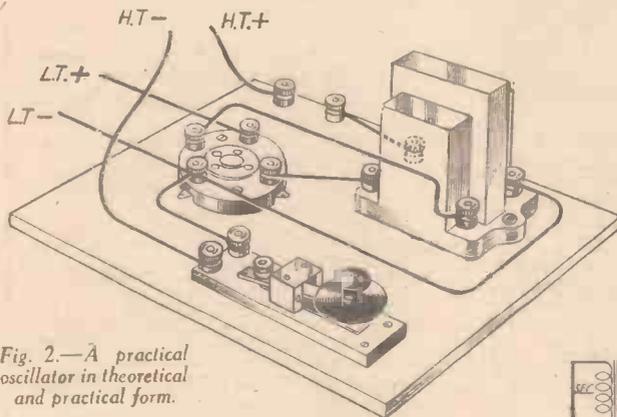


Fig. 2.—A practical oscillator in theoretical and practical form.

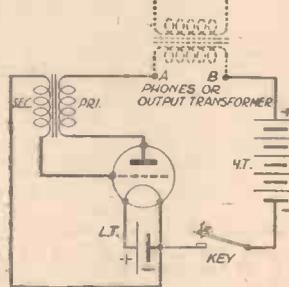
letters in "opposites," and by learning the latter it is not such a difficult matter to remember the symbols. It is necessary to learn the symbols by the "tune" of the letter, and not merely to remember, for instance, that "J" is dit, dah, dah, dah. As an aid to memory in this connection you may make use of the following phrases for certain letters. For the letter "F" memorise the phrase, "Did it 'urt yer"; for the letter "L" (the opposite of "F"), remember, "Of course it did." For "Q" memorise "God Save the Queen." As an opposite to "Q"—the letter "Y," remember the opposite of the "Q" phrase—"Queen; the God Save."

## Figures

The figures are quite easy to remember, the numbers 1 to 5 being dots in that order, and 6 to 0 being dashes in that order, each number totalling five dots or dashes. Thus 1 is 1 dot followed by 4 dashes; 2 is 2 dots followed by 3 dashes and so on. Having memorised the symbols it is now

of electric turntables cannot be slowed down to bring these records slow enough for a beginner. We might also mention there are one or two mistakes in the published translation—so don't follow the code symbols in the book too rigidly if you intend to use the printed matter for practice purposes.

The Masters record is at a nice slow speed and may be speeded up with a clockwork motor to 20 w.p.m., but again, the small speed control afforded with most electric motors will probably only enable the speed to be controlled between approximately 6 w.p.m. and 12 w.p.m. There is also a slip in this disc, the omission of the letter "r" in Northern in the message on the second side.



**MASTERING THE MORSE CODE**

(Continued from previous page)

message, but this method of sending with the record will give you ideal practice in sending and by speeding up the record you can acquire perfect practice at sending up to 20 or 25 w.p.m. with correct spacing. If you can devote one hour a day to this type of practice you will soon be able to identify the symbols without having to "translate" each one and will soon acquire the necessary speed. By tuning on the short waves at special times you can also pick up amateur transmissions in slow speed designed for practice purposes, whilst at certain times a Spanish station on approximately 26 metres will be found conducting a morse class. Although the teacher there gives out the corrections to his pupils, who read back the groups in Spanish, many of the letters can be identified by their similarity to English letters, and the few special Spanish characters may be ignored. A German station on approximately 41 metres also sends commercial messages at frequent periods at about 12 to 15 w.p.m., and although this is in German it again affords excellent practice, as you are unable to anticipate the following letters unless you are familiar with German.

When endeavouring to increase speed it is desirable to obtain a message at a speed greater than you can normally manage.

It will then be found that you have to work two or three letters behind, but when a symbol comes which you cannot immediately identify, don't wait and try to sort it out but forget it and go on to the next

when picking up code stations select one which you find just a little beyond you.

When the code itself has been mastered commonly occurring words should be sent and the "tune" of them mastered in the

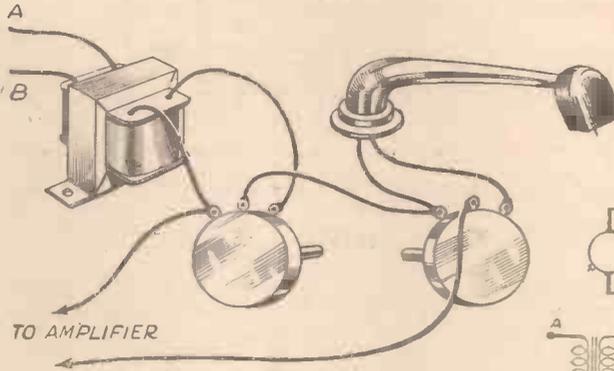


Fig. 3.—How to connect pick-up and oscillator outputs for mixing as described in the text.

letter. In this way you will keep up with the speed and gradually the "faulty" letters will drop into line until every symbol is immediately recognised. Do not keep trying to read at speeds which you can do comfortably. Always try and work beyond your capabilities so that you force yourself into speed. Thus with the records, set them so that they are going just too fast, and

same way. Such words as "the," "and," and other short words will quickly be identified as easily as the single symbols, and by copying a few letters behind the actual message these words will be recognised en bloc and speed will accordingly increase.

**IMPORTANT BROADCASTS OF THE WEEK**

**NATIONAL (261.1 m. and 1,500 m.)**  
Wednesday, May 17th.—Variety from the Argyle Theatre, Birkenhead.

Thursday, May 18th.—Commentary on Professional Lawn Tennis, from Wembley.

Friday, May 19th.—Best Welsh, a story of Coal and of the life it created in the most famous of mining valleys—the Rhondda.

Saturday, May 20th.—County Cricket: Nottinghamshire v. Kent, and Essex v. Yorkshire; commentaries during the first day's play from Nottingham and Ilford.

**REGIONAL (342.1 m.)**

Wednesday, May 17th.—Roundabout—3, an all-Regional Entertainment.

Thursday, May 18th.—Health for the Nation, a dramatic survey of the fight for health services.

Friday, May 19th.—The Pig and Whistle, Number 15, another truly rural episode.

Saturday, May 20th.—Hampstead Heath: Massed bands and grand display of fireworks.

**MIDLAND (297.2 m.)**

Wednesday, May 17th.—Instrumental recital.

Thursday, May 18th.—Poor Girl's Riches, an almost surrealist adventure.

Friday, May 19th.—Ronald Goursley (entertainer).

Saturday, May 20th.—Mendelssohn: Orchestral concert.

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

Wednesday, May 17th.—Catering for a Country Hotel, a talk.

Thursday, May 18th.—An introductory talk to The Bath and West Show this year being held at Bridgwater.

Friday, May 19th.—Studio Show.  
Saturday, May 20th.—Choral and Orchestral Concert, from the Colston Hall, Bristol.

Friday, May 19th.—The Ancient Monuments of North Wales, a talk.

**WELSH (373.1 m.)**

Wednesday, May 17th.—Orchestral concert.

Thursday, May 18th.—Three Valleys Festival Concert from the Pavilion, Mountain Ash, Glamorgan.

Friday, May 19th.—Our Towns—Whence and Whither? first of four talks.

Saturday, May 20th.—The Sailing Off the Coast of Wales, a talk.

**NORTHERN (449.1 m.)**

Wednesday, May 17th.—A Recital of Hymns from Ripon Cathedral.

Thursday, May 18th.—"Loser Takes All," a dialect comedy with the Great Hucklow Village Players.

Friday, May 19th.—Our Towns—Whence and Whither? first of four talks.

Saturday, May 20th.—Saturday Concert Hall.

**AMAZING TROPHY 14-DAYS OFFER!**

**● PART-EXCHANGE YOUR PRESENT SHORT-WAVE GEAR!**

number of TROPHY'S, one of which you can obtain NOW by part-exchanging your present short-wave kit-set or receiver. We will offer you a fair price, but this is a special 14-day advertising offer and YOU MUST WRITE NOW with details of your present gear and TROPHY preferred.

The best receiver for short-wave listening is the TROPHY. We have set aside a strictly limited number of TROPHY'S, one of which you can obtain NOW by part-exchanging your present short-wave kit-set or receiver. We will offer you a fair price, but this is a special 14-day advertising offer and YOU MUST WRITE NOW with details of your present gear and TROPHY preferred.

**TROPHY 3** Here is a marvellous 3-valver for battery or A.C. mains use. Wave-range 6-550 metres. Slow-motion tuning. Calibrated scale. Built-in moving-coil speaker and phone jack. Comes to you ready for operation with self-locating coils for 12-52 metres. A.C. Model 6 gns., or yours for 7/6 down and 18 monthly payments of 7/9. Battery Model (less batteries). £5/15/0, or 7/- down and 18 monthly payments of 7/-.



**£5.15s. YOU PAY LESS**

**TROPHY 8 COMMUNICATION RECEIVER**

THE A.C. set all Hams are now buying. 8 valves. Wave-range 7-550 metres. All features for utmost efficiency including continuous bandspread tuning, B.F.O., A.V.C. and Send/Receive switches. Pitch control. R.F. on all bands. Complete in metal cabinet for using separate speaker. Phone jack. Yours for 15/6 down and 18 monthly payments of 15/6. **PAY LESS THAN 12 Gns.**

**TROPHY 5**

The ideal junior communication receiver for serious short-wave work and general use in the home. 5-valves. Wave-range 10-550 metres (continuous). Bandspread tuning. A.V.C. and B.F.O. switches. Built-in speaker and phone jack. Pleasing cabinet as illustrated. **TROPHY GUARANTEE—12 months including all valves.** Ready for use on A.C. mains, 200/250 volts 40/100 cycles. Yours for 10/9 down and 18 monthly payments of 10/9. **PAY LESS THAN £9**



**POST Details of your gear for Special TROPHY quotation NOW!**

**PETO SCOTT CO., LTD.**  
77, (Pr. 40), City Road, London, E.C.1. Tel. GLIHOLO 0875.  
41, (Pr. 40), High Holborn, London, W.C.1. Tel. HOLBORN 3248.

**AERIAL EFFICIENCY!** The congested state of the ether and the presence of man-made interference make the use of a Peto Scott All-Wave Anti-Noise Aerial essential for reliable all-wave listening. 17/6 only cash or C.O.D. or 2/6 weekly, plus 2/6.

# Some Superhet Faults and Remedies

"The Experimenters" Give Details of Some Rather Out-of-the-Ordinary Superhet Troubles which are Not Always Revealed by the Usual Tests

THERE have been many articles in these pages dealing with fault tracing and remedying, and more than one of these has had special reference to the superhet. Consequently, we do not propose to go over the whole ground again, but to deal particularly with a few of the faults that have come our way during recent experimentation. Where necessary, we shall also point out how the faults were overcome.

One of the most peculiar, although it seems perfectly obvious when you have discovered it, produced a peculiar form of distortion and a "hissing" background noise. The usual tests were made for bad connections and faulty components, whilst some of the valves were changed and the speaker was checked. After spending a fair amount of time on the set without producing any improvement, it was noticed that the first I.F. transformer had a list to starboard. Apparently, it had received a knock during the experimental work. The set was built on a wooden chassis, and the earthing of the I.F.-coil screen was by means of a soldering tag, which was originally clamped between the base of the coil and the chassis. Movement of the coil had broken the connection. In future we shall be more careful in making earth returns, or use metallised or metal chassis.

## Low Signal Level

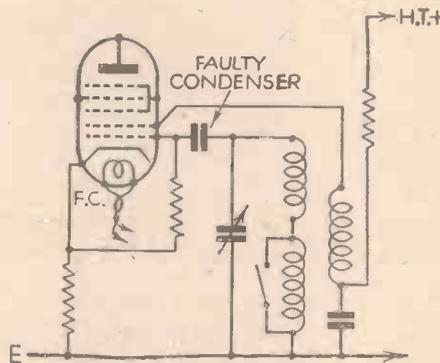
With another superhet, in which a pentagrid frequency-changer was used, there was a similar annoying background noise, but instead of being accompanied by distortion, signal strength was below par. We measured anode currents and filament voltages, checked feed resistors and decoupling condensers, and still overlooked the component that was entirely responsible. In the end it was decided to make a stage-by-stage check, starting from the output circuit. We therefore shorted the grid circuits in turn, starting with the output valve. The trouble did not arise until the frequency-changer was in use.

It was therefore considered necessary to make a further test of the feed components in this circuit and to test the coils. We hadn't a capacity bridge handy so condensers were checked for short-circuits only. Eventually, it was decided to replace some of the components, one at a time. As soon as the oscillator grid condenser was replaced the trouble ceased; proper test of this with a bridge showed that it had an intermittent open circuit.

## An Alignment Hint

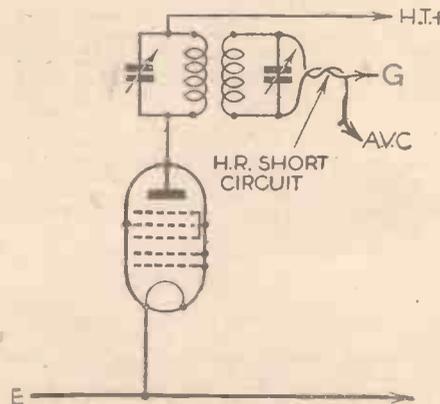
When a new receiver has been built, alignment sometimes presents a problem if the set is provided with sensitive A.V.C. As readers are aware, it is possible to have one of the I.F. trimmers badly out of

adjustment without there being any noticeable difference in output or signal strength. Of course, you can put the A.V.C. out of action, but that is not always convenient, and might even affect trimming adjustments in some cases. An alternative method that we have used a few times



A noisy background, accompanied by low signal strength, was traced to a faulty oscillator grid condenser. It had developed a high resistance, or partial open circuit.

recently (it was actually suggested by a reader who wrote to us some time ago) is to connect a high-resistance voltmeter across the bias resistor of the first controlled valve—in a mains set, of course—and trim for minimum reading. The effect is the same as that of inserting a milliammeter in the anode circuit, because in both cases you adjust for maximum A.V.C. effect, but the connections mentioned often appear to give a more definite reading. In any case, you might care to try the arrangement and see how you like it.



Signal strength was low, and the trimming condenser had little effect, due to leakage between the ends of the I.F. transformer secondary.

## I.F. Transformer Fault

Writing about alignment brings to mind the case of a new set we had built. It was undergoing preliminary tests and adjustments when we found that adjustment of the secondary trimmer of the first I.F. transformer had no effect. Additionally, signal strength and sensitivity were well below normal for a four-valve superhet. The transformer was suspect, so it was removed from the receiver and the screen taken off. It was then found that the two secondary leads were twisted round each other and that there was a high-resistance short between them due to the insulation having been damaged. After untwisting the leads and binding them with insulation tape the fault was overcome.

It should be mentioned that the transformer was of the type having flexible leads brought through holes in top of the screening can, the can being held by means of a central bolt. Apparently, the screen had been twisted round after the leads had been brought out, and this had caused the trouble. Another similar fault, this time resulting in barely audible signals, was due to a short-circuit between the vanes of the trimmer. It must be admitted that the component was an old one which had seen a good deal of service in experimental receivers.

## I.F. Instability

It is not unusual to find in a newly-built receiver that background noises, slight distortion and varying sensitivity over the wavelength scale is due to I.F. instability. This might be due to bad design, lack of screening, incorrect choice of coupling and decoupling resistors, but in many cases it can be overcome by the very simple expedient of slightly increasing the standing bias voltage on the I.F. grid. When the set uses indirectly-heated valves this can be done by replacing the bias resistor, or by connecting another one of about 100 ohms in series with it; with a battery set the procedure is obvious.

Another remedy which we applied recently to a set which was especially stubborn in this respect, was that of increasing the distance between the primary and secondary windings on the first I.F. transformer. They were mounted on a central rod and fixed with varnish, so the upper winding was gently eased along the rod—it was necessary to move it only about  $\frac{1}{8}$  in. After finding that this removed the fault a smear of glue was run round the rod adjacent to the honeycomb winding. We do not recommend this procedure unless all others fail, and in the case of a set built to a PRACTICAL AND AMATEUR WIRELESS design the alteration should not be made, because if the fault had been present in the original model a different type of I.F. transformer would have been specified if necessary.

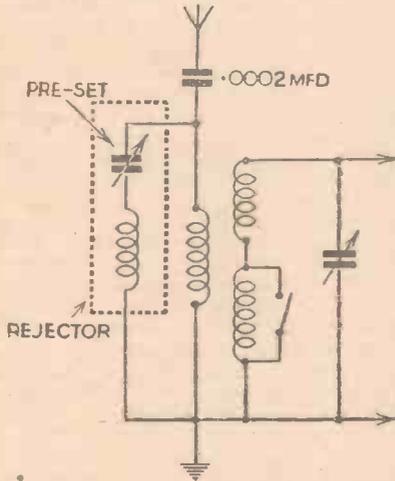
(Continued on facing page)

**SOME SUPERHET FAULTS AND REMEDIES**

(Continued from previous page.)

**Interference at I.F.**

Some time ago one of our number was testing a newly-built transportable superhet near the coast in East Anglia. The set worked well, as it had done in initial tests further inland, but a good deal of trouble was caused by interference from transmitters on trawlers and fishing boats. As will have been gathered, the I.F. circuits were tuned to 465 kc/s (approximately), and it was found by disconnecting the aerial lead-in that the interference was actually being picked up by the aerial, which was of the throw-out type.



I.F. interference can often be prevented by fitting a simple rejector circuit between the ends of the primary winding of the input coil.

The fault was overcome easily by connecting a simple rejector circuit between the ends of the primary (aerial winding) of the input coil. This filter consisted of a coil consisting of 250 turns of 36-gauge enamelled wire wound in two slots on a 3/4 in. diameter former, and a series .0003-mfd. pre-set condenser. Suitable coils for use in this position can, of course, be bought ready made. They act essentially as wave-traps, and the pre-set condenser is adjusted until the interference is tuned out.

**Insufficient Oscillator Output**

A fault that was found with an old superhet that had been running satisfactorily for a few years will probably interest some of our readers. A triode-pentode frequency-changer was used, and although reception of many of the more distant stations was almost as good as ever it had been, the local transmitters could not be heard at full strength, and reception was badly distorted. The L.F. portion of the set was at first suspected, but it was found that this was not at fault because gramophone reproduction was good, even when the volume control was turned full on.

That offered the suggestion that the fault was in the frequency-changer circuit, and lack of oscillator output seemed likely. Very few tests were necessary to show that the resistor feeding the anode of the triode section was almost open-circuited, with the result that the anode actually received just under 10 volts! Consequently, any oscillations that might have been produced with that low voltage were "swamped" by strong signals and the triode was made to oscillate intermittently, thus explaining the distortion and queer behaviour on the local transmissions.

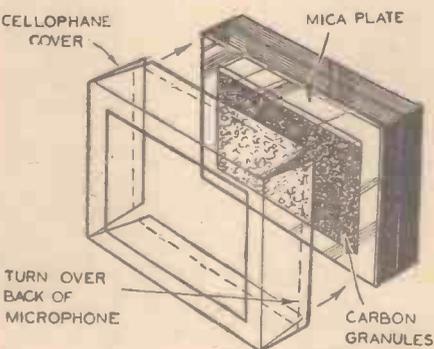
**MAKING A TRANSVERSE CURRENT MICROPHONE**

(Continued from page 220)

each hole to form a seal when the rods are in position. It is also advisable to repeat this process on the outside, as no air must be allowed to enter. Two clean matchsticks are then cut to the same length as the rods and fixed, with a spot of adhesive, up against the inner edges of the rods, as indicated in the illustrations. When you are satisfied that everything is firm and dry, the diaphragm can be fixed in position. Once again, owing to the hard and smooth surfaces to be joined it is essential to rough them in the manner previously described, and for the adhesive I would strongly advise good shellac varnish. The diaphragm is cut from a piece of mica free from flaws and approximately .002 in. thick. If a press or vice is handy the microphone body with diaphragm in position should be clamped in it, under even pressure, and left for at least 24 hours. When removed, any unevenness of the edges can be removed with a sharp safety-razor blade, taking care that the cutting stroke is always toward the body of the microphone, and not away from it.

The next operation is the filling of the space between the two rods with the carbon granules, and this is best done by forming a fine-pointed paper funnel which can just rest in the filling hole previously drilled. The carbon granules should be poured into the funnel very slowly, to prevent them packing in the filling hole, although a gentle vibration will usually ensure a steady flow. When the body is approximately half-full it should be lightly tapped on the back to enable the granules to settle

down, and the filling process then repeated until the space is filled to within 1-16in. from the top. Repeat the tapping process, and add more granules if necessary, but make sure that a space is left, otherwise the sensitivity of the microphone will be reduced. The filling hole can now be plugged and sealed by a very short length of matchstick, which has been rubbed down to make a tight fit, and after cutting it off flush with the outside, seal it with a spot of adhesive.



The microphone assembled and ready for the protective Cellophane covering.

To complete the job the protective cover should be cut from a smooth piece of Cellophane such as that obtained off many packets of cigarettes. The Cellophane does not cover the diaphragm. It is cut to form a cover over the edges of the mica and microphone body, and a reasonable amount of care should be taken to see that it is firmly stuck down at all points.

**MORE FINE BARGAINS**

**5/- Powerful New Steel Moving-Coil SPEAKER-MAGNETS.**

Four-claw 4 1/2 lbs. 10 watt M.C. Speaker Permanent Magnets at manufacturer price. A great opportunity for **5/-**

**CONDENSERS.** Fixed electrolytic 12-4 mfd. -18 mfd. 275 volts, 1/6; 6-6-12 mfd. 250 volts, 1/6; 8-8-16 mfd. 350 volts, 1/6; 24-8-32 mfd. 400 volts, 2/6; 8 mfd. 500 volts, 1/6; Mansbridge Paper and Mica, 4 mfd., 3/6; 8 mfd., 5/6; 10 mfd., 7/-; Dubilier .01 for 1,000 volts, 1/8; .005 Mica Trans. 5,000 volts, 2/6; 10,000 volts, 5/-; 25 mfd. mica, 4,000 volts, 6/-; Oil Condensers, 1 mfd. 3,000 volts, 5/6; Special Condenser Bargain to clear surplus. Western Electric 1 mfd. and 2 mfd., 2d. each, 1,6 doz.; 12/- gross, carriage forward. Ideal for makers of smoothing and filter circuits. Offer open till cleared.

**BLUE BOTTLES.** Glass enclosed; 1 and 1 watt Resistors 01, .025, .05, .1, 1 and 1 meg. 1st 1/-. Sale 1/- per doz., any of these sizes, 9/- per gross.

**COIL WINDERS.** Hand drive, bevel friction, 8 in. high 2/6. Iron Pedestal, Brass Wheel, worth 1 gn.

**COILS.** S.W. plug-in, 1/6. Ribbed formers, 9d. Long-wave and B.C. 2-pin, 1/-. Reaction tuners, 9d. H.F. twin chokes, mains, 9d. Rugby and other coils in stock. All wavelengths in 2-pin, 1/3. S/W. Formers ribbed and slotted, 4d.

**PANELS.** Aluminium 16- and 18-gauge one side enamelled. Paxolin and Ebonite, any size, from 24 in. x 24 in. at low prices.

**VARIABLE CONDENSERS.** .005 mfd. Tekade, 1/3; .00075 Polar Compax, 1/-; S/W. Formo 2/-; J.B. Midget, .0001, 1/8; 2-gang variable, .0005, 2/6; 3-gang, 3/6.

**PROJECTION LANTERNS,** on Stand, with 250-watt focus bulb, 25/-. Arc lamps, Slide lanterns, Film projectors, and Sound heads, cheap.

**EARTH SPIKES.** Massive R.A.F. earth spikes, with terminal for Aerials and Telephone lines, 1/- or 9/- doz.

**MOTOR BARGAINS in Midset H.P.** Motors for A.C. or D.C. 200/230 volts, 110th H.P. D.O.T. type, totally enclosed KB Cover, 2,000 revs., at a price never before offered, 7/6 only. Next larger GM No. 2 type, high speed 150 HP, 4,000 revs., 9/6. Larger still, 145th HP, Model GE, No. 1, 12/6. All as new and first rate for model drive or light duty.

**MORSE RECORDING OF WIRELESS SIGNALS.** These well-known service paper tape linkers record messages on any wavelength at speed. Recorders add enormously to interest. Magnificent British work, mahogany drawer containing tape reel. Such apparatus cost £48, £2 to £8 10s. each.

**ELECTRIC SOLDERING IRONS.** Heavy workshop type, 125 watts, 220/250 volts, 6/6. Big 220v. Alarm Bells, 10 in. gong, 39/-.

**220 VOLT FOOTWARMER** Electric Mats, covered fibre, 7/6. Bed-warmer Blanket Pads, 220 volts, 12/6. 110 volts, 10/6.

**3-VALVE (part finished) BATTERY SETS** with oak cabinet ready wired and fitted 2 condensers and engraved panel, 13 x 7 x 6 in., 15/-.

**PUSH BUTTON TUNING.** 6-way Gang Push, metal cover, 1/6. Multiple Cord, 6d.

**STATIC CONVERTERS.** A.C. mains to D.C. 40 watts output, steel case. Output 440 volts, 60/100 m.a. D.C. with valves, 45/-. A.C. mains to D.C. 120 watts at 1 amp. for 220 v. D.C. sets, steel-cased, valves, 50/-.

**SOUND RECORDING AT HOME** at a reasonable cost. No fancy prices for elaborate gear. The Feign records on any discs.

**THE FEIGN RECORDER** fits any Gramo, has positive drive by ball-bearing worm gear and rack. The Recording Stylus is tracked across blank at the exact grooving spiral. Price, complete, as illus. with Tone Arm and cutter with real diamond, 37/6. All-Metal discs, 3/3 doz.

**MAGNETIC SOUND RECORDING.** Stille Steel Tape, 9d. yard.

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

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

**ELECTRADIX RADIOS**

218, UPPER THAMES ST., LONDON, E.C.4.

Telephone: Central 4611.

**"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.L.W.T., A.M.I.R.E., and similar qualifications.

**WE GUARANTEE "NO PASS-NO FEE."**

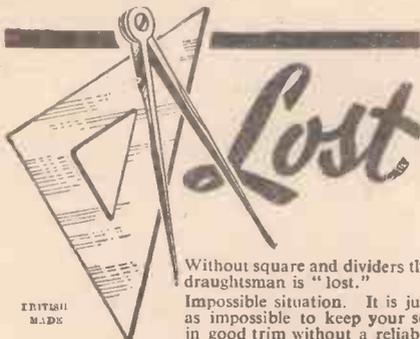
Details are given of over 150 Diploma Courses in all branches of Civil, Mech., Elec., Motor, Aero, Radio, and Television Engineering, Building, Government Employment, etc.

Write for this enlightening Hand-book-to-day FREE and post free. British Institute of Engineering Technology, 400, Shakespeare House, 17, 18, 19, Stratford Place, W.1.

**FREE ADVICE BUREAU COUPON**

This coupon is available until May 27th, 1939, and must accompany all Queries and Requests.

PRACTICAL AND AMATEUR WIRELESS, 20/5/39.



Without square and dividers the draughtsman is "lost." Impossible situation. It is just as impossible to keep your set in good trim without a reliable meter. The D.C. AvoMinor tells you all you want to know; troubles are instantly traced; falling-off in performance is immediately checked.

BRITISH MADE



45/- in case, with instruction booklet, leads, interchangeable test rods and crocodile clips. DEFERRED TERMS IF DESIRED.

Voltage	
0-6 volts	0-240 volts
0-12 volts	0-300 volts
0-120 volts	0-600 volts
Current	
0-6 m/amps.	
0-30 m/amps.	
0-120 m/amps.	
Resistance	
0-10,000 ohms	
0-60,000 ohms	
0-1,200,000 "	
0-5 megohms	

The D.C. **AVOMINOR**  
 Regd. Trade Mark  
 ELECTRICAL MEASURING INSTRUMENT  
 • Write for fully descriptive leaflet  
 Sole Proprietors & Manufacturers—  
 Automatic Coil Winder & Electrical Equipment Co., Ltd.  
 Winder House, Douglas St., London, S.W.1. Phone: Victoria 3404/7.

# 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.

**THE SURREY RADIO CONTACT CLUB, CROYDON**  
 Headquarters: 79, George Street, Croydon, Surrey.  
 Hon. Sec.: S. A. Morley, 22, Old Farleigh Road, Selsdon, Surrey.

THE May meeting of the club constituted a very interesting talk and demonstration given by Mr. J. H. George (G2FH), entitled "Modern High Speed Telegraphy." Mr. George described in full how messages are handled by cable and wireless systems between different parts of the world. He then illustrated by films how the receiving and transmitting apparatus works which deals with the messages. After this he described and gave advice to members on the easiest method of learning morse, and the correct method of operating a morse key.

A morse class is now held at 7.30 p.m., at headquarters, prior to the commencement of each meeting, and is given by a first-class operator. All those desirous of gaining a complete knowledge of the code or those wishing to increase their speed, would do well to take advantage of these classes.

## GOLDERS GREEN AND HENDON RADIO SCIENTIFIC SOCIETY

All communications to be addressed to: H. Ashley Scarlett, 60, Pattison Road, Hampstead, N.W.2. THE application of the cathode-ray tube for measurement purposes formed a most interesting lecture recently by Mr. D. N. Corfield. Imposing no load it was most useful for D.C. measurements.

Wave-form comparison and analysis were demonstrated. An electronic switch was demonstrated enabling the input and output wave-forms being shown superimposed.

The direction finding competition on 80 metres, organised by the Society, and open to all readers, will take place on May 21st, near St. Albans. Those interested should write to Col. H. A. Scarlett, 60, Pattison Road, N.W.2.

## THE SALE AND DISTRICT RADIO SOCIETY

Meetings: Held weekly at St. Mary's School, Barkers Lane, Sale, near Manchester, on Thursday evenings. Secretary: S. C. O. Allen (2FCQ), 31, Ennerdale Drive, Ashton-on-Mersey, Sale.

AT the last meeting of the Society, Mr. G. E. Taylor gave the second in a series of lectures on the fundamental principles of electricity and magnetism, with special reference to radio communication. Mr. Taylor gave a thorough explanation of Ohm's Law without undue reference to mathematics.

## STOURBRIDGE AND DISTRICT RADIO SOCIETY

Hon. Sec.: Donald Rock, 4, Linton Road, Old Hill, Staffs.

THE above Society has recently been formed, and caters for transmitting and non-transmitting amateurs. Meetings are held on the second Wednesday in each month. New members will be welcomed if they will get into touch with the Hon. Sec., who will be pleased to forward full details. There are 12 fully-licensed amateurs, and nearly 20 A.A. members in the Society at present.

## Radio Biography

REG WILLIAMS

REG WILLIAMS, famous Bristol band-leader, is always ready to introduce something different in his broadcast programmes. Reg has broadcast with his Futurist Band and his String Quartet over fifty times during a period of two years on Nationals and Regionals, including an Ameri-

—titles: "I'm Madly in Love With You" and "Tom, Tom, the Piper's Son"

The immediate sales reaction on this recording has caused even shrewd, hard-boiled judges to sit up and take notice; in fact, the first month's sales have been far in excess of what the Columbia Company expected. Reg has established his own particular style of dance music. Band-leaders over here usually look to the Americans for their inspirations, but Reg is not interested in anybody else's style of playing, thus having cultivated something different which is so very easily distinguishable whenever heard.



Reg Williams.

can relay. Age 26, he has made such amazing headway in the dance world that reputable Press critics are already predicting top honours within a year for the ambitious West Country maestro.

The band is made up from entirely new names, these lads having been very carefully sifted from all parts of the country—first-class musicians with the acme of technique. Reg and his Futurist Band record for Columbia, and made their recently first disc



Said Peter Augustus de Wet,  
 "I've found out what's wrong with this set.  
 For all it's requiring  
 Is just a rewiring.  
 And this time, with  
 FLUXITE you bet!"

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, or filled 2/6.

**ALL MECHANICS WILL HAVE**

# FLUXITE

IT SIMPLIFIES ALL SOLDERING

FLUXITE LTD. (Dept. W.P.) DRAGON WORKS, BERNMONDSEY STREET, S.E.1.

## PERSONAL PARAGRAPHS

Mr. Alan Thomas, the recently appointed Editor of the "Listener," succeeds Mr. R. S. Lambert, who, until his retirement at the end of March, had been Editor since the paper's foundation in January, 1929.

Mr. R. J. F. Howgill, Director of B.B.C. Programme Administration, has been appointed to the new post of Assistant Controller (Administration). Mr. Howgill has been engaged on programme administration since he joined the staff of the British Broadcasting Company in December, 1923, and was appointed Director of Programme Administration in October, 1936.

Mr. E. A. F. Harding, Chief Instructor of the B.B.C. Staff Training Department, will be seconded from September 4th next to the Features and Drama Department, where he will act temporarily as a producer. He will be succeeded as Chief Instructor of the Staff Training Department by Mr. C. V. Salmon, who is at present an assistant in the Talks Department.

After four years in the Drama Department, where he produced many important feature programmes such as the first "Round the Empire" programme on Christmas Day, 1932, Mr. Harding was appointed first Programme Director of the North Region at Manchester in 1933. He relinquished this post to become Chief Instructor of the Staff Training Department on its inauguration in 1936.



# 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.)

### Station VS2RA

SIR,—I have recently received a QSL from VS2RA, who asks me to inform other amateurs in this country that his British call of G5RA is being pirated.

It might interest other readers to know that on the same night that I received VS2RA I also heard all continents in 18 minutes; also that at the time of writing 20 metres is alive with real DX at around 08.00 B.S.T.—GERALD R. W. LEWIS (Cheltenham).

### The "P. and A. W." Contrast Expander

SIR,—Having been a reader of your journal for several years, I have been tempted on several occasions to write and congratulate you on the fare you provide.

However, the Contrast Expansion unit described in the issue of May 6th is the circuit I have been waiting for for a very long time. When I have built the Expander, I am going to try it on radio, records, and a sound film machine which I have in my possession.

I am at present using two LS6A valves in parallel as an output stage in my amplifier. Is there any chance of an output stage being described by you using, say, two Ostram KT66 in push-pull or a couple of PX25A's in push-pull? This I think, would be a fitting output to the Expander, and would satisfy my requirements.—W. LONGHURST (Uxbridge).

[A suitable amplifier for the Contrast Expander will be described in our next issue.—Ed.]

### Slow Morse Transmissions!

SIR,—I was very interested to read the letter from Mr. A. Gale (G3XN) in the April 29th issue. My own experiences with several component manufacturers is that they were remarkably quick in sending my requirements. In one case I received the goods within four days of ordering them!

I would appreciate very much some slow morse transmissions as Mr. Gale suggests, as I am rather a newcomer to wireless, but very keen, and am trying hard to learn morse. I am finding this rather difficult as I have no one to help me. I should, therefore, be very much obliged if you could put me in touch with someone in my locality interested in short-wave reception.

May I express my appreciation of your instructive and very enjoyable journal.—E. J. W. LOVETT (29, Kingston Road, Leatherhead, Surrey).

### Exchanging QSL Cards

SIR,—Being a reader of your very fine paper for about three years, I would be glad to exchange QSL cards, with any A.A. "ham," or full ticket "hams," or any listening stations in the British Isles or elsewhere.—J. E. SWIFT (2DZA) (14, Glanselsig Street, Blaenycwm, Treherbert, Glam, South Wales).

### Correspondents Wanted

SIR,—I have been a reader of PRACTICAL AND AMATEUR WIRELESS for a considerable time now, and I am very pleased to find such interesting articles in its pages. I should be very pleased indeed if you could put me in touch with any short-wave enthusiast living either in this country or abroad, who is a beginner like myself.—ARTHUR MILLINGTON (31, Mill Lane, Darton, Nr. Barnsley, Yorkshire.)

SIR,—As an old reader of PRACTICAL AND AMATEUR WIRELESS, I shall be glad to get in touch with another reader interested in short-wave reception and transmission. I will be pleased to answer any letters from readers who are interested.—STANLEY HATTON (Boundary Hotel, Leigh, Lancs).

### A Log from Alabama

SIR,—A correspondent, A. F. Jackson, of Great Yarmouth, Norfolk, has been sending me your excellent paper for several weeks, and I find it quite the thing for getting an insight into the viewpoint of the DX'ers and set-builders on the other side

of "The Pond." I always find items of interest as well as new DX tips in your various departments. Many of your DX items, however, are slightly "old" news over here but they always prove interesting.

Herewith I am submitting a log of G phones logged during the recent ARRL Contest (March 17th-26th): G2PU, 2UT, 2WD, 3DO, 4AS, 5ML, 5QN, 6BY, 6LK, 6UX, 6WY, 8CL, 8IK, 8TD. Also, GW3KY, GM2UU. All those were logged on 20 metres. A Hallicrafter S14 plus a 1851 pre-selector was used.

My best catches during the contest were: LA1F, SU1MW, SU1CR, VK6LH, PK4KS (14.33), EK1AF.

I shall be very pleased to send my SWL card to any of your readers desiring an Alabama card for their collection.

All good wishes to PRACTICAL AND AMATEUR WIRELESS, and 73's to all its readers, from Alabama, U.S.A.—JACK WELLS, (1,000-14th Street, Phenix City, Alabama, U.S.A.).

### Logged at Saxthorpe

SIR,—I hope this 20-metre log will be of interest to other readers, especially those living in this district. The following stations were logged between March 25th and April 27th: VK2HG, JQ, 3MH, HG, 4CW, MF, 6BY; OA4CF; CE2BX, 3AT, AQ; K6QPH, NYD; PK4JA; FB8AH; CO2JJ, WM, 7CX, AS, 8BC; YV5ABE, ABF, AK, 6AM, TF3F; EA7BA; TG5JG; CT3AT; YL2CD; HK3DA; CX2CO; ZC6HS; ZS1T, QAZ, X, 5BE, Q, 6A, S, DK, DY, DX; KA1GR, FH, KG, 3KK; XZ2EM; CRTAS, HR5C; VS7RA; PY1GR, 2DA BH, 3CA; LU1AQ, 4BC, 5CZ; VU2FA, CQ, FQ; VP1BA, 2LC, 3EF, 4TK, 6YB, NU, MR, FO, 7NU, 9B; EK1AA, AF, VQ2CM, HC, 4ECJ. The receiver used was a 5-valver with an outdoor antenna about 30ft. long and 20ft. high.—J. W. BUSH (Saxthorpe, Norwich).

### CUT THIS OUT EACH WEEK

## Do you know

—THAT some push-button tuners are adjusted by varying the inductance of the coils and not by pre-set condensers.

—THAT when testing a receiver with A.V.C. it is often desirable to cut out the A.V.C. action.

—THAT in some cases the above procedure may be carried out merely by earthing the A.V.C. line, but in others that line may have to be disconnected.

—THAT in some circuits an ordinary pentode may be used as a high-efficiency triode by strapping screen and anode together.

—THAT the speed of a synchronous motor is directly related to the frequency of the supply and the number of poles on the rotor and accordingly its speed cannot be controlled.

—THAT although a reduction in H.T. voltage sometimes removes H.F. instability, this is only because the efficiency of the stage is reduced.

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.

### "SUN UP"—A Television Play

THIS moving drama of North Carolina mountains in 1917, when young men were being called up for Army service, tells the story of Widow Cagle (Sybil Thorndike) and her son Rufe. Widow Cagle has no knowledge of international affairs and when her son leaves she imagines he is fighting the "Yankees" like his father before him. The "Yankees" and the "law" are her life enemies.

Thus, when the "law," in the person of Sheriff Weeks, pursues a deserter to her mountain cabin she hides the man, only to discover later that she has been shielding the son of the man who killed her husband. Tragedy follows tragedy and Widow Cagle, despite her rugged nature, is strongly tried. Dame Sybil Thorndike made her first appearance in this television play, by Lula Vollmer, on the evening of May 14th.

The cast includes Harry Hutchinson, Betty Jardine, Edmund Willard and Esmond Knight. "Sun Up," which will be produced by George More O'Ferrall, will be repeated in the afternoon programme on May 22nd.

## PRACTICAL WIRELESS SERVICE MANUAL

By F. J. CAMM;

From all Booksellers 5/- net, or by post 5/6 direct from the Publishers, George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

# 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 5s. per Group Volume or in bound volumes price 2s. each.

**Abstracts Published.**

**WIRELESS RECEIVING-APPARATUS.**—Fabbrica Italiana Magneti Marelli. No. 499727.

A variable resistor for adjusting the potential applied to a circuit has a sliding contact moved through reduction gear, and is provided with a switch that is closed by the resistor control knob and brings into circuit a voltmeter for showing the condition of the supply source. The slider 7 on resistor 5, Fig. 1, is driven through a screw-threaded tube 9 that is frictionally coupled to the knob 11 by resilient means

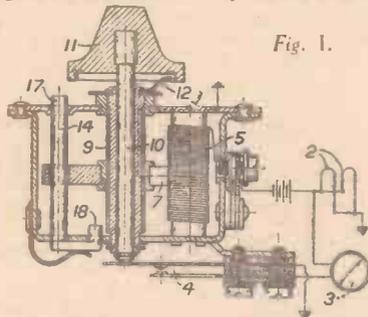


Fig. 1.

12. The thrust on a concentric spindle 10 closes switch 4 and connects voltmeter 3 into a battery circuit supplying the filaments 2 of a radio receiver. In order to prevent changing of the battery 1 unless all of the resistance is in circuit, the end 17 of guide rod 14 locks on the battery cover and remains there until the end 18 of rod 14 is engaged by the contact carrier.

**AUTOMATIC VOLUME CONTROL.**—Marconi's Wireless Telegraph Co., Ltd., and Keall, O.E. No. 499774.

The detector diode 8, 9, Fig. 2, is muted by the potential across the resistance 55 between the common H.T. negative terminal 37 and earth. When signals of above a predetermined amplitude are received, the muting bias is opposed by the potential across the resistance 47 due to current

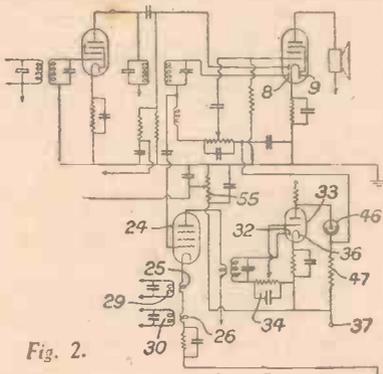


Fig. 2.

through a glow-discharge tube 46 made conducting by cutting off the anode current of the triode 33, the grid of which is controlled by the rectified signal voltage across the load resistance 34 of an auxiliary diode 32, 36. The latter is fed from the anode circuit of an auxiliary amplifier 24, the cathode coils 25, 26 of which feed the A.F.C. discriminator circuits 29, 30. The negative feed-back produced by the latter produce a desirable triangular output-frequency characteristic in the muting circuit. The glow-discharge tube 46 may be associated with the tuning scale to act as a tuning indicator.

**CATHODE-RAY TUBES.**—Baird Television Ltd., and Lance, T. M. C. No. 499828.

The mosaic screen in a television transmission system is formed of wire mesh 5, Fig. 3, coated with insulation 6 and bearing discrete elements 7 which are photo-sensitive; an optical image is focused thereon and the elements are returned to datum

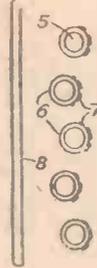


Fig. 3.

potential by a scanning beam, this effect being used for producing the signals. In order to remove space charge from the front of the screen, a plate 8 is placed on the side of it remote from the electron gun and maintained at a positive potential. The resistance of the insulation 6 is such that some conduction takes place from the elements to wire mesh in order that the elements do not attain the potential of the plate 8.

## 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. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

**Latest Patent Applications.**

- 12318.—Askania-Werke Akt.-Ges.—Radio direction-finding means. April 24.
- 12367.—Baird Television, Ltd., Tingley, G.R., and Ridgway, D.V.—Thermionic-valve oscillation generators. April 25.
- 12359.—Cole, Ltd., E. K., and Hutchings, E. L.—Tone-correction, etc., in audio frequency amplifiers. April 25.
- 12046.—Grantzel, A.—Tuning devices for short-wave radio transmitters, etc. April 21.
- 12176.—Hazeltime Corporation.—Band-pass selector systems. April 22.
- 12177.—Hazeltime Corporation.—Scanning ray tube target for a television signal-reproducing system. April 22.
- 12162.—I.M.K. Syndicate, Ltd., and Nagy, P.—Light-modulating devices for use in television receivers. April 22.
- 12559.—Jackson, D., and Pye, Ltd.—Mounting of the chassis of radio and television apparatus, etc. April 26.
- 12127.—Kolster-Brandes, Ltd., and Beatty, W. A.—Discriminating circuits for television, etc. April 22.
- 12406.—Control circuits for temperature responsive resistances. April 25.
- 12126.—Kolster-Brandes, Ltd., Shannon D.S.B., and Chatterjea, P. K.—Electron-discharge devices, etc. April 22.
- 12112.—Marconi's Wireless Telegraph Co., Ltd., and Levin, N.—Cathode-ray tubes, etc. April 21.
- 12260.—M.O. Valve Co., Ltd., and McAulay, T. S.—Thermionic valves. April 24.
- 12192.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Arrangements for neutralising distortion in cathode-ray tubes. April 22.

- 12193.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Cathode-ray tubes, etc. April 22.
- 12082.—Radio Corporation of America.—Film phonographs. April 21.
- 12008.—Radioakt.-Ges. D. S. Loewe.—Cathode-ray tube. April 21.

**Specifications Published.**

- 503954.—Radioakt.-Ges. D. S. Loewe.—Cathode-ray tubes.
- 504268.—Rudkin, E. P., and Hellings, G. M.—Television reception. (Cognate Application, 21242/37).
- 504109.—Klemperer, O.—Cathode-ray tubes.
- 504022.—Mitchell, F. A.—Electrical control of tuning mechanism for radio apparatus.
- 504029.—Telefunken Ges. Fur Drahtlose Telegraphie.—Wireless receivers.
- 504035.—Anson, T. G.—Magazines for gramophones provided with automatic record-changing apparatus.
- 504188.—Baird Television, Ltd., and King, E. B.—Methods of constructing mosaic electrodes. (Cognate Application, 9627/38).
- 504129.—Murphy Radio, Ltd., and Webb, A. K.—Diaphragms for loudspeaker telephones.
- 504196.—Fortescue, R. L.—Thermionic valve apparatus.
- 504141.—Siemens Bros. and Co., Ltd., and Chittenden, P. A.—Thermionic-valve circuits.
- 504060.—Telefunken Ges. Fur Drahtlose Telegraphie.—Radio direction-finding receivers.
- 504229.—Hazeltime Corporation.—Automatic signal interference control for radio receivers.
- 504230.—Hazeltime Corporation.—Automatic fidelity control for radio reception.
- 504327.—Daniel, K.—Method of duplicating band sound records produced by the needle sound-recording method. (Cognate Application, No. 18702/38).

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.

## A COMPLETE LIBRARY OF STANDARD WORKS

By F. J. GAMM

- WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA, 5/-, by post 5/6.
- EVERYMAN'S WIRELESS BOOK, 3/6, by post, 3/10.
- TELEVISION and SHORT-WAVE HANDBOOK, 3/6, by post 4/-.
- 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
- PRACTICAL WIRELESS SERVICE MANUAL, 5/-, by post, 5/6.
- WIRELESS TRANSMISSION FOR AMATEURS, 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



# QUERIES and ENQUIRIES

## The "Q" Code

"Could you kindly tell me how, or where, I can obtain a complete copy of the 'Q' code, as used by amateurs, as I am now starting out on the short waves?"—J. M. W. (Ipswich).

A LIST of the standard Q Code abbreviations as used in radio communication will be found, with other useful data, in the Handbook for Wireless Telegraph Operators, obtainable from H.M. Stationery Office, price 9d. The main abbreviations as used by amateur transmitters are also given in the Q code in our book Wireless Transmission for Amateurs, price 2s. 6d.

## Adding H.F. Stage

"I am in the same difficulty as your reader, F. R. of Leigh-on-Sea. I wish to add an H.F. stage to my 1-valver, and have looked around for a diagram, but am unable to find one. Could you inform me where I could get it please?"—E. B. (Salford).

WE published an article entitled, "The Range Getter" in our issue dated December 31st last, in which an H.F. amplifier was described. No layout was given, but in view of the small number of parts needed no difficulty should be experienced in building up an efficient H.F. stage, provided that care is taken to screen this stage so that interaction between the coil or any wiring on the H.F. stage is avoided. If screened coils are used, and the wiring carefully carried out there should be no difficulty in this connection.

## The "Elf" Portable

"Is it still possible to obtain a theoretical diagram of the Elf Portable, and if so, would you tell me how to obtain it?"—N. K. (N.W.3.).

UNFORTUNATELY the issue describing the construction of this particular receiver is out of print. Upon receipt of a stamped, addressed envelope, however, we can send you a cutting of the circuit in question.

## Trimming Three Coils

"How do you trim a tuning unit consisting of three coils—two aerial band-pass and one H.F. transformer. Also, it is stated that in R.C. coupling the anode resistance should be approximately two to three times the valve impedance. Does this value include decoupling resistances?"—R. F. B. (Bradford).

THE best plan in trimming coils in combination as mentioned is to adjust the transformer first. This will generally be sharper tuned than the remaining part, and if a wavelength calibrated dial is used, will govern the pointer settings. When approximately correct the circuit feeding the grid of the first valve should be trimmed for maximum volume, the aerial coil being trimmed last. The three circuits are, of course, adjusted for maximum volume and preferably this should be carried out at each end of the medium-

waveband—the settings with most coils holding for the long waves. The anode resistance alone is considered in the R.C. coupling unit, the decoupling resistance not being part of the valve circuit. Its value must, of course, be considered when working out the H.T. applied to the stage as the anode current will flow through both resistances and the voltage drop will thus be dependent upon both. The amplification of the stage is dependent only on the load offered by the coupling resistance.

### 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.

## Stand-by Repairs

"In your April 15th issue you mentioned a method of cutting out a defective L.F. transformer, and making use of R.C. coupling. My transformer developed a fault and I tried to use the idea you mentioned but when wired exactly as shown in your sketch it failed to function. I believe this is because the resistance shown in the anode circuit should be joined to the anode and not crossed over as shown in the sketch. Is this correct please?"—F. S. (Bournemouth).

YES, you are quite in order in joining the resistor to the anode of the valve. This takes the place of the primary of the transformer, and owing to a draughtsman's error the line to the coupling condenser was shown crossing the anode lead instead of being joined to it.

## WIRELESS TRANSMISSION FOR AMATEURS

Edited by F. J. GAMM

Explaining how to Learn the Morse Code: Applying for a Licence: Building and Operating the Set. Illustrated by Many Practical Diagrams.

Price 2/6 or 2/9 by post

From George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, W.C.2.

## Energised Speaker

"I have bought a surplus energised speaker with a field of only 300 ohms. I should like to use this but a circuit which I have found shows a 2,000 ohm field. Does this mean that my speaker is no use or must I have it rewound or joined in series with another choke?"—L. D. (N.W.4).

THE speaker was probably designed for a special receiver and although you could connect it in the H.T. positive lead of your proposed receiver you will have to watch the current which flows through it. If excessive the field will heat unduly, and if you connect another choke or resistance in series you may not obtain sufficient wattage to enable the speaker to prove sensitive enough for your work. Probably the best plan would be to communicate with the suppliers or the makers and ascertain the correct rating of the field.

## Making L.F. Choke

"I wish to use a small L.F. choke in a battery amplifier I am making, and require an inductance of about 30 henries. The choke should carry a current round about 50 mA and I have several collections of stampings available with plenty of wire. Could you give me constructional details of a suitable choke?"—B. I. S. (Perth).

IT would be difficult to give all the necessary data in the form of a reply and think the best plan is to refer you to our issue dated January 28th last. In that number we gave constructional data of a choke which would be quite suitable for your purpose, together with other relative material on chokes and transformers. The back number costs 4d. post paid.

## 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. A. C. (Leamington). The Z.63's are used in the B.F.O. and 2nd detector stages.

W. J. M. (Birmingham). The field is probably used as a bleeder across the entire H.T. supply and therefore is quite in order. We cannot give connections and suggest you write to the makers as there is no standardisation.

J. D. (Waterford). We are unable to give transformer winding data in the space available and suggest you obtain a copy of our book on the subject, "Coils, Chokes and Transformers."

E. H. M. (Bournemouth). Write to one of the firms whose adverts. will be found from time to time in our pages.

P. F. MacG. (Clachnaharry). Write to the British Radiophone Company, at 56, Vicarage Lane, Ilford, Essex.

P. W. (C.R.C. 3202). We are preparing an article on the subject for early publication.

C. O'F. (Bristol, 8), and L. N. (Nr. Lancaster). We cannot supply further details in a letter or reply, and therefore suggest that you write to Messrs. Webb's Radio, of Soho Street, London, W.1, for the information in question.

R. H. (N.21). We have no details now available concerning the type of apparatus mentioned in your letter.

P. H. M. (Leicester). The amateur in question lives in Cecilia Road, Leicester, and thus his close proximity to you gave rise to the effect mentioned.

D. C. (Chelmsford). We have no blueprints of apparatus of the type mentioned and cannot therefore supply you with any details. If you need actual apparatus you should write to Messrs. Premier Supply Stores, or Radiomart, of Birmingham.

The coupon on page 235 must be attached to every query.

# Practical and Amateur Wireless BLUEPRINT SERVICE

**PRACTICAL WIRELESS**  
**CRYSTAL SETS.**  
 No. of Date of Issu. Blueprint

Blueprints, 6d. each.  
 1937 Crystal Receiver ... PW71  
 The "Junior" Crystal Set ... 27.8.38 PW94

**STRAIGHT SETS.** Battery Operated.  
 One-valve : Blueprints, 1s. each.  
 All-Wave Unipen (Pentode) ... PW31A  
 Beginners' One-Valver ... 10.2.38 PW85  
 The "Pyramid" One-valver (HF Pen) ... 27.8.38 PW93

Two-valve : Blueprints, 1s. each.  
 Four-range SuperMag Two (D, Pen) ... PW30B  
 The Signet Two (D & LF) ... 24.9.33 PW76  
 Three-valve : Blueprints, 1s. each.  
 The Long-range Express Three (SG, D, Pen) ... 24.4.37 PW2

Selectone Battery Three (D, 2 LF Trans) ... PW10  
 Sixty Shilling Three (D, 2 LF RC & Trans) ... PW34A  
 Leader Three (SG, D, Pow) ... 22.5.37 PW35  
 Summit Three (HF Pen, D, Pen) ... 1W37

All Pentode Three (HF Pen, D, Pen) ... 29.5.37 PW39  
 Hall-mark Three (SG, D, Pow) ... 12.6.37 PW41  
 Hall-mark Cadet (D, LF, Pen (RC)) ... 16.8.35 PW48  
 F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) ... 13.4.35 PW49

Genet Midget (D, 2 LF Trans) ... June '35 PM1  
 Cameo Midget Three (D, 2 LF Trans) ... 8.6.35 PW51  
 1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) Battery All-Wave Three (D, 2 LF RC) ... PW53

The Monitor (HF Pen, D, Pen) ... PW55  
 The Tutor Three (HF Pen, D, Pen) ... 21.3.36 PW61  
 The Centaur Three (SG, D, P) ... 14.8.37 PW64  
 F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ... 31.10.36 PW69

The "Colt" All-Wave Three (D 2 LF RC & Trans) ... 18.2.39 PW72  
 The "Rapide" Straight 3 (D, 2 LF RC & Trans) ... 4.12.37 PW82  
 F. J. Camm's Oracle All-Wave Three (HF, Det., Pen) ... 28.8.37 PW78

1938 "Triband" All-Wave Three (HF Pen, D, Pen) ... 22.1.38 PW84  
 F. J. Camm's "Sprite" Three (HF Pen, D, Tet) ... 26.3.38 PW87  
 The "Hurricane" All-Wave Three (SG, D (Pen), Pen) ... 30.4.38 PW89

F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet) ... 3.9.38 PW92  
 Four-valve : Blueprints, 1s. each.  
 Sonotone Four (SG, D, LF, P) ... 1.5.37 PW4  
 Fury Four (2 SG, D, Pen) ... 8.5.37 PW11

Beta Universal Four (SG, D, LF, C, B) ... PW17  
 Nucleon Class B Four (SG, D (SG), LF, C, B) ... 6.1.34 PW34B  
 Fury Four Super (SG, SG, D, Pen) Battery Hall-Mark 4 (HF Pen, D, Push-Pull) ... PW34C  
 F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ... 26.9.36 PW67

All-Wave "Corona" 4 (HF Pen, D, LF, Pow) ... 9.10.37 PW79  
 "Acme" All-Wave 4 (HF Pen, D (Pen), LF, C, B) ... 12.2.38 PWS3  
 The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC)) ... 3.9.33 PW90

**Mains Operated.**  
 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 (D, Pow) ... PW19

Three-valve : Blueprints, 1s. each.  
 Double-Diode-Triode Three (HF Pen, DDT, Pen) ... PW23  
 D.C. Ace (SG, D, Pen) ... PW25  
 A.C. Three (SG, D, Pen) ... PW29  
 A.C. Leader (HF Pen, D, Pow) ... 7.1.39 PW35C  
 D.C. Premier (HF Pen, D, Pen) ... 31.3.34 PW35B  
 Ubique (HF Pen, D (Pen), Pen) ... 28.7.31 PW36A

Armada Mains Three (HF Pen, D, Pen) ... PW38  
 F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) "All-Wave" A.C. Three (D, 2 LF (RC)) ... 11.5.35 PW50  
 A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ... PW56  
 Mains Record All-Wave 3 (HF Pen, D, Pen) ... 5.12.36 PW70

All-World Ace (HF Pen, D, Pen) ... 28.8.37 PW80  
 Four-valve : Blueprints, 1s. each.  
 A.C. Fury Four (SG, SG, D, Pen) A.C. Fury Four Super (SG, SG, D, Pen) ... PW20  
 A.C. Hall-Mark (HF Pen, D, Push-Pull) ... 24.7.37 PW45  
 Universal Hall-Mark (HF Pen, D, Push-Pull) ... 9.2.35 PW47  
 A.C. All-Wave Corona Four ... 6.11.37 PW81

**SUPERHETS.**  
 Battery Sets : Blueprints, 1s. each.  
 £5 Superhet (Three-valve) ... 5.8.37 PW40  
 F. J. Camm's 2-valve Superhet ... 13.7.35 PW52  
 F. J. Camm's "Vitesse" All-Waver (5-valver) ... 27.2.37 PW75

**Mains Sets : Blueprints, 1s. each.**  
 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 PW59  
 F. J. Camm's Universal £4 Superhet 4 ... PW60  
 "Qualitone" Universal Four ... 16.1.37 PW73

**Four-valve : Double-sided Blueprint, 1s. 6d.**  
 Push-Button 4, Battery Model ... 22.10.38 PW95  
 Push-Button 4, A.C. Mains Model

**SHORT-WAVE SETS.**  
 One-valve : Blueprint, 1s.  
 Simple S.W. One-valver ... 9.4.38 PWS8  
 Two-valve : Blueprints, 1s. each.  
 Midget Short-wave Two (D, Pen) "Fleet" Short-wave Two (D (HF Pen), Pen) ... 27.8.33 PW91

Three-valve : Blueprints, 1s. each.  
 Experimenter's Short-wave Three (SG, D, Pow) ... 30.7.38 PW30A  
 The Perfect 3 (D, 2 LF (RC and Trans)) ... 7.8.37 PW63  
 The Band-Spread S.W. Three (HF Pen, D (Pen), Pen) ... 1.10.38 PW68

**PORTABLES.**  
 Three-valve : Blueprints, 1s. each.  
 F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ... PW65  
 Parvo Flyweight Midget Portable (SG, D Pen) ... 10.6.37 PW77

Four-valve : Blueprint, 1s.  
 "Imp" Portable 4 (D, LF, LF, Pen) ... 10.3.38 PW86  
**MISCELLANEOUS.**  
 S.W. Converter-Adapter (1 valve) ... PW48A

**AMATEUR WIRELESS AND WIRELESS MAGAZINE**  
**CRYSTAL SETS.**  
 Blueprints, 6d. each.  
 Four-station Crystal Set ... 23.7.38 AW427  
 1934 Crystal Set ... AW444  
 150-mile Crystal Set ... AW450

**STRAIGHT SETS.** Battery Operated.  
 One-valve : Blueprints, 1s. each.  
 B.B.C. Special One-valver ... AW387  
 Twenty-station Loudspeaker One-valver (Class B) ... AW449

Two-valve : Blueprints, 1s. each.  
 Melody Ranger Two (D, Trans) ... AW388  
 Full-volume Two (SG det. Pen) ... AW392  
 Lucerne Minor (D, Pen) ... AW425  
 A Modern Two-valver ... WM409

Three-valve : Blueprints, 1s. each.  
 Class B Three (D, Trans, Class B) Fan and Family Three (D, Trans, Class B) ... 25.11.38 AW410  
 £5 5s. S.G.3 (SG, D, Trans) ... 2.12.33 AW412  
 Lucerne Ranger (SG, D, Trans) ... AW422  
 £5 5s. Three : De Luxe Version (SG, D, Trans) ... 19.5.34 AW435

Lucerne Straight Three (D, RC, Trans) ... AW437  
 Transportable Three (SG, D, Pen) ... WM271  
 Simple-Tune Three (SG, D, Pen) ... June '33 WM327  
 Economy-Pentode Three (SG, D, Pen) ... Oct. '33 WM337  
 "W.M." 1934 Standard Three (SG, D, Pen) ... WM351  
 £3 3s. Three (SG, D, Trans) ... Mar. '34 WM354

1935 £6 6s. Battery Three (SG, D, Pen) ... WM371  
 PTP Three (Pen, D, Pen) ... WM389  
 Certainty Three (SG, D, Pen) ... WM393  
 Minutube Three (SG, D, Trans) ... Oct. '35 WM396  
 All-Wave Winning Three (SG, D, Pen) ... WM400

Four-valve : Blueprints, 1s. 6d. each.  
 65s. Four (SG, D, RC, Trans) ... AW370  
 2HF Four (2 SG, D, Pen) ... AW421  
 Self-contained Four (SG, D, LF, Class B) ... Aug. '33 WM331  
 Lucerne Straight Four (SG, D, LF, Trans) ... WM350  
 £5 5s. Battery Four (HF, D, 2 LF) ... Feb. '35 WM331  
 The H.K. Four (SG, SG, D, Pen) ... Mar. '35 WM384

The Auto Straight Four (HF Pen, HF Pen, DDT, Pen) ... Apr. '36 WM404  
 Five-valve : Blueprints, 1s. 6d. each.  
 Super-quality Five (2 HF, D, RC, Trans) ... WM320  
 Class B Quadrydne (2 SG, D, LF, Class B) ... WM344  
 New Class B Five (2 SG, D, LF, Class B) ... WM340

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.

**Mains Operated.**  
 Two-valve : Blueprints, 1s. each.  
 Consoelectric Two (D, Pen) A.C. ... AW408  
 Economy A.C. Two (D, Trans) A.C. ... WM286  
 Universal 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  
 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 WM329  
 Harris' Jubilee Radiogram (HF Pen, D, LF, P) ... May '35 WM380

**SUPERHETS.**  
 Battery Sets : Blueprints, 1s. 6d. each.  
 Modern Super Scolor ... 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.**  
 Heptode Super Three A.C. ... May '34 WM350  
 "W.M." Radiogram Super A.C. ... WM366

**PORTABLES.**  
 Four-valve : Blueprints, 1s. 6d. each.  
 Holiday Portable (SG, D, LF, Class B) ... AW393  
 Family Portable (HF, D, RC, Trans) ... AW447  
 Two H.F. Portable (2 SG, D, QP21) ... WM363  
 Tyers Portable (SG, D, 2 Trans) ... WM367

**SHORT-WAVE SETS—Battery Operated.**  
 One-valve : Blueprints, 1s. each.  
 S.W. One-valver for America ... 15.10.38 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 AW435  
 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-valve Short-waver (SG, D, LF, P) ... Mar. '35 WM383

Superhet : Blueprint, 1s. 6d.  
 Simplified Short-wave Super ... Nov. '35 WM397

**Mains Operated.**  
 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 : Blueprint, 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

**MISCELLANEOUS.**  
 S.W. One-valve Converter (Price 6d.) ... AW329  
 Enthusiast's Power Amplifier (1/6) ... WM387  
 Listener's 5-watt A.C. Amplifier (1/6) ... WM392  
 Radio Unit (2v.) for WM392 (1/-) ... Nov. '35 WM398  
 Harris Electrogram (battery amplifier 1/2) ... WM399  
 De Luxe Concert A.C. Electrogram (1/-) ... Mar. '36 WM403  
 New Style Short-wave Adapter (1/-) ... 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

**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.

**SOUTHERN RADIO'S Bargains.**

**5/-** BARGAIN Parcels of Useful Radio Components, coils, transformer resistances, condensers, wire, circuits, etc., value over 20/-; 5/- per parcel.  
**T**ELSEN W349 Midget Iron Core Coils, 3/6.

**A**C./D.C. Multi-meters, 5-range, 8/6; Ace "P.O." microphones, 4/-.

**2/6** ORMOND Loud-Speaker Units, new and boxed, 2/6 each.

**36** ASSORTED 1-watt Wire-ended Resistances, 5/6; 24 tubular condensers, assorted capacities up to 0.5 mfd., 6/-; volume controls, assorted capacities (less switch), 7/6 dozen; with switch, 11/6 dozen; mica condensers, assorted, 1/9 dozen; Mansbridge type condensers, 1 mfd., 2 mfd., 4 mfd., 8 mfd., 8/- dozen; valveholders, 5-pin, 7-pin, 9-pin, 2/6 dozen; battery leads, multi-way, 6/6 dozen; parcel of assorted servicing components comprising resistances; tubular, mica, variable, electrolytic and block condensers; wire; sleeving; volume controls; valveholders, etc., etc., 10/- each; parcel containing at least 100 articles.

**S**OUTHERN RADIO, 46, Lisle Street, London, W.C. Gerrard 6653.

**R**ESISTANCES!!—Parcels of 50, 1-watt to 2-watt consisting of 20 useful values, only 1/9 for 50.—Harrison & Co., 89, Great Portland Street, London, W.1. Langham 2471.

**100** RESISTANCES, over 22 values ranging from 1/2-watt—2-watt 3/3 per 100.—Harrison, 40, Sidmouth Road, Brondesbury, London, N.W.2.

**V**AUXHALL.—All goods previously advertised are still available; send now for latest price list, free.—Vauxhall Utilities, 163a, Strand, W.C.2.

**LOUDSPEAKER REPAIRS**

**L**LOUDSPEAKER 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.S. Repair Service, 5, Baiham Grove, London, S.W.12. Battersea 1321.

**NEW LOUDSPEAKERS**

**3,000** SPEAKERS from 6/6 each, P.M. and energised 4in. to 14in., including several Epoch 18in.—Sinclair Speakers, Alma Grove, Copenhagen Street, N.1.

**VALVES**

**A**MERICAN Valves in Sealed Cartons, all types 5/6 post paid.—Valves, 661/3, Harrow Road, N.W.10.

**BATTERY CHARGERS**

**B**UILD the Argon 2 to 25-volt Charger. Transformer, 12/6. Valve, 10/6. New List of Transformers ready.—Thompsons, 176, Greenwich High Road, Greenwich.

**NEW RECEIVERS AND CHASSIS**

**C**HASSIS, panels and cabinets drilled to your requirements. Example, aluminium chassis 10" x 8" x 2", 4/6. Black crackle panel 10" x 8", 3/6. Satisfaction guaranteed.—The Universal Productions, Rigby Lane, Bromsgrove, Worcs.

**A**RMSTRONG IMPORTANT ANNOUNCEMENT: For the convenience of our customers we have moved to modern offices and showrooms at Writers Road, Holloway. Writers Road adjoins Holloway Arcade and is readily accessible from all parts of London. ARMSTRONG CO. will gladly demonstrate 1939 range of Radio chassis at the new premises. Kindly note in future all correspondence to Armstrong Manufacturing Co., Writers Road, Holloway, London, N.7.

**PREMIER RADIO** 1939

**Premier Short-Wave Kits**

Complete to the last detail including all Valves and coils, as well as theoretical and wiring diagrams and lucid instructions for building and working. Each kit is supplied with a steel Chassis and Panel and uses plug-in coils to tune from 13 to 170 metres.

- 1 Valve Short-Wave Receiver or Adapter Kit 17/6
- 1 Valve Short-Wave Superhet Converter Kit 20/-
- 1 Valve Short-Wave A.C. Superhet Converter Kit 22/6
- 2 Valve Short-Wave Receiver Kit 25/-
- 3 Valve Short-Wave Screen Grid and Pentode Kit 58/6

**PREMIER 3-BAND S.W. KITS**, 11-86 metres, without Coil Changing. Complete Kits, including all components and valves.

Short-Wave One-Valver 12/6

Short-Wave Two-Valver 19/6

**PREMIER U.S.A. QUARTZ TRANSMITTING CRYSTALS**, 7 mc Band, 10/- each, with Calibration Certificate. Enclosed holder and Base, 3/-.

**PREMIER MOVING COIL METERS** Guaranteed Accuracy within ± 2 per cent.

Model No. 21. Model No. 311.  
3 in. square case. 3 1/2 in. diameter round case.

0-1 m/A .. 18/6	0-1 m/A .. 22/6
0-10 m/A .. 17/6	0-10 m/A .. 20/-
0-50 m/A .. 17/6	0-50 m/A .. 20/-
0-100 m/A .. 17/6	0-100 m/A .. 20/-
0-250 m/A .. 17/6	0-250 m/A .. 20/-

Model 311. 0-1 m/A movement, with calibrated scale, volts-ohms-m/A. 25/-.

**VOLTAGE MULTIPLIER RESISTANCES**; guaranteed accuracy ± 2 per cent. All standard ranges, 1/3 each.

**TAPPED SHUNT** to provide readings of 5 m/A., 25 m/A., 250 m/A., and 1,000 m/A., 5/6.

**PREMIER A.C./D.C. MOVING IRON METERS**, 2 1/2 in. diam. Flush Mounting. All ranges, 10 m/A.

30 m/A, 50 m/A, 100 m/A, 250 m/A, 5/9 each.

**AMMETERS**, 1, 3, 5, 10 or 30 amps, 5/9 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.

**ULTRA S.W. COILS**, 4-10 metres. Wound silver-plated Wire. Mounted on Trolitul base. Inside diam. coils 1/2 in., 3, 4, 5, 6 or 7 turns, complete with base, 1/- each.

**UTILITY Micro Cursor Dials**, Direct and 100: 1 Ratios, 3/9.

**PREMIER Short-Wave Condensers**, all-brass construction with Trolitul insulation. 15 mmf., 1/6; 25 mmf., 1/7; 40 mmf., 1/9; 100 mmf., 2/-; 160 mmf., 2/3; 250 mmf., 2/6.

**TROLITUL DOUBLE SPACED TRANSMITTING CONDENSERS**, 15 mmf., 2/9; 40 mmf., 3/6; 160 mmf., 4/6.

**NEW TROLITUL SPLIT STATOR CONDENSERS**, 50 x 50 mmf., 10/6.

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

**NEW PREMIER MULTI-RATIO OUTPUT TRANSFORMERS**, 11 ratios from 15:1 to 150:1; Suitable Class B or Push-Pull, 5/9 each.

**P.M. SPEAKERS**, complete with output transformer. All brand new, Magnavox 8in. P.M., 10/6. Rola Sin. P.M., 15/-.

Rola 10in. P.M., 19/11. Telsen Sin. P.M., 11/6. Celestion Soundex 6in. P.M., 10/6.

**AMERICAN VALVES**. We hold the largest stocks of U.S.A. tubes in this country and 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.

**EUROPA MAINS VALVES**, 4 v. 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 H. ex. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 33-watt D.H. Triode, 7/6; 350 v. and 500 v. F.W. Rect., 5/6. 13 v. 2 amps. 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 ALL-WAVE AERIAL KITS**, complete with Insulators, weatherproof wire and matching transformer. Ideal for All-Wave Reception. 15-2,000 metres. Complete Kit 10/-. Doublet Aerial Kit. The best Short-wave Aerial, 10/- complete.

**PREMIER BATTERY CHARGERS**. Westinghouse Rectification. Complete. Ready for use. To charge 2 volts at 1 amp., 10/-; 6 volts at 1 amp., 16/6; 6 volts at 1 amp., 19/6; 12 volts at 1 amp., 21/-; 6 volts at 2 amps., 32/6.

Orders 5/- and over sent Post Free. Under 5/-, please add 6d. Postage.

Have you had our 1939 Catalogue, Handbook and Valve Manual? 90 pages of Radio Bargains and interesting Data. **Price 6d.**

**ALL POST ORDERS TO:** Jubilee Works, 167, Lower Clapton Road, London, E.5. Amherst 4723.

**CALLERS TO:** Jubilee Works or our NEW PREMISES, 169, FLEET ST., E.C.4. Central 2833.

or 50, High St., Clapham, S.W.4. Macculay 2381.

*Practical Handbooks for the Modern Handyman*

**THE HOME MECHANIC SERIES**

This series of practical handbooks is designed specifically to help the amateur mechanic or craftsman. Each volume is simply written by an expert and profusely illustrated with photographs and diagrams.

1. Power-driven Model Aircraft
2. Model Aeroplanes and Airships
3. Accumulators
4. The Home Woodworker
5. Twenty-five Simple Working Models
6. The Handyman's Enquire Within
7. Simple Electrical Apparatus and Experiments
8. Practical Leather Work and Allied Crafts.
9. Toy Making for Amateurs
10. Lathe Work for Amateurs
11. House Decoration and Painting
12. The Home Electrician

Each 1/- net. (By post 1/2)

ASK YOUR BOOKSELLER to get you the book or books you require, thus saving postage. Alternatively, send the form to the Publishers, with Postal Order (plus postage), and the book or books will be sent direct to you.

To the Publisher, **GEORGE NEWNES, LTD.** (Book Dept.), Tower House, Southampton Street, Strand, W.C.2.

Please send me by return the book or books encircled below. I enclose Postal Order value..... which includes postage.

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Name .....

Address .....

P.W. 20.5.39

George Newnes, Ltd.

**NEW RECEIVERS, COMPONENTS AND ACCESSORIES**

**BANKRUPT Bargains.** List free. State requirements. Large stock of new receivers up to 10 valves: Trifonic 5v allwave AC/DC 1939 10 1/2 gn. superhets 6gns. Valves, components.—Butlin, 6, Stanford Avenue, Brighton.

**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

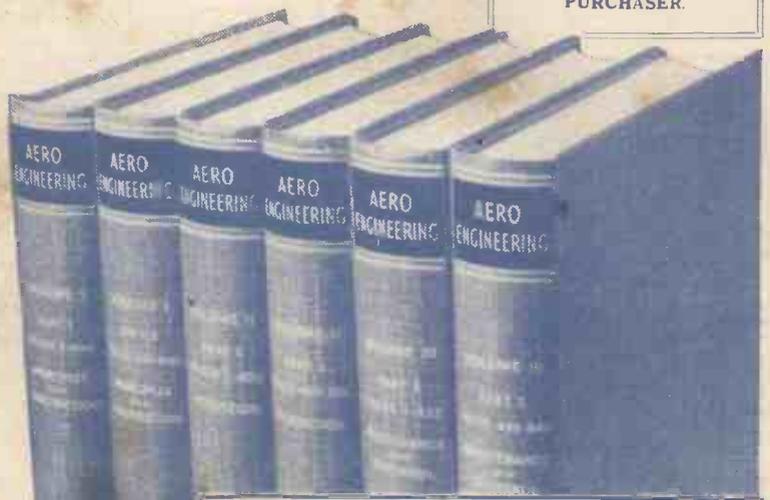
### 50 FREE DATA SHEETS

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.



## 40

EXPERT CONTRIBUTORS

2,500 PAGES OF THE LATEST AND MOST PRACTICAL INFORMATION.

2,000 ILLUSTRATIONS, PLANS, DIAGRAMS.

50 DATA SHEETS COVERING 50 CIVIL & MILITARY AIRCRAFT.

TWO YEARS' TECHNICAL ADVISORY SERVICE FREE TO EVERY PURCHASER.

## POST THIS COUPON TO-DAY HOME LIBRARY BOOK COMPANY

(George Newnes, Ltd.)

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.20539

If you do not wish to cut your copy, send a postcard mentioning "Practical Wireless" to above address.

George Newnes, Ltd.

# Practical and Amateur Wireless

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

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 14. No. 349.  
May 27th, 1939.

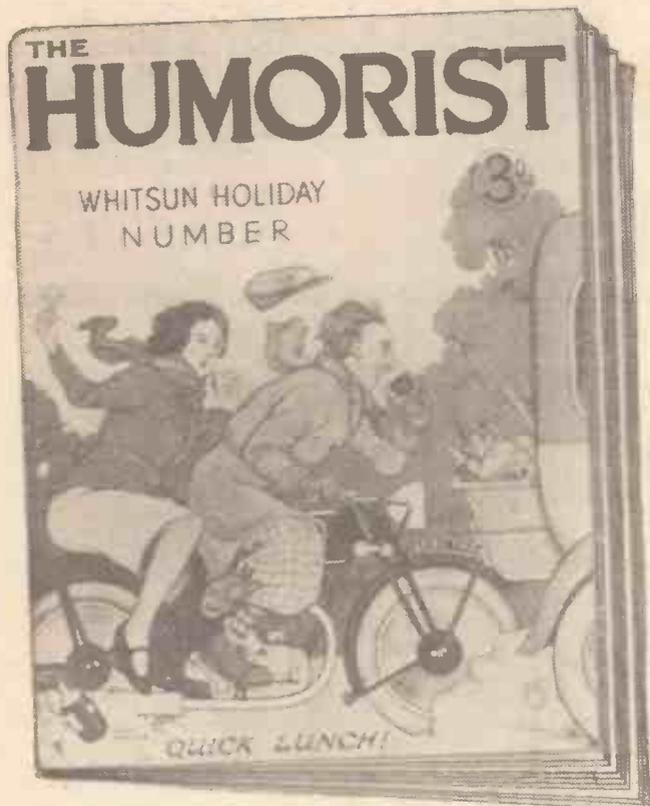
**AND PRACTICAL TELEVISION**



## STANDARD WIRELESS BOOKS

See announcement on the back cover of this issue for ideal  
Wireless Books for the enthusiast and practical man.

# The Big Holiday Favourite



## A Laugh on Every Page

Full of amusing articles by the leading writers, and black-and-white illustrations by the most popular humorous artists.

Get it To-day

# THE HUMORIST

WHITSUN HOLIDAY NUMBER

Of all Newsagents  
and Bookstalls

**3<sup>D</sup>** OUT  
NOW



## THE HOME MECHANIC SERIES

This series of practical handbooks is designed specifically to help the amateur mechanic or craftsman. Each volume is simply written by an expert and profusely illustrated with photographs and diagrams.

- 1 House Decoration and Painting.
- 2 The Home Woodworker.
- 3 The Handyman's Enquire Within.
- 4 The Home Electrician.
- 5 Simple Electrical Apparatus and Experiments.
- 6 Lathe Work for Amateurs.
- 7 Toy Making for Amateurs.
- 8 Twenty-five Simple Working Models.
- 9 Accumulators.
- 10 Model Aeroplanes and Airships.
- 11 Power-driven Model Aircraft.
- 12 Practical Leatherwork and Allied Crafts.

EACH **1/-** NET  
(By post 1/2)

ASK YOUR BOOKSELLER to get you the book or books you require, thus saving postage. Alternatively, send the form to the Publishers, with Postal Order (plus postage), and the book or books will be sent direct to you.

To the Publisher, GEORGE NEWNES, LTD.  
(Book Dept.), Tower House, Southampton  
Street, Strand, W.C.2.

Please send me by return the book or books encircled below.

I enclose Postal Order value.....  
which includes postage.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Name .....

Address .....

P.W. 27:539

Hints for Home Constructors—See page 243



# Practical and Amateur Wireless

Edited by **F. J. CAMM**

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

Vol. XIV. No. 349. May 27th, 1939.

## ROUND *the* WORLD of WIRELESS

### American Amateur Receivers

OUR recent review of the special types of amateur receiver aroused considerable interest and there is obviously a very wide field for this type of apparatus. It was obviously impossible in the space available to deal with all aspects of this type of receiver, and in response to many requests we propose to publish from time to time further details of these specialised receivers. In this issue we give some details of a new receiver produced by McMurdo Silver in America and although this is not available in this country yet, the details of design which are described on page 259 will undoubtedly interest those who prefer this type of receiver for general use. There are many interesting points which have to be incorporated in the design if the receiver is to carry out its main function, and some of the points and the method of carrying out the practical interpretation of them are described by Mr. McMurdo Silver in this particular article. The illustrations show how the receiver has been built up, and those who wish to design their own apparatus will undoubtedly find much to interest them in this particular feature.

### Royal Train Radio

THE train which is to be used to convey the King and Queen across Canada has been provided with receivers in each of the five coaches and a special telephone system is installed so that the King and Queen can 'phone any member of the party from their private suites on the train. Each day wires are to be joined to the train so that their Majesties can call up London via a radio-telephone link.

### Licence-free Reception

AMERICAN broadcasting organisations are stressing the advantages of their licence-free reception by making the following announcement in certain newspapers, "Read the radio log in your newspapers—fifty million dollars' worth of radio entertainment—free. That's American radio!"

### Olympic Games

SPECIAL arrangements are being made for relays of next year's Olympic Games, and the Olympic Broadcasts Committee of Finland have formed a special Radio Bureau to handle the work. Orders are being placed for new outside-broadcast

vans and special sound-on-film equipment, the latter to be used after the event where direct relays are not found practicable.

### New "H.M.V." Showrooms

SIR THOMAS BEECHAM recently pressed a switch in a small portable control box weighing less than half a pound, and the luxurious new West End showrooms of "His Master's Voice" in Oxford Street were flooded with the strains of Sir Walford Davies' "Fanfare for a Ceremony." The new showrooms were opened, and after a gap of nearly 18 months, "H.M.V." were again in their accustomed place in Oxford Street.

broadcast the final of a gold medal competition is to be played off.

### G-Men Against Crime

THE third feature originating from the B.B.C. offices in New York this year—following "Crosstown New York" and "No Help Wanted"—will be a dramatic broadcast on June 3rd featuring the work of America's Special Agents. It has been written by Travis Ingham, who wrote the script of "Crosstown New York," and produced by William N. Robson, who was responsible for the production of the other programmes in the series.

### Exchange Programmes with the Continent

THE Strings of the B.B.C. Scottish Orchestra will play on June 2nd in an exchange programme with the Stockholm Studio Orchestra. Both these light musical combinations are to give a nationally characteristic concert of old Scottish and Swedish airs, to be broadcast in the Scottish, Northern Ireland and Welsh Regions.

There is much in common between the peoples of Scotland and Sweden. Both stations stretch their beams across the waters of the North Sea and are heard clearly in each other's countries. In the early days of broadcasting Aberdeen was a favourite station of Scandinavia, and broadcast many programmes in collaboration. Westerglen and Burghead transmitters, of high power, follow in the pioneer's footsteps and in this broadcast will pay musical compliments to the Northern radio organisations.

### Carillon Exchange

MALINES, famed city of Belgium, possesses an historic carillon of bells which has become known all over the world, both by records and radio. Bournville, England, is proud of its much younger carillon presented by a local industrialist.

An exchange programme between these two carillons has been arranged for broadcasting on June 11th. Monsieur Staf Nees, the famous carillonneur of Malines, will be heard playing first an Etude for Carillon composed by himself, then—happy gesture to the Celts of England—the March of the Men of Harlech and, lastly, a fantasy by Benoit. The Bournville carillon programme is not yet to hand, but will contain three famous English airs.

On Other Pages	
	Page
Hints for Home Constructors	243
An Experimental A.C. Amplifier . . . . .	245
On Your Wavelength . . . . .	247
Short-wave Section . . . . .	249
Operating the Transverse Current Mike . . . . .	251
Readers' Wrinkles . . . . .	253
Practical Television . . . . .	254
An S.G. All-wave H.F. Choke . . . . .	256
The Latest in American Communication Receivers	259
What is a Bi-Morph? . . . . .	258
Readers' Letters . . . . .	261
Queries and Enquiries . . . . .	263

### "Inn-door" Games

QUOITS—iron, not table—is the next of the "Inn-door" games to be contributed by Midland to "Roundabout." On May 31st the programme comes from right out in the country, the scene being the Hundred House, at Purslow, which is near Clun and Craven Arms and so in the heart of a famous sheep district. Quoits is one of the favourite games with farm-workers and with shepherds, who are usually accompanied by their dogs. This part of Shropshire once produced a world's champion at quoits. At the time of the

# ROUND the WORLD of WIRELESS (Continued)

## Restrictions on Power Output

ACCORDING to decisions taken at the Montreux (Switzerland) Conference, special limits have been defined in respect of the output power of European broadcasting stations. All transmitters working on a channel above 1,250 m. (240 kc/s) may use up to 500 kilowatts by day, but must reduce to 200 kilowatts by night. Restrictions are also made in the other bands. For channels between 1,250-230.8 m. (240-1,300 kc/s) the highest power permissible is 120 kilowatts; for wavelengths between 230.8-200m. (1,300-1,500 kc/s), 30 kilowatts, and for the smaller stations operating on channels in the 200-192.3 m. band (1,500-1,560 kc/s) not more than 10 kilowatts is tolerated. Within the next 12 or 18 months some 80 European and North African stations will increase their power. *Poste National* (France), which will shortly be testing, is boosting its output to 450 kilowatts; Warsaw (Poland) will increase its power to 300 kilowatts and *Deutschlandsender* (Germany), Lahti (Finland), Droitwich (G.B.) and Motala (Sweden) will closely follow with 200 kilowatts. The number of transmitters which have decided to go to the 120 kilowatt limit is 32, and a further six stations will attain 100 kilowatts in the near future.

## A U.S.A. Flood Story

THE latest Ohio Valley version of high water brought forth a new edition of flood stories at the WLW studios, which were pretty close to the 1937 sprinkle. Most hair-raising tale, however, is that related by Paul Jones, who at the time was with a station in Parkersburg, West Virginia. He had been assigned to do a special programme from a flooded house, where he proceeded to interview a lady who refused to become a refugee. Midway in the conversation the foundation gave way and the house rolled clear over on its side. Announcer and interviewer grunted and screamed respectively. Jones had to climb out of the doorway through which originally he had walked. By that time the lady decided to leave, too.

## South American Expedition

IT is reported that a Venezuelan Government expedition has left Caracas to explore the S.E. part of Venezuela, along the frontiers of the Guianas and Brazil. It is carrying a 1,000-watt amateur trans-

## INTERESTING and TOPICAL NEWS and NOTES

mitter, which will operate on 14.125, 14.122, 7.284 and 7.222 m/cs, using the call YV9AB, and the slogan "Expedicion

*Air Raid Precaution exercises affecting a wide area covered by Hampshire, Berkshire, and Surrey took place recently with military and R.A.F. co-operation. There was a daylight raid in the Aldershot area, and the illustration shows a portable - wireless operator in communication during the "air raid."*



de la Gran Sabana." Contacts are planned for 2 p.m. E.M.T. Reports are requested (IRC unnecessary), which should be ad-

ressed to the Ministerio de Fomento, Servicio Tecnico de Minería y Geología, Expedicion de la Gran Sabana, Caracas, Venezuela. All reports will be verified after the return of the expedition.

## Weekly News in Afrikaans

WE are informed by the B.B.C. that a translation in Afrikaans of the weekly newsletter addressed to Empire listeners will now be broadcast each Sunday in the Empire short-wave programme. The weekly newsletter which is normally broadcast to listeners in South Africa in English at six o'clock G.M.T. consists of a survey of the more important news events which have taken place during the preceding week. The newsletter follows a brief summary of important events which have occurred since the news bulletin broadcast on the previous day.

The Afrikaans translation of the newsletter will be broadcast at 6.30 p.m. G.M.T.

## SOLVE THIS!

### PROBLEM No. 349

Burrows built a 4-valve battery set and when this was tested he found that signals, although very loud, were distorted. After various tests he found that the distortion could be overcome by placing an earthed metal screen over the H.F. choke. This resulted in reduced signal strength and he was unable to find out the cause of this. What was the cause of the distortion, and why was signal strength reduced in spite of retrimming the coil circuits? Three books will be awarded for the first three correct solutions opened. Entries should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 349 in the top left-hand corner and must be posted to reach this office not later than the first post on Tuesday, May 30th, 1939.

### Solution to Problem No. 348

The field resistance of the speaker which Atkins purchased was of the order of 2,000 ohms and the H.T. output from his rectifier was insufficient to allow of adequate H.T. on the valves after passing through this high-resistance. Furthermore, the lack of sufficient current to energise the field sufficiently would account for insensitivity in the speaker.

The following three readers successfully solved Problem No. 347 and books have accordingly been forwarded to them: G. S. Appleby, 49, Cornforth Lane, Conchre, Ferryhill, Co. Durham; Wm. A. Gold, 20, Gladsmut Road, London, N.19; E. Stephens, 13, Sterndale Road, Richmond, Surrey.



Mr. S. J. Warmington, better known to radio listeners as Inspector Hornleigh, is being perpetuated on canvas by Mr. Lewington Grace, the artist, at his Kensington studio. Our illustration shows Inspector Hornleigh "inspecting" the work of Mr. Lewington Grace, who is seen looking over his shoulder.

and will last until approximately 6.50 p.m. G.M.T. It will be radiated on the normal wavelengths used for transmissions to South Africa.

## Australian Short-wave Transmission Schedule (June, 1939)

VK2ME (Sydney), 31.28 m. Sundays: (Sydney time) 3 p.m.-5 p.m. (05.00-07.00 G.M.T.), 8 p.m.-midnight (10.00-14.00 G.M.T.). Mondays: 2.30 a.m.-4.30 a.m. (16.30-18.30 G.M.T.). VK3ME, Melbourne (31.5 m.) Nightly (Melbourne time): Monday to Saturday (inclusive), 7 p.m.-10 p.m. (09.00-12.00 G.M.T.). VK6ME, Perth (31.28 m.) Nightly (Perth time): Monday to Saturday (inclusive), 7 p.m.-9 p.m. (11.00-13.00 G.M.T.).

# PRACTICAL HINTS TO HOME CONSTRUCTORS

Making Wooden and Metal Chassis : Cutting Large Holes in Metal and Plywood : Making a Cutting Tool : How to Fit a Receiver Chassis into a Cabinet : The Use of a Template

**A** LARGE proportion of the receivers built by home constructors would be far more satisfactory—and in many instances more efficient—if they were made with greater care. Of course, a certain degree of skill is also essential, but it is more important that the worker should know the correct method of carrying out a constructional job than it is that he should be a skilled engineer or a woodworker.

Many constructors make shift with an old-fashioned baseboard because they wish to save the trouble of making a chassis, and at the same time do not care to buy one when, perhaps, the receiver is only an experimental one built from odd components. As all readers of PRACTICAL AND AMATEUR WIRELESS know, we have always recommended chassis-form construction for most types of receiver, because it offers many practical advantages. One simple method of building a shallow chassis is shown in Fig. 1. Two runners of  $\frac{1}{2}$  in. (fin. planed) red deal are screwed to the plywood, metallised or metal baseboard.

### Marking Out

Although the work is simple enough, it is well worth while to draw lines across the ends of the baseboard a distance equal to half the thickness of the runners away from the edge. They can be drawn with a pencil and ruler, scriber and ruler, marking gauge, or by drawing the point of a pair of dividers along the wood, as indicated in Fig. 1; of course, the same result could be obtained by using a pair of compasses. Note the dividers are inclined in the direction in which they are being moved to prevent the point from digging into the wood. Another method of marking lines parallel to the edge is by holding a pencil in the normal manner, but running the tip of the second finger along the edge to act as a guide. This generally presents a little difficulty at first, but the knack is soon acquired with a little practice. After marking, drill  $\frac{1}{16}$  in. holes and countersink them on the upper side to receive the screw heads.

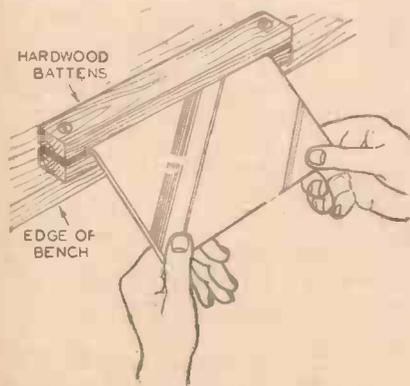


Fig. 2.—An improvised "vice" for holding aluminium sheet while bending it to form a chassis.

It will be seen in Fig. 1 that the side runners are made slightly shorter than the width of the baseboard so that an ebonite terminal strip can be screwed to the ends of the runners to be flush with the edge of the top board. If a metal baseplate were being used it would be desirable to fit a front strip of three-ply in a manner similar to that followed for the ebonite in order to give additional support to the comparatively thin aluminium.

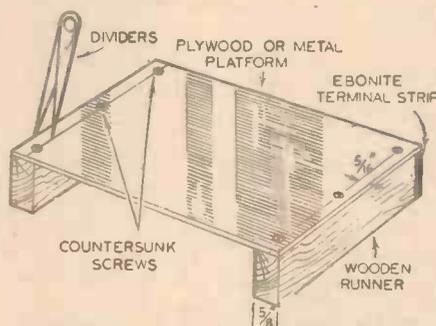


Fig. 1.—A strong and easily-made chassis. Note the method shown for drawing lines parallel to the edge.

A complete wooden chassis can be made by nailing together pieces of five-ply wood, but this is unsatisfactory unless the insides of the angles are supported by gluing in small blocks of wood. The reason is that nails cannot obtain a proper grip in the edge of plywood.

### Aluminium Chassis

If a metal chassis is to be made the best procedure is to use aluminium sheet of fairly good quality; low-grade aluminium is apt to be hard and rather brittle. Aluminium up to about  $\frac{1}{16}$  in. thick can be bent fairly easily if gripped between two pieces of hardwood not less than  $\frac{1}{2}$  in. thick held in the vice jaws. The correct procedure is to grip the narrow edge of the metal, leaving the greater part projecting. A better grip can be obtained on the larger part so that initial bending can be done with the hands; once the metal has been bent to about 45 degrees the work can be finished by using a mallet. Do not use direct blows, however, but allow the mallet to glance over the corner of the metal. That prevents the formation of an irregular edge.

When a vice is not available the method shown in Fig. 2 is convenient. The metal is held between two stout pieces of hardwood (two lengths of 2 in. by  $\frac{1}{2}$  in. hoop iron are better) which are screwed to the top of the bench and made quite firm. Bending can then be done in the same way as when the sheet is held in the vice. It is often helpful to make a fairly deep score or scribe mark on the metal before bending, this being on the outside of the angle. This is not advised if the metal is brittle, however, for cracking would then occur,

especially if an attempt were made to form too sharp an angle.

### Making Large Holes

Many constructors find difficulty in making large holes in aluminium sheet, although the method is simple enough. Holes for valveholders can be made with a fairly-sharp centre bit of the kind used in woodworking if a centre is first punched and drilled with a  $\frac{1}{16}$  in. twist drill. In making the hole, the chassis should be held firmly down against a piece of hardwood; better still, it can be screwed to the wood if some of the smaller holes have already been made. This prevents the bit from breaking through on the underside and forming a jagged edge. When a really clean hole is desired—and this is always preferable—it is best to use the bit to scribe a clear circle on one side and then to reverse the chassis and go right through from the other side. It will be understood that the metal is cut entirely with the projecting point (or tracer) of the bit, and not with the actual cutting edge used on wood. This means that the bit must be in its normal good condition with the tracer projecting at least  $\frac{1}{16}$  in. below the level of the cutter.

Larger circular holes, such as might be required with some types of condenser drive, can be made by the time-honoured and laborious method of drilling a series of holes just inside the previously drawn circle and then cutting between the holes with a cold chisel and finally smoothing the inside edge of the hole with a smooth, half-round file. But this is cumbersome, inaccurate and tedious. A far better method is to use what is known as a washer cutter, as shown inset in Fig. 3. This can be held in a woodworker's brace and consists of a central pillar through which is passed a bar carrying a cutting tool. The general method of using the tool

(Continued on next page)

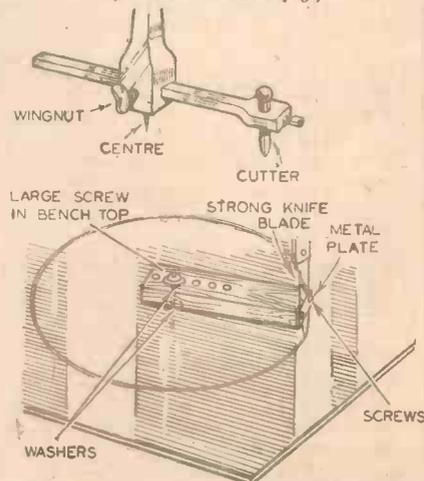


Fig. 3.—An easily-made tool for cutting large circular holes in plywood, or metal panels. Inset shows a washer cutter.

## PRACTICAL HINTS TO HOME CONSTRUCTORS

(Continued from previous page.)

is the same as with a centre bit, except that additional pressure must be placed on the cutter itself.

### A Useful Tool

An improvised tool, which is fully satisfactory with fairly thin and soft metal is shown in Fig. 3. It consists of a strip of wood with a metal plate screwed to the end. A pivot is formed by a hole through which a screw should be passed into the bench top or a block of waste wood; a washer should be placed above and below the wood. As can be seen, a strong pocket-knife blade is held at the end of the wood by means of the metal plate. To cut the hole pressure is applied to the knife which is moved round the pivot. The knife should be fairly well pointed and should be sharpened to a comparatively blunt angle, so that the edge is not quickly damaged. It will be seen that the wooden trammel shown in Fig. 3 has a number of holes so that it can be used when cutting holes of different diameters.

The same tool can be used when dealing with a thin plywood panel, but in that case it is important that cutting should be commenced on one side of the wood and completed from the other to prevent splintering the edge of the hole. It is also applicable to thin sheets of ebonite, paxolin and fibre, but a good deal of pressure is required and it is desirable to lubricate the knife point at intervals with water or turpentine.

Another method of dealing with non-metal panels is to make a hole within the circle and then cut out the disc with a fret-saw. This procedure can also be followed when making a hole of irregular shape. Sometimes it is better to make holes just inside each of the corners if the sharp angles are to be preserved. The corners can then be removed with the saw

or by means of a sharp knife or a triangular file.

### Fitting Into a Cabinet

A difficulty often encountered is that of drilling a cabinet to receive the control spindles of the various components, when these are mounted on the chassis and on various angle brackets. The best method is generally to make an accurate template from a sheet of thin card. First smear the ends of the control spindles with paint or with soot mixed to a thick paste with water. Then offer the card up to them, so that the longest one leaves a mark on the card. Make a hole at this point and offer up the card again, this time allowing the long

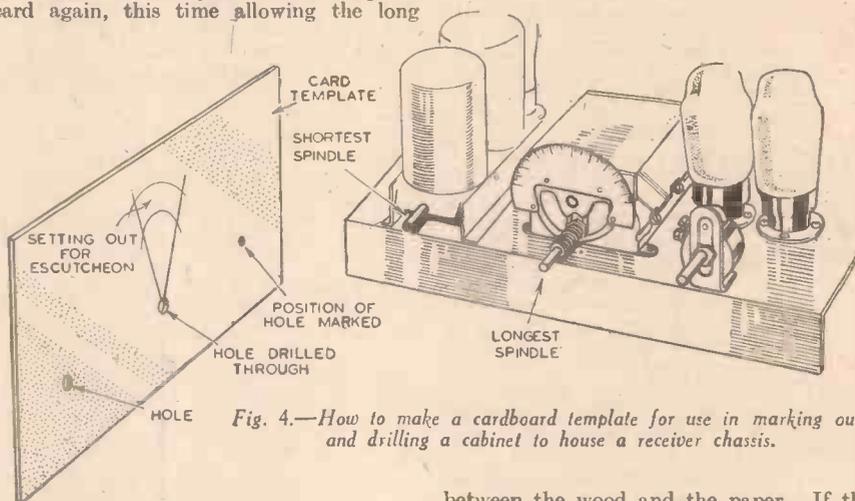


Fig. 4.—How to make a cardboard template for use in marking out and drilling a cabinet to house a receiver chassis.

spindle to project through it. The second-longest spindle then leaves a mark and another hole can be made. By repeating the same procedure for the other knobs an accurate template will be made, so that there will be no difficulty in marking out and drilling the holes in the exactly correct positions in the front of the cabinet. Fig. 4 shows the method.

### Drilling the Cabinet

In drilling, the best method is to fix the template to the inside of the cabinet with a trace of glue or with a few drawing-pins, and then to drill small "pilot" holes through the wood. Holes of the correct size can then be started from the front and finished off from inside, or *vice versa*. It is important, however, that the wood should be well supported throughout by means of a block of wood held immediately behind the hole being made. To avoid scratching the polished front of the cabinet, lay it on a sheet of newspaper and take care that fragments of wood are not allowed to lie

between the wood and the paper. If the wood is slightly scratched the surface can be restored by rubbing with a good furniture polish, applying heavy pressure.

**WORKSHOP CALCULATIONS, TABLES AND FORMULÆ**  
3/6, by post 3/10 from  
George Newnes, Ltd.,  
Tower House, Southampton St., Strand, W.C.2

## BROADCAST EVENTS OF THE WEEK

### NATIONAL (261.1 m. and 1,500 m.)

Wednesday, May 24th.—The King's Empire Day broadcast from Canada.

Thursday, May 25th.—Music from the Movies, orchestral programme.

Friday, May 26th.—The Caledonian Ball, from Dorchester House.

Saturday, May 27th.—The British Open Amateur Championship: An account of the afternoon's play, from Hoylake Golf Course.

### REGIONAL (342.1 m.)

Wednesday, May 24th.—Roundabout, an entertainment circuit.

Thursday, May 25th.—Lots of Love, musical comedy.

Friday, May 26th.—London Music Festival, 1939: Beethoven Concert 8, from Queen's Hall, London.

Saturday, May 27th.—Portrait of a Lady (Anne Cowley), a radio biography by James R. Gregson, from North.

### MIDLAND (297.2 m.)

Wednesday, May 24th.—Industry Entertains: Selected from the Variety programmes given by three Midland industries.

Thursday, May 25th.—Song Recital by Mary Pollock.

Friday, May 26th.—Running your own Show: Our Male Voice Choir, a talk.

Saturday, May 27th.—Robert and Clare Schumann, a musical biography: 4, The Young Couple (1840-1844).

### WEST OF ENGLAND (285.7 m.)

Wednesday, May 24th.—Band concert.

Thursday, May 25th.—Choral and Orchestral Concert, from the Colston Hall, Bristol.

Friday, May 26th.—Choral programme.

Saturday, May 27th.—Trouble House, feature programme.

### WELSH (375.1 m.)

Wednesday, May 24th.—The Ancient Monuments of South Wales, a talk.

Thursday, May 25th.—Shakespeare's "The Merchant of Venice," in Welsh.

Friday, May 26th.—Fishing in the Waters of Ogmere and Ewenny, a symposium by members of the Ogmere Angling Association.

Saturday, May 27th.—The Celtic West, a talk.

### NORTHERN (449.1 m.)

Wednesday, May 24th.—Stagshaw Searchlight registers its 24th target.

Thursday, May 25th.—Border Ballads: A recital for voice and harp.

Friday, May 26th.—From Scafell to the Sea: an Eskdale Journey, feature programme.

Saturday, May 27th.—Portrait of a Lady (Anne Cowley), radio biography by James R. Gregson.

### SCOTTISH (391.1 m.)

Wednesday, May 24th.—Instrumental programme.

Thursday, May 25th.—Trades Shows—4, Tobacco, a concert given by members of the Tobacco Industry in Scotland.

Friday, May 26th.—Population 9,000: Glimpses of the life of the Nor' East town of Elgin.

Saturday, May 27th.—Organ recital from the Freemasons' Hall, Edinburgh.

### NORTHERN IRELAND (307.1 m.)

Wednesday, May 24th.—Roundabout, an entertainment circuit.

Thursday, May 25th.—The Man in the Cloak, a play by Louis L. D'Alton.

Friday, May 26th.—Instrumental programme.

Saturday, May 27th.—Orchestral programme.

# An Experimental A.C. Amplifier

How to Build a Useful Multi-purpose Amplifier for Service or Public-address Work  
By W. J. DELANEY

THE Service Engineer is often called upon to test out speakers of different types, and also has from time to time to test certain types of valve under actual operating conditions. The keen experimenter also desires to carry out such types of test or experiment and the amplifier described in this article, and illustrated on our cover this week, was built especially for such purposes. It was actually built from existing parts which were on hand for special test work, and the details of construction are given for those who may find a use for such a piece of apparatus. From the theoretical circuit it will be seen that there are several novel points in the design. Firstly, flexible leads are brought out so that any type of field winding may be inserted in the H.T. positive line. Owing to the wide range of resistances which are available in field windings, however, some variation in the H.T. applied to this line is desirable to ensure that the output stage will receive sufficient H.T. for adequate working values. Accordingly a tapped transformer was used, the particular component having a secondary giving a total of 500 volts and being tapped to provide 350 when needed. Two L.T. secondaries were provided, in addition to the rectifier heater circuit, these delivering 4 volts at 4 amps and 4 volts at 4 amps. The transformer was, in fact, a modified commercial model, and if you are unable to wind a similar model a ready-made component may be obtained from the Premier Supply Stores.

## Additional Smoothing

As the amplifier may be needed for addition to a broadcast receiver or head amplifier used with a microphone, an additional H.T. point is provided and this will be about 250 volts, so that it was employed also for the first stage in the amplifier. This scheme also enables hum to be kept

the by-pass condenser for the bias circuit of that stage. A separate electrolytic of 50 mfd. is used for the output stage which is of the push-pull type, fed by a standard low-ratio transformer. The inductance of this component is maintained at a high level by using the parallel-feed system. The value of the anode resistance which is given, and also of the coupling condenser, may, of course, be modified if it is desired to change the response curve of the amplifier.

mounted in place of the smoothing choke on top of the chassis, and the choke placed underneath.

## Constructional Details

The main theoretical considerations having been detailed, we can now pass to the constructional side, and this will be found fairly simple. Four holes are needed along the front edge of the chassis to accommodate the rectifying, push-pull and input valves,

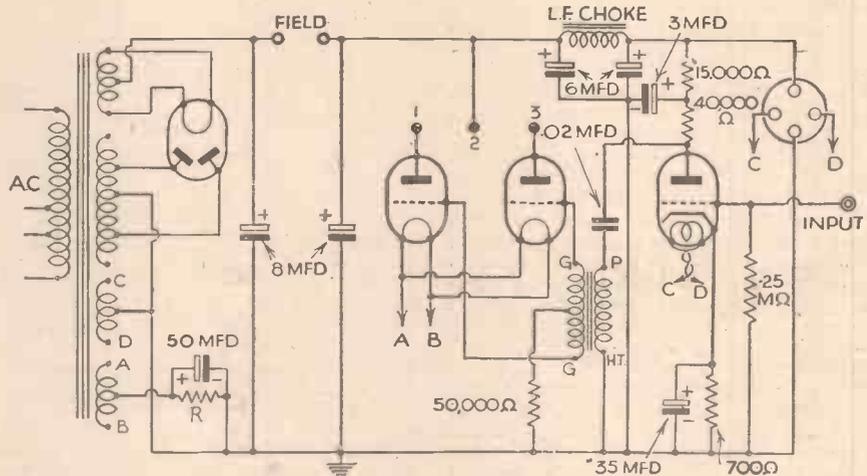


Fig. 1.—Theoretical circuit of the amplifier. Connections to the output transformer are shown in Fig. 2. The resistance R must be selected according to the output values which are used.

## Refinements

By way of refinements mention may be made of the special four-pin socket, mounted on the chassis runner from which H.T., L.T., and an earth connection may be obtained for a radio receiver or amplifier as already described. A Clix loudspeaker panel is also fitted to the runner so that speaker selection may be carried out, or an extension speaker used if the amplifier is made a permanent installation. It will be noted that the two anodes in the theoretical illustration are terminated and numbered. To couple the amplifier to a speaker a push-pull output transformer is needed, and most speakers are now provided with a matching transformer of the type having a centre-tap for push-pull working. Accordingly the three connections from the primary of such a speaker transformer would be joined to the points marked 1, 2, and 3 in the theoretical sketch. The transformer and speaker connections are also shown in Fig. 2, which also indicates the connections to the speaker control panel.

To give the amplifier more scope, the output transformer may be obtained separately and should then be of the multi-ratio type. It may be mounted on the chassis, ample space being found underneath where interaction between the mains transformer and other similar items on top will be avoided. Two leads may then be taken out for connection to a low-resistance speaker, the extension speaker being, of course, of the low-resistance type also. If it is desired to use both high and low-ratio outputs and facilities are required for changes from time to time, the speaker transformer may be

and for these 1in. holes are needed. A similar hole is called for in the front runner for the receiver connecting plug. A rectangular hole 1in. by 1½in. is needed for the speaker control panel and as a steel chassis was used for rigidity this hole must be cut out by drilling a series of small holes and finally filing the hole to shape. The mains transformer must be mounted according to the particular type which is obtained, and the particular design must therefore be followed here. A hole ¼in. in diameter is needed for the flexible leads on the block condenser mounted behind the smoothing choke, and the fixing holes for the latter, the condenser, and the push-pull input transformer should be marked off when the components are placed in position. Holes are needed for interconnecting leads, and these may be ¼in. in diameter. Insulated sleeving will avoid short-circuits and should be passed over all connecting wires and through the holes in the chassis. A Clix insulated socket is mounted on one end of the chassis for connection to a radio unit and a similar hole should be made at the other side of the chassis and provided with a rubber grommet. Through this leads for connection to the speaker field are taken.

On the underside anchor points must be provided for the choke and field and these must be insulated. This was carried out in the original model by cutting off small strips of paxolin and mounting these on the holding-down bolts of the components, with separate bolts attached and provided with solder tags. Distance pieces must be

(Continued overleaf)

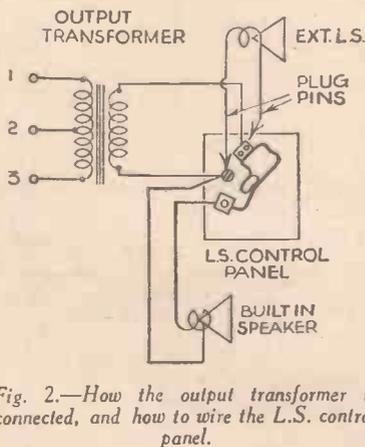


Fig. 2.—How the output transformer is connected, and how to wire the L.S. control panel.

at a very low level as an additional smoothing choke may be added in series with the field as shown in the theoretical sketch. Two 6-mfd. electrolytic condensers are employed in conjunction with this latter choke, and two 8-mfd. in association with the field winding, the latter forming part of a block unit which also provides a 3-mfd. condenser for decoupling the first stage and

AN EXPERIMENTAL A.C. AMPLIFIER

(Continued from previous page)

provided to avoid risk of the extra bolt heads coming into contact with the chassis, and extra nuts may be used for this purpose, or short pieces of small diameter tube may be cut down to suit. Spacing washers from an old condenser may be found in the spares box for this purpose. The 50-mfd. electrolytic condenser and the 6.6-mfd. block unit must be held down with straps, and these were cut from an old aluminium chassis and anchored by component fixing bolts. The wiring diagram, Fig. 3, should make all these points quite clear.

Precautions

When using the unit there are one or two points which must receive attention. The current applied to the two output valves will suit two PX.25A's or similar valves, but if smaller valves are used, which only call for 1 amp. each there may be a voltage rise—depending upon the regulation of the transformer. If there is an undue rise—a point which must be ascertained by measuring it with an A.C. meter—a bleeder resistance must be joined across the circuit. Similarly, if 250-volt valves are used it may be necessary to use the 350 or the 500-volt winding—dependent upon the field resistance which is employed. Again, it will be necessary either to measure the output from the rectifier under load, or to calculate the voltage drop according to the particular valves which are being used.

Connections to Amplifier

It will be noted that the input circuit is shunted by a high resistance leak (250,000 ohms) and this is intended to complete a resistance-capacity coupling unit, such as would be found in the output of a standard radio unit with which the amplifier is primarily intended to be used. The coupling condenser should, of course, be included on the radio chassis, and the lead from that chassis to the amplifier should be screened, especially if it is of any substantial length. If it is desired to restrict the amplifier to use with a pick-up or microphone, then the leak may not be required, unless an insensitive mike or pick-up is employed, which calls for a pre-amplifier. This could consist of a single low-gain stage and should be housed close to the pick-up or mike, again-screening the lead to the amplifier.

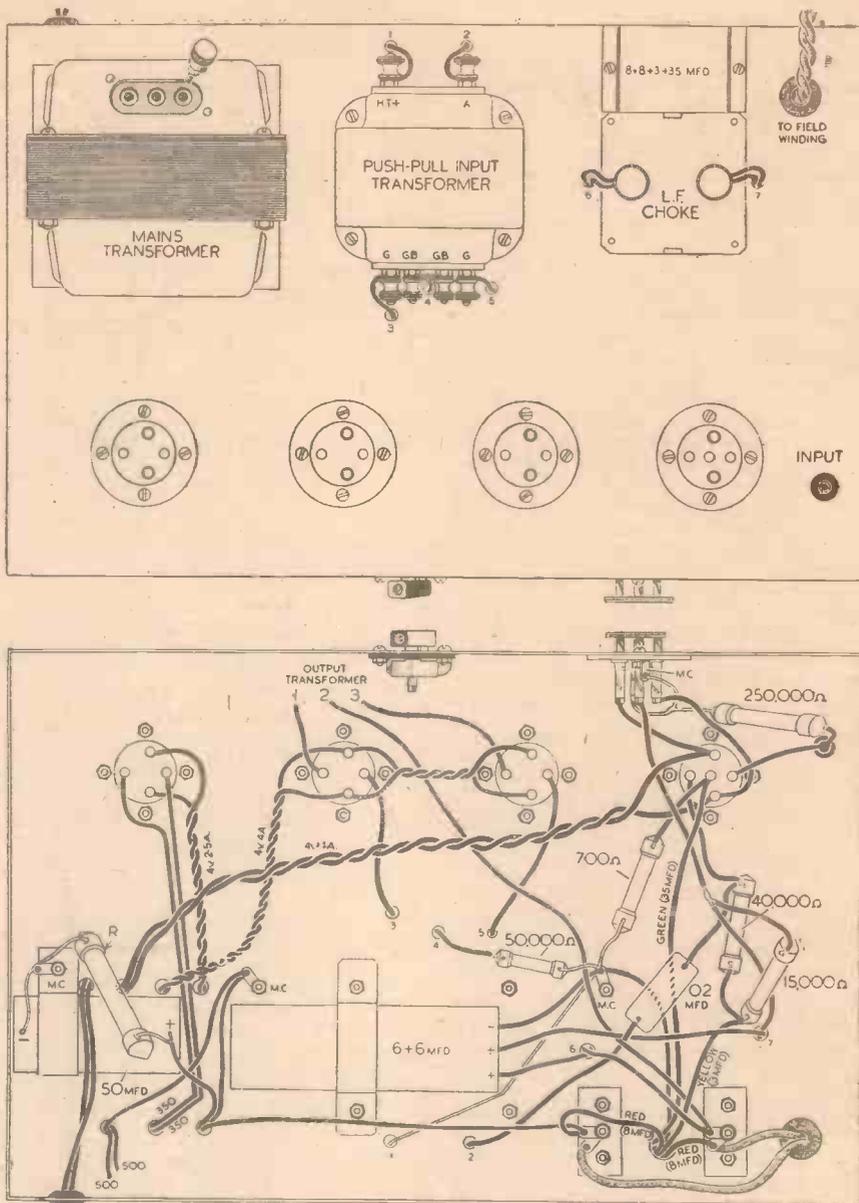


Fig. 3.—Top and sub-chassis wiring diagrams of the A.C. Amplifier.

- LIST OF COMPONENTS**
- One mains transformer (See text).—500-350-0-350, 500 v. at 120 ma.; 4 v. 2.5 a.; 4 v. 4 a.; 4 v. 4 a.
  - One push-pull input transformer, type D.P.6 (Varley).
  - One 20 henry smoothing choke, type L.F.14 (Bulgin).
  - One block condenser unit, 8-8-3-35, type 33016 (Dubilier).
  - One block condenser unit, 6-6, type 310 (Dubilier).
  - One tubular condenser, .02 mfd., type 4601/S (Dubilier).
  - One 50 mfd. tubular electrolytic condenser, type 3004 (Dubilier).
  - One 3 watt fixed resistor. (See text.) (Dubilier).
  - One 700 ohm 1 watt fixed resistor (Dubilier).
  - One 15,000 ohm 1 watt fixed resistor (Dubilier).
  - One 40,000 ohm 1 watt fixed resistor (Dubilier).
  - One 250,000 ohm 1 watt fixed resistor (Dubilier).
  - One 50,000 ohm 1 watt fixed resistor (Dubilier).
  - Four 4-pin chassis type valveholders (Clix).
  - One 5-pin chassis type valveholder (Clix).
  - One insulated socket, type 12 (Clix).
  - One L.S. control panel (Clix).
  - One steel chassis, 14in. by 9in. by 3in. (Peto-Scott).
  - Two rubber grumets, supply of 4.BA bolts and nuts, connecting wire, insulating sleeving (Peto-Scott).

When no pre-amplifier is employed the grid leak in question may be substituted by a volume control of similar value, the two ends (outside terminals) being joined to the grid of the input valve and the earth line, and the arm (centre terminal) being joined to the input socket. This control will not be needed, of course, if the pick-up is provided with its own volume control. Similarly if a transformer is used to couple the two sections together, the secondary of the transformer would be included in place of the leak, but it will then be housed on the radio or pre-amplifier chassis, and the lead from the "grid" terminal of the secondary of the transformer being used as the coupling link—again screening it to avoid the picking up of hum or other interference.

It is emphasised that this is an experimental amplifier and, accordingly, may be used under widely different conditions and each particular case must be worked out according to the components being used and the method of applying the amplifier to the work in hand. In the event of finding difficulty our Query Service will,

as usual, assist you in overcoming any troubles you may meet in applying the unit to your own particular case.

EVERY PRACTICAL WIRELESS SERVICE MAN SHOULD HAVE

**PRACTICAL WIRELESS SERVICE MANUAL**

By F. J. CAMM

A Complete, Practical and Up-to-date Work on the Testing of all Types of Wireless Receivers. 288 PAGES and OVER 220 PHOTOGRAPHS, DIAGRAMS, and PLANS.

From all Booksellers 5/- net, or by post 5/6 direct from the Publishers, George Newnes, Ltd. (Book Dept.), Tower House, Southampton St., London, W.C.2.

# ON YOUR WAVELENGTH



## The P.M.G. and Television

THE manufacturers are continuing their push to ensure a satisfactory television service throughout the country. My best wishes for their success. The P.M.G. recently received a deputation from the R.M.A., urging a speedy extension of the television service to the provinces. The deputation stressed the point that as the Government had decided that the present transmission system was satisfactory, and as recent developments in the London area had been rapid, a provincial station should be opened almost immediately. They emphasise that if other countries establish television transmission on different systems, an enormous potential export market might be lost to Gt. Britain, which to-day held a lead over all other countries. The P.M.G. stated in reply that the Television Advisory Committee were actively investigating the problem in all its aspects and that they would furnish a report to him on the subject as soon as possible, and he promised that in considering this report he would give full weight to the representations made to him by the deputation.

## The Licence Figures

NOW let us turn to the licence position. The Post Office issued 536,427 wireless receiving licences during April, 1939, which represents a decrease of 5,259 in the number of licence holders during the month after making allowance for expired licences and renewals.

The approximate total number of licences in force at the end of April, 1939, was 8,962,850, as compared with 8,604,400 at the end of April, 1938, an increase during the year of 358,450. During the month there were 309 successful wireless prosecutions.

Bearing in mind the cheapness of wireless entertainment (it is assuredly the cheapest form of entertainment in the world), a wireless pirate when caught deserves all that he gets. In these times of crisis the Government have not seen fit to increase the wireless licence fee, and any man who endeavours to dodge the payment of 10s. a year is an enemy to the State.

## By Thermion

### Bound Volumes of "Practical and Amateur Wireless"

THERE are now only six sets of volumes 1, 2, and 3 of PRACTICAL AND AMATEUR WIRELESS left. These volumes are complete with the blueprints, data sheets, gift booklets, etc., are bound in blue with silver lettering, and cost 12s. 6d. each. When these six sets have gone, further copies will be unavailable and the money will be returned.

### The New Season's Receivers

VERY few firms have announced their new programmes up to the moment. Up to the present the surprise has been the push on small accumulator-less portables. I think there will be a big demand for such a set, especially when it is claimed that one of the small dry cells used is capable of giving over 200 hours' performance. The Midget valves intended for such sets are already on the market, and I understand that the Editor of this journal is experimenting with a circuit incorporating these valves and dry cells.

In view of the television push I anticipate that a fair amount of attention will be devoted at Radiolympia to this, for it seems reasonably certain that next year is going to be a television year. The demand from the provinces is a good index of the demand for receivers, but until the service is extended sales cannot very well increase.

From a preliminary inspection of the plans you may take it that this journal will be situated on the same site as previous years. From my knowledge of what is being done I am quite certain that this is going to be the best wireless Show of the whole series. There will be a special section for constructors in which they can inspect the latest components. The

re-introduction of the cabaret will possibly attract more visitors. We know that the poster arrangements of previous years have been scrapped, and that the futuristic nonsense of the fried egg and rasher type, as last year, will be no more.

### An Offer to Crooners

WE must always make allowances for the person who feels that he is the only one in step, and I have at long last received a letter from a reader who disagrees with my views on crooning. He asks if I should like to be criticised in print in the manner in which I have criticised crooners. Yes! I make this offer to all crooners. If they can prove where my arguments concerning them are wrong, I shall be glad to publish their letters. I do not know whether many of them can write. Any rate, there is the offer. I now expect to receive a few letters written with a hand that trembles with nervousness, for nearly all crooners are nery people, of the sort who wear suede shoes and silk pants. I am glad to observe, however, that the demand for bands is growing less. It was all right when there was only one or two. Like germs, however, the bands have split and split again until there are so many of them that the laws of supply and demand are beginning to apply.

### Radio Gramophones

I WONDER how many of my readers operate radio gramophones? I ask this question because some years ago we instituted the practice with our receivers of incorporating pick-up terminals, and in such receivers as we have published in which these have been omitted we have received many letters asking for a sketch showing how to add them. I do not think that the practice of using a separate pick-up is a good one, for it is much better to build the receiver as a complete radiogram. I should welcome letters from my readers, however, which indicate their point of view on this topic.

### Wind Chargers

THERE has been a steady demand from readers in remote districts for instructions on the con-

struction of a wind charger. I have been investigating this problem, and find that there is on the English market an American device that can be purchased complete for about £10 which can not only be used for charging wireless accumulators, but also for lighting the house. I believe that there is one company in this country which also makes such chargers, although I cannot place them. Some years ago a small handbook entitled "Wind and Wind Motors," published in this country, gave constructional details.

### The Vanishing Aerials

IN the early days of wireless there was scarcely a house which did not erect a good outdoor aerial of full P.M.G. length, and many were the articles written on aerial erection, position of lead-in, counterpoise earths, and so on. Sets have become so efficient, however, that we can now afford to throw away large chunks of efficiency and work on indoor aerials. The real fans, however, have not changed their habits; they still have an attic, a loft, or a spare bedroom, littered with apparatus and wires. I shall be glad to offer prizes to the senders of any pictures of such dens which I publish. Address photographs to "Thermion," George Newnes, Ltd., "Tower House," Southampton Street, Strand, W.C.2.

### Listeners to Help Write New "Roundabout" Serial

NOW that everyone in the country has had plenty of opportunity to study the technique of building up suspense, drama and thrills in radio serials, the B.B.C. intends to recruit their aid in an interesting new idea in the variety schedule.

Listeners will shortly be invited to write synopses, on which every episode after the first will be based, for a mystery serial thriller which, from May 31st, is to be a regular feature in the weekly "Roundabout" programme which recently set out on its first all-Regional circuit.

John Watt, B.B.C. Director of Variety, believes that listeners everywhere will help to make the scheme a great success. "After we have set the characters in the first instalment," he says, "it is up to anybody to send in a synopsis for the next. We shall decide which to use. In this way the serial can develop almost anyhow you like—as a spy drama, a love story, a comedy. . . ."

"And, by the way, we shall pay a fee of one guinea for the synopsis we choose each week."

Let Francis Worsley, "Round-

## Notes from the Test Bench

### Mains Receiver Points

A CASE of fire which was recently investigated, showed that a constructor had overlooked an important point concerning the use of mains points for feeding a receiver. It is customary to use a mains input connector in some receivers, provided with 5-amp fuses. If the mains leads are then joined to a 15-amp power point as is often the case, a short-circuit in the mains connecting leads will blow the mains fuse when the necessary high current flows. This will obviously be greater than would be needed for 5-amp circuits. If the fuses are omitted on the receiver input, then a 15-amp circuit will probably enable a transformer to burn out on overload before the mains fuses blow, and in the case in question this had happened; the mains leads had burnt through and fallen on a carpet, and although the cotton covering of the mains leads was only smouldering, the carpet was ignited. Where a 15-amp circuit is used, therefore, it is preferable to make use of a 5-amp fuse plug, connected to the 15-amp mains socket by means of one of the special 5-15 amp adaptor plugs.

### Earth Tubes

THE importance of the earth connection is appreciated by most listeners and various ideas have been suggested from time to time to improve the usual buried earth plate. A very common idea is to use a tube which is pointed and drilled throughout its length, the idea being that water may be poured into it and the surrounding ground thereby kept moist. It is important to note, however, that the tube should be of copper if reliability is required and coppered iron tubes will rust away when the copper plating peels off and in some soils the tube will prove useless after a fairly short period of use. A length of copper gauze is a very good earth connection as it retains water.

### Making a Volume Control

WHEN making high-resistance controls, it is sometimes possible to use a wire-wound component and to avoid difficulties due to the wire becoming fractured by a wiping contact a good plan is to use a small spool of ebonite or similar material and wind insulated resistance wire on it with tappings at various points. A stud type selector switch may then be used and if the tapping points are carefully chosen a fairly smooth variation in steps will be obtained. Obviously the uses to which such a type of control may be put are limited and the circuit must be carefully chosen.

about's" producer, fill in the details of the plan.

"The title of the serial is 'To Be Continued,'" he says, "The first instalment is written by Gale Pedrick, the originator of the idea, and Max Kester. It will present five main characters, who find themselves together in an air liner.

"These characters are perfectly distinct and clear-cut, but they have one feature in common: it is obvious from the beginning that every one of them is engaged upon some mysterious adventure, the nature of which is not made clear, at any rate, in the first instalment on May 31st. After hearing this, we shall ask listeners to take a hand by sending in their suggested synopsis on which we can base the next instalment. They should submit their suggestions on a postcard, clearly indicating how, in their opinion, the next instalment should run.

"Points to remember are: (1) The number of characters in the story should not be increased, and the plot should be confined to their adventures only, and (2) Each instalment must have a climax which maintains the suspense.

"Conditions of entry are simple. Postcards should be addressed to the B.B.C. Broadcasting House, London, W.1, clearly marked 'To Be Continued. . . .' Contributions will not be acknowledged, and they must be received, initially, by the first post on Monday, June 5th, and, for subsequent instalments, by the first post on the Friday following the instalment they succeed. We at St. George's Hall will read every synopsis with very great care, and our decision will be final. No correspondence can be entered into on the subject of the award, and, of course, we retain the right to make what use we like of the synopsis selected.

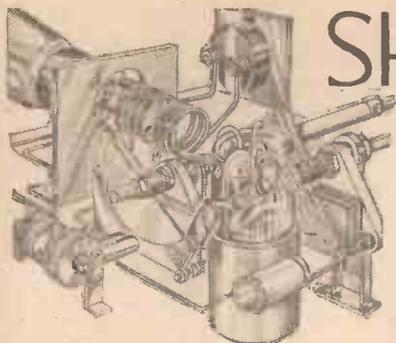
"Each entry should be a bare outline of the next episode, containing no indication of treatment; and all the instalments that follow the first will be based upon those which we judge to be the most workable for broadcasting technique.

"Listeners should also remember that Gale Pedrick and Max Kester will have to do some high-speed work to get the script ready for production each Wednesday, so I hope they will be concise.

"Find a plot and win a prize!"

### WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA

5/- or 5/6 by post from  
George Newnes, Ltd., Tower House, Southampton St.,  
Strand, London, W.C.2.



# SHORT-WAVE SECTION

## MODERN AERIALS AND H.F. COUPLING

In this Article Various Systems are Discussed for Ensuring Maximum Efficiency, with Special Reference to U.S.W. and Transmitting Aerials

FOR receivers operating only on the medium and long-wave bands, the natural resonant characteristics of the aerial are not a critical factor owing to the comparatively low order of the signal frequencies, and invariably a reasonably long aerial conductor positioned well outside the field of any local interference will suffice; the down lead system being screened so that the collected signal is transferred with a minimum of super-imposed stray electric currents picked up from nearby parasitic radiations.

As the natural wavelength of an aerial conductor is proportionate to the frequency at which it would resonate, it will be apparent that on reducing the receptive wavelength, thus increasing the frequency, there will be a greater tendency for some of the collected energy to leak away, a point which will be well appreciated by those who have experimented on the ultra-high frequency bands. To reduce this attenuation as much as possible, special attention is paid to the actual characteristics of the non-resonant conductors of the aerial scheme; this will be clearly noticed as one reviews some of the more modern arrangements.



Fig. 1.—Using bamboo for supporting U.S.W. conductors.

previously in these columns, it is proposed to deal only with some of the more recent designs, the individual merits of which will provide interesting comparative data when considering the wide field of requirements.

One of the more popular forms of aerial installation for average conditions of reception is the single or dipole vertical aerial surmounted on a mast, or by suitable stays.

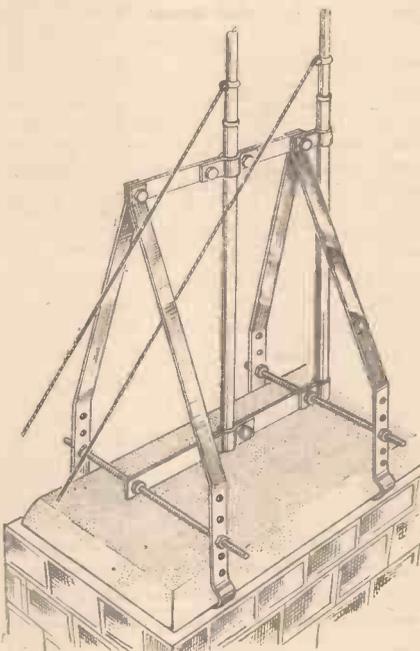


Fig. 2.—A clamp support arrangement for mounting an aerial mast on a parapet.

### All-wave Reception

In all-wave reception the inefficiency of an aerial system can considerably influence not only the quality and power in reproduction, but the actual control, causing less experienced listeners to wonder whether in the case of a new receiver, the investment was worth while, and it is such considerations which prompted the preparation of the following data.

A good short vertical or horizontal aerial is far better than a long aerial scheme in which the points just mentioned have not been considered, and to obviate leakage, background noises, and the effects of a swaying conductor, the installation should be kept as far from any trees and metal work or house wiring as possible, the strain of the aerial conductor wire and feeders being taken up by suitable springing.

As the more conventional forms of screened down leads have been dealt with

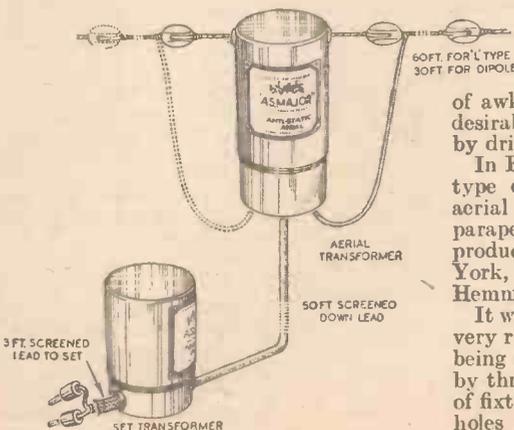


Fig. 4.—A combined "L" type aerial and dipole, showing the aerial and receiver transformers.

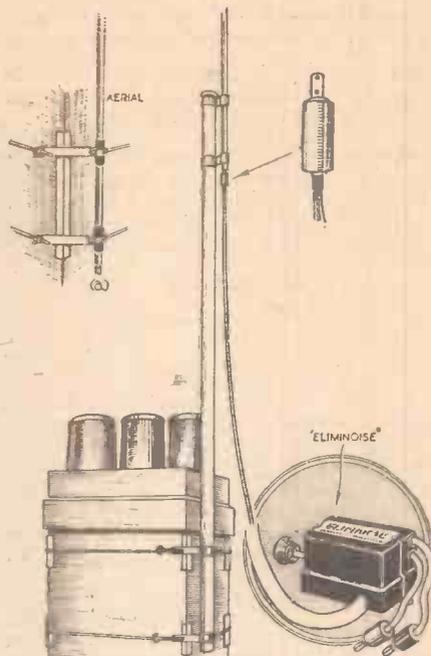


Fig. 3.—A typical installation of the Belling and Lee "Skyrod" aerial system.

### Use of Bamboo

Some of these systems are of the self-supporting rod or tube type, whilst others are of the telescopic principle, and it is only recently that advantages have been realised in the use of bamboo for supporting light gauge conductors in the form of rod, tube and wire.

Lightness, durability, rigidity and economy are a few of the merits to be found in the use of bamboo, whilst the ease of erection is an incentive to its use.

One example showing the convenience in the employment of bamboo from the home constructor's point of view is given in the illustration Fig. 1. This erection comprises two fractional-wave conductors of light gauge copper rod for use on the ultra-high frequencies, but any longer system could be fitted having the same basic design, provided, of course, due regard be given to the question of "whip" tendency when installing in a windy location.

### Methods of Fixing

One of the many problems with which the listener is faced when contemplating the erection of an aerial concerns the most suitable method to adopt for fixing the main support to a chimney stack or other brickwork, since apart from the possibility of awkwardness of access, it may not be desirable to interfere with the brickwork by driving in screws or bolts.

In Fig. 2, therefore, is depicted a sturdy type of clamp support for mounting an aerial mast or radiators on a fire wall or parapet, and is one of the wide range of products made by "Premax," of New York, and obtainable from Holliday and Hemmerdinger, Ltd., Manchester.

It will be noticed that the framework is of very rigid design, the clamping adjustment being arranged by contracting each section by threaded rods and lock nuts, the limits of fixture being governed by the five fixing holes provided in each stay.

In Fig. 3 is illustrated a typical installation of the Belling and Lee "Skyrod" range, where the mast is lashed to the

(Continued overleaf)

## SHORT-WAVE SECTION

(Continued from previous page)

chimney stack by means of adjustable brackets having corner angle strips for binding and protecting the masonry.

In the inset illustration is shown the neat method of fitting the "Eliminose" system. If there is little interference in the location, the mast need not be used, the aerial conducting rod being mounted directly to the form of insulated bracketing exemplified in Fig. 3.

## Uni-directional Aerial

The most suitable position for the installation of a uni-directional aerial is best determined by trial and error methods, but this is in most cases very inconvenient, particularly in roof mast erection, and so to obtain the best results under such conditions, a transfeeder system coupled to a dipole aerial having rectangular conductors provides one of the simpler and most satisfactory methods for a wide variety of purposes including operation on the shorter wavebands.

In Fig. 4 is shown a system embodying the advantage of combining the "L" type aerial with that of the dipole, so helping the user to determine quite closely the most suitable condition.

The aerial and receiver transformers in this particular system, chosen from the "A.S." Major and Minor series, manufactured by A. H. Hunt, Ltd., are matched to very fine limits, and sealed in wax having a high melting point which ensures thorough protection in all types of atmosphere and weather, whilst the mechanical design is along symmetric and robust lines.

## Twin-feeder Systems

To reduce signal attenuation as much as possible, not only is it necessary correctly to match twin-feeder systems from the point of view of the H.F. transformers connecting the aerial to the receiver, but the natural impedance of the down leads or feeders requires correct balancing.

To this end, then, the dielectric constant of the feeder insulated sleeving, and the distributed capacity of the conductors to

the screening braid have to be taken into account, the spacing and different gauges of conductor resulting in very appreciable variation in the natural characteristic.

For transmitting purposes, where a considerably greater order of radio-frequency current is being handled, this becomes of major importance since the conductor "surface" requires absolute protection against corrosion brought about through

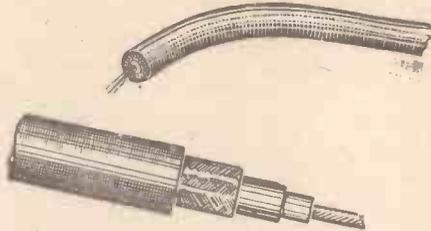


Fig. 5.—A type of coaxial cable of solid dielectric construction.

hygroscopic effects such as dampness, gaseous atmospheres, and the like.

## Coaxial Cables

To obtain very close impedance balancing and constant capacity distribution in such cases as the above, coaxial cables are used, these having the conductor, or conductors, centrally maintained when the cable is curved in the installation.

Fig. 5 shows one such cable having a solid dielectric construction of the finest

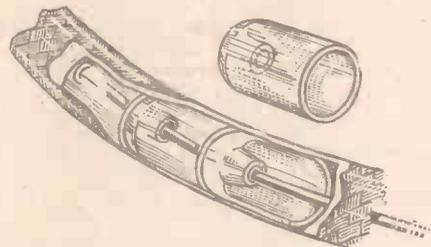


Fig. 6.—Section of a special transmitting aerial, showing the inter-bearing insulators.

Brazilian Para rubber compound. The sheathing is of weather-proof tough rubber, and the screening braid of tinned copper wire (six strands). The impedance of the conductor, which comprises 14/36 stranded tinned copper wire, lies between 70 and 80 ohms.

In locations where electrical interference, and damping, proves a difficult problem to eliminate, particularly when the television and short-wave bands are being operated, this form of coaxial cabling will be found to meet the majority of requirements, considerably improving the performance of receivers, including those of the all-wave type, where the more simple type of screened feeder system is used which invariably has a varying natural characteristic. Further details of this type can be had on applying to the Sterling Cable Co., Ltd., Queensway, Ponders End, Middx.

## Transmitting Aerials

For more critical requirements such as is met in transmitting aerials the dielectric constant is of considerable importance to ensure the minimum of signal attenuation, and special lateral insulators have to be fitted for centring the non-resonant feeder or feeders.

One highly efficient and interesting cable construction in this class is shown in Fig. 6.

Referring to this pictorial illustration, which, for clarity, gives an exploded view, it will be seen that each insulator, which is made of a non-hygroscopic substance similar to Trollylul, is inter-bearing, in this way permitting very appreciable curves to be had during the installation.

The centre conductor, which is not confined to one gauge, is passed through each insulator as shown, and so maintained centrally whatever the position of the cable within the wide limits of its flexibility; thus not only is an even capacity distribution obtained under the most trying conditions of use, but owing to the mean dielectric constancy being of such a low order, the transmitted or received H.F. currents at almost any frequency, will be handled with negligible loss over considerable lengths of feeder.

(To be continued)

## Lima Well Heard

BROADCASTS from OAX4J, Lima (Peru), on 32.15 m. (9.33 mc/s) are now easily logged between B.S.T. 02.00-03.30. The call is *Radio Internacional* (in Spanish) and in English, *National Broadcasting Station of Peru*. The studio heralds all announcements with a bugle call using, at intervals, chimes of the N.B.C. type. English and American dance tunes are features of the broadcasts. Man and woman announcers.

## More Broadcasts from China

THE *Call of the Orient* is adopted by a transmitter at Shanghai (China) working on 24.59 m. (12.2 mc/s) for its daily broadcast at B.S.T. 12.00. Reception reports should be addressed to Station XMHA, 445 Racecourse Road, Shanghai. Listeners also report hearing broadcasts of war news bulletins between B.S.T. 14.00-14.30 from XGRV, Hankow (China), on 26.32 m. (11.4 mc/s). This station appears to have replaced XTJ, Hankow, formerly operating on 25.66 m. (11.691 mc/s). Another transmitter which had been logged some months ago was XGOW, Hankow, on 33 m. (9.09 mc/s), but it has not been picked up lately, and it is possible that the channel has been abandoned.

## Leaves from a Short-wave Log

## Alterations in Uruguay

CXA4, Montevideo (Uruguay) formerly on 48.98 m. (6.125 mc/s) appears to have suspended its broadcasts on that wavelength, and the programmes of the medium-wave studio CX6 in that city are now being put through CXA6 on 31.41 m. (9.55 mc/s). It is still the *Estacion Oficial de Montevideo*, according to its announcements, and is operated by the Servicio Oficial de Difusion Radio Electrica, Calle Mercedes, 823, at Montevideo. Broadcasts are now well heard from B.S.T. 21.00-03.00 daily, and include programmes of Bolivian, Indian (Correntina), and Paraguayan, in addition to native Uruguayan music. Another station in that city on a neighbouring channel is CXA2, now working on 31.35 m. (9.57 mc/s) with a power of 5 kilowatts. It may be distinguished from the former by the fact that in its call it styles itself *Radio Continental*.

## South of the Equator

HCJB, a private station operated by Clarence W. Jones, Casilla Postal, 691, at Quito (Ecuador) is now on the air during the entire month of May on 24.8 m. (12.46 mc/s). The call is given out as follows: *Station HCJB, La Voz de los Andes: H as in Harry; C as in Chicago; J as Jones and B as broadcast, at Quito, just a little south of the Equator, and high up in the Andes*. Opens with a march (*Patria*), uses chimes as an interval signal and closes down with the playing of Liszt's *Liebestraum*. The distance from London is approximately 5,500 miles. Local time: B.S.T. less six hours.

## Haiti: Port-au-Prince

HH2S, the Port-au-Prince transmitter which has hitherto been broadcasting the sponsored programmes of the West Indies Broadcasting Company on 50.68 m. (5.92 mc/s), has changed its wavelength to 49.37 m. (6.077 mc/s). The studio is run by a woman announcer. Interval signal: double chimes. Transmissions open and close with an electrical recording of *The Swan* (Saint Saëns). All announcements are made both in the French and English languages.

# OPERATING THE TRANSVERSE CURRENT MICROPHONE

Complete Details of Testing the Completed Microphone are Given in this Article together with Useful Suggestions Concerning Possible Application and Suitable Amplifiers - - - - - By L. O. SPARKS

**A**LTHOUGH the original model was constructed with ebonite, it is possible that some little difficulty might be experienced in obtaining satisfactory adhesion between the various parts. This difficulty can be overcome by cutting the two sections which form the body of the microphone from hard wood, or even well-seasoned plywood of the same thickness as the specified ebonite. If this method is adopted, it is essential to see that all edges are well finished and that the material is absolutely free from any trace of moisture. All other details would, of course, be the same as those given for the model which

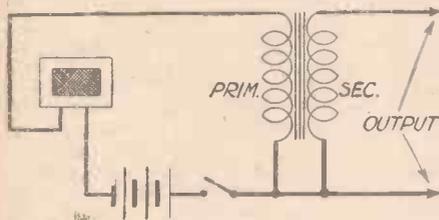


Fig. 1.—Showing how a transformer is employed to form the coupling between "mike" and amplifier.

was described fully in the article published in last week's issue.

### Testing

Before the microphone can be tested, it is necessary to secure a suitable transformer and have ready some form of low-frequency amplifier.

The transformer is required to provide the coupling between the microphone and the amplifier, and it is connected in the manner shown in Fig. 1. It should have a ratio of between 30:1 and 75:1, and if quality of reproduction is a consideration, as it should be with this class of apparatus, it will pay to buy a reliable component specifically designed for such work and not attempt to make use of some makeshift arrangement.

It will be noted that the primary of the transformer is connected in series with the microphone, i.e., the two carbon rods and a small dry battery. A 9-volt grid bias battery is suitable, but for the sake of compactness I would suggest an ordinary 4½-volt pocket lamp battery.

If the microphone is likely to be used frequently, it is advisable to include a switch between the battery and one side of the primary, so that the circuit can be broken at will and thus avoid an unnecessary current drain from the battery. It is a very good idea to house the transformer and battery in a small case to which has been fitted four terminals and a switch. The case should be constructed from metal sheet for preference, although a wooden case will be found quite satisfactory for average amateur requirements. A suggested assembly is shown in Fig. 2, two of the terminals being for the microphone, and two for the output to the amplifier.

After connecting the microphone to the appropriate terminals, completing the battery circuit, and connecting the output to the input side of the amplifier, snap the fingers just in front of the diaphragm and *don't* resort to that rather dangerous habit of *jabbing* the diaphragm with a finger to see if the "mike" is working. If the amplifier is in order, the sound should be reproduced via the speaker, in which case tests can be made with speech or music.

When speaking, don't speak *into* the mike unless you are at least two or three feet away. It is far better, when the mouth is close to the microphone, to speak *across* it, otherwise very objectionable blasting may be produced.

### Microphone Howl

If the microphone is in the same room as the loudspeaker it is highly probable that a piercing howl will be set up as soon as the volume is increased. This is due to a form of feed-back between the loudspeaker and the microphone, and the only way to overcome the trouble is to adjust the position of the microphone with relation to the speaker until the former is out of the effective sound field of the latter. In most simple installations, the speaker should be in front and pointing away from the microphone, although a great deal depends on the acoustic properties of the room or hall in which the apparatus is being used.

It is permissible for the leads from the transformer to the microphone to be several yards in length, but the connections to the input of the amplifier should be kept as short as possible, and preferably made with screened wire, the screening being connected to earth. As one side of the input is invariably connected to the common negative

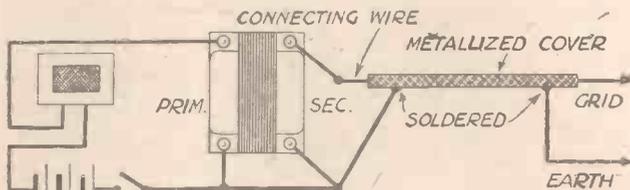


Fig. 3.—If a screened lead is connected in this manner, only one wire is required for the output.

earth line of the amplifier, the connections can be made with a single screened wire if the method shown in Fig. 3 is adopted.

There is one exception to short input leads, and that is in the case of A.C. operated amplifiers, when it will be found necessary to keep the microphone transformer three or four feet away from the mains transformer. This procedure is necessary, unless the mike transformer is housed in a metal box, to avoid the possibility of hum being introduced into the input circuit by radiation from any parts of the circuit carrying raw A.C.

### Volume Control and Amplifiers

As it is practically impossible to keep the sound, whether speech or music, to be reproduced within fairly narrow limits, it

is essential to provide some form of volume control to enable the input to the amplifier, and likewise the overall amplification, to be regulated.

This is most easily done by fitting a potentiometer either across the secondary of the microphone transformer or, better still, across the grid circuit of the input valve, as shown in the top diagram of Fig. 4.

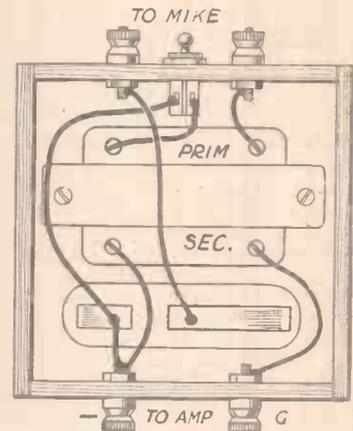


Fig. 2.—A suggested assembly for a self-contained microphone coupling unit.

As it is desired, in so many instances when a microphone is used with an amplifier, to make use of a pick-up as well, the method shown in the lower diagram of Fig. 4 should be adopted as it allows the input from a microphone and a pick-up to be controlled at will and mixed according to the operator's requirements. It is well

worth embodying this arrangement in the amplifier, as it adds considerably to the effects which can be produced.

Elsewhere in this issue complete details are given of an A.C. operated amplifier which would be very satisfactory for use with the transverse current microphone already described, but this does not mean to say that such elaborate apparatus is always essential.

It is practically impossible to say what type of amplifier or how many valves are necessary to give good reproduction, as so much depends on the volume required, the size of the room or hall, acoustic properties and the number of people to be addressed or the area to be covered by the amplified sound.

The figures given below therefore must  
(Continued overleaf)

### OPERATING THE TRANSVERSE CURRENT MICROPHONE

(Continued from previous page)

only be taken as a guide and, if possible, tests should be made to determine the amplification required for any given installation. After a little experience in this direction the operator will soon be able to judge the capabilities of his apparatus and arrange his plans accordingly.

For domestic use, where sufficient output for a normal room is required, quite good results can be obtained from a battery-operated amplifier having an output of, say, 1½ to 2 watts. This will necessitate

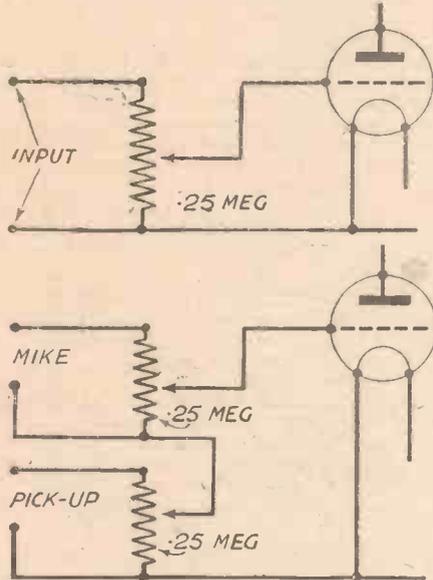


Fig. 4.—Two input control arrangements, the lower one being the "mixer."

at least three valves and push-pull or Class B should be used in the output stage. A mains receiver or amplifier having an output of 3 watts can be used for speech or music in a small hall when the audience is quiet, but if dancing is to take place then a minimum of 5 watts will be essential.

If one is interested in using the microphone for, say, crooning or relaying music in a small dance hall, then I would strongly advise a mains-operated amplifier of the portable type, having an output in the neighbourhood of 8 watts.

#### A Word of Warning

When using a microphone for entertainment purposes *don't skimp* the selection of your apparatus to such an extent that everything is working at its maximum output. It is very advisable, and equally essential in the interests of quality, always to have a reserve of power in the amplifier so that if conditions necessitate a slight increase in volume it can be obtained without discomfort to the listeners, and hectic moments for the operator.

## PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM.

400 pages, 6/- or 6/6 by post

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

# RADIO IN AVIATION—5

## In this Section the Problems of Listening-through and Generator Noise are Dealt With

AT quite an early period in the development of radio it was not unusual to arrange for control the transmitter and receiver by the telegraph key. This enabled the listening operator to interrupt the transmitting operator by causing signals to be heard in the intervals between dots and dashes. This practice died out with the advent of valve-operated transmitters and valve receivers used under aircraft conditions, owing to the interference caused by the continuously running generator. But as listening-through became a vital military requirement attention had to be paid to the design of devices which would permit of this operation.

Considerable attention was paid in the R.A.F. to this kind of device, and many alternative forms of electro-mechanical listening-through keys were tried before a satisfactory one was evolved. The requirement was that the transmitter and receiver were to be alternately switched over to the aerial at Morse speed. Safety of the operator and of the equipment demanded that the following operations be performed in the order given: (a) Change over from "receive" to "send." (b) Make H.T. + connection to transmitter. (c) Make transmitter key circuit.

It was important to ensure precision in the order given in order to avoid any possibility of high voltage reaching the receiver and so endangering the comfort and perhaps the life of the operator. For use in emergency a dummy listening-through key was provided which, on being plugged-in in the place of the real one, effected normal connections through the hand-operated send-receive switch. Various designs were produced, and one particular form was its own dummy when reversed back to front. With this mode of working it was unavoidable that a certain amount of key-click interference should reach the operator's headphones, but with substantial H.T. filtering excessive generator noise during receiving periods was obviated.

#### Increasing Selectivity

In recent years an improved form of listening-through has been introduced, having the advantage of simplicity and safety, together with the elimination of a special instrument. It consists in coupling the receiver directly to the aerial (which is common to the transmitter) through a very small series capacitance of high insulation. With the transmitter permanently connected to the aerial, its tuned output circuit affords an extra resonant circuit for the receiver, thus increasing the selectivity. It has the further great advantage that the aircraft transmitter can be automatically set to the ground-transmitter frequency as the operator tunes in the signal from the latter. This ensures accurate setting-up on the wanted frequency without necessitating the use in the aircraft of an accurate wavemeter. Naturally this method does not permit of working on different frequencies for transmission and reception, but as the same frequency is normally intended to be used in each direction this limitation is not at all an undesirable one. Nevertheless, it is possible to revert to complete flexibility by operating the send-receive switch when the

two frequencies need no longer be identical. The value of the coupling condenser is so chosen as to limit the interaction between the transmitter and receiver tuning circuits to a negligible minimum, and it further ensures a reasonably low voltage across the receiver coils during transmission. Nevertheless, it was found that the induced voltage across the grid-filament circuit of the first valve was sufficiently high to impair the emission of the filament in a relatively short time and also to cause insulation troubles in the valve itself. To overcome this defect a diode is connected across the tuned circuit with a negative bias of about 0.5 volts on the anode; this removes the valve load from the tuned circuit during reception, but introduces heavy damping in the receiver during transmission. A special high-emission valve, free from anode current at very small negative anode potentials, was designed by the manufacturers and satisfactorily fulfils requirements.

Although this form of reception has been in regular use in the fighting services for many years, it has not yet been applied to civil aviation, but from recent inquiries it would appear that designers of civil-aviation radio apparatus have the matter under consideration.

#### Generator Noise

The necessity for a high degree of generator-noise suppression in connection with L/T operation necessitated the carrying of heavy and bulky H.T. filters, and with high-gain receivers even the noise of the generator for the transmitter filaments was troublesome. Attention was, therefore, turned to the study of generator windings and commutators, with the result that generators are now available in which the mean H.T. ripple on load is of the order of 0.3 per cent. without additional smoothing while the L.T. ripple is of the order of 0.75 per cent. on full load. A pair of small condensers of 10 milli-microfarad capacitance are connected across the brushes and to the carcass of the machine to remove oscillatory interference caused by commutator sparking.

#### Voice-operated Switching

It is evidently so desirable to relieve the operator, who may be the pilot of a fighter aircraft, of all unnecessary operations that voice-operated switching of the type regularly applied to ground systems would appear to be worth developing. Such a system must have the following characteristics: (I) It must change over from "receive" to "send" immediately speech is applied to the microphone. (II) It must be entirely unaffected by external noise. (III) It must not respond to change of external noise-level. (IV) It must be unaffected by change of altitude. (V) It must be unaffected by change of temperature.

To these requirements should be added the remark that there should be no tendency to remain in the transmitting condition when speech is not being applied to the microphone. Such an occurrence would destroy communications in the whole of the squadron.

(To be concluded.)

A PAGE OF PRACTICAL HINTS

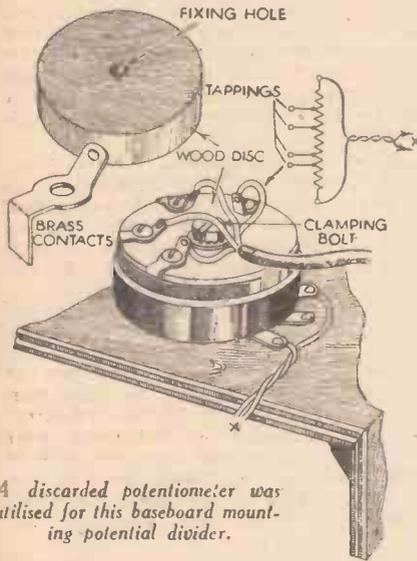
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Baseboard Mounting Potential Divider

INSTEAD of discarding a damaged potentiometer of 50,000 ohms, I decided to convert it into a baseboard mounting type potential divider in the rather novel manner shown in the illustration. After making a number of contact pieces out of thin brass strip, I obtained from a wood shop a disc of wood having



A discarded potentiometer was utilised for this baseboard mounting potential divider.

a diameter which would provide easy recessing whilst resulting in good contact pressure on the old potentiometer element.

As will be seen from the sketch, the original wiper movement is removed, in my case leaving only a thin bronze slip ring which is disregarded, and in its place is positioned the wood disc after determining the exact resistance tappings required for setting the contact pieces. A large bolt secures the disc, clamping the whole assembly to the wood chassis. The inset diagrams clearly show the conversion details.—R. L. WESTLEY (Forest Gate).

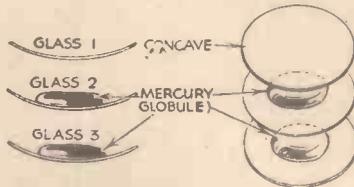
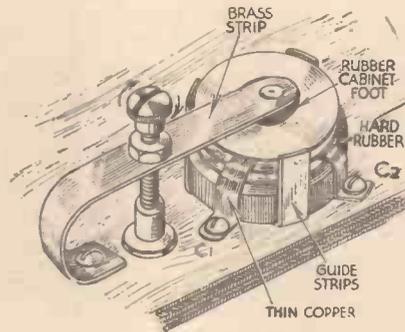
A Novel Micro-condenser

WHILST experimenting the other day with some watch glasses and mercury, I hit upon the idea illustrated in the attached sketches. I noticed that by pouring a small quantity of mercury into one of these concave glasses (old eyeglass lenses do quite as well) and compressing another glass of equal size into the globule of mercury formed, the mercury expanded evenly between the two glasses. It soon occurred to me that with suitable means of adjustment, this expansion of mercury could be used for a small constant capacity pre-set condenser for high-frequency circuit padding, and with the aid of the proverbial junk box I devised a hard rubber glass holder, and pressure spring assembly, as illustrated.

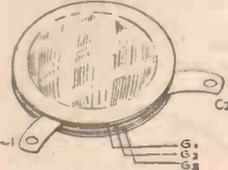
**THAT DODGE OF YOURS!**  
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn 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.

The weight of the mercury in glass No. 2, together with the exerted pressure, resulted in the mercury in the bottom glass (No. 3) expanding slightly more than that in glass No. 2, but this had no detrimental effect on pre-setting in any way. Thin copper strips served for contacting with each mercury "plate" of the condenser, and to prevent any movement, after setting, the guide-strips—made of celluloid, heated, bent, and then screwed through the rubber base into the wood baseboard—were found all that was necessary.—F. S. TILLER (Cromer).



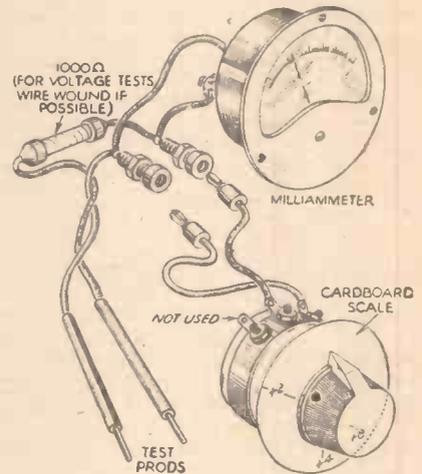
MERCURY FORCED TO CONCAVE MIRROR SHAPE INCREASING CAPACITY AREA.



A novel micro-condenser in which mercury is used for varying the capacity.

Extending the Range of a Milliammeter

HAVING a good moving coil 1.5 mA meter, and wishing to extend its range, I have fixed a potentiometer across it as shown, in place of the usual shunt. This is a very handy arrangement as the ratio of the actual flowing current to the meter reading can be instantly adjusted to quit the job on hand; in fact a cardboard scale can be made to show the X value at various positions of the potentiometer arm. Connect up the meter to give full scale reading (in my case 5), then insert the two



A simple method of extending the range of a milliammeter.

plugs. Of course if the resistance of the potentiometer is the same as the meter resistance, the reading is halved, if not, adjust until this is the case, and mark on the scale X2, full reading is now 10 milliamps, or volts, if 1,000 ohm res. is in series.

Various other positions can now be found and marked, for example, 1 mA—1/4 of actual current, therefore X reading by 5. Full scale—50 mA.

Take care not to overdo the increase of ratio too much, as excessive current will flow through the potentiometer and burn it out: use one with a high wattage rating, and when measuring higher voltages start with little resistance in circuit so as to avoid "Bumping" the meter.

The sketch explains the construction, and the whole unit can be fitted into a cigar box.—L. D. MORELEY (Hove).

**NOW READY!**  
**WORKSHOP CALCULATIONS, TABLES AND FORMULÆ**  
By F. J. GAMM  
3/6, by post 3/10, from George Newnes, Ltd., Tower House, Southampton St., London, W.C.2.



May 27, 1939.

Vol. 4.

No. 153

### A Deadlock

THE recent questionnaire in which the B.B.C. asked viewers several leading questions had a most successful response, and among other things revealed that set owners show a marked preference for televised plays. It was not long ago that those who opposed development of home television put forward the point of view that the screen sizes on modern sets were too small to follow a stage play in comfort and hold the interest of those looking in for a period of about two hours. Subsequent events have proved that these pessimists were quite wrong in their conclusions and plays are the demand from all quarters. Unfortunately, this has led to a most awkward situation, for whereas the B.B.C. on their part are prepared to make the necessary arrangements to meet viewers' wishes, the theatre managers have declared "war" and banned their artists from television work. This deadlock has arisen because the B.B.C. maintains its right to televise plays on Sundays and in objecting to this the managers of West End theatres say they should be allowed to open as well or, alternatively, all should be banned. The point at issue has been raised in Parliament, but action refused, so the ban is to be maintained until a satisfactory agreement is reached between the B.B.C. and the association of West End theatre managers. It would seem that American television, which has now made its official bow to the public, is going to run into similar difficulties, as four different trade unions, the American Guild of Musical Artists, the American Federation of Radio Artists, the Screen Actors' Guild and Actors' Equity have all claimed jurisdiction over television performers.

### Achieving Linear Deflection

ONE of the features which is always looked for in a modern television receiver is whether the deflection of the beam of electrons when tracing out the picture on the cathode-ray tube is truly linear in both line and frame directions. This is by no means a simple matter, but unless linearity is present the final picture lacks the quality which the enlightened would-be purchaser expects. Any squeezing together of the picture at the masking edges is annoying, for it produces a form of distortion reminiscent of that seen in the shaped mirrors designed for amusement. Various correcting devices are incorporated

in the time-base generator circuits to achieve linearity, and these aim at nullifying the saturation or slowing up effect of the charging stroke at the end of its traverse. In one case this is brought about by adding to the usual exponential charging waveform another shaped curve which gives a combined effect strictly saw-toothed in shape. Whether magnetic or electrostatic deflection is employed in the C.R. tube this point has to be watched, and one of the best ways of checking receiver performance on this question is to study the tuning signal as radiated on the vision carrier by the B.B.C. prior to the commencement of each performance.

### Electrode Shaping

IN electron multipliers of the reciprocating or successive type, in which the electron stream is made to strike each secondary emissive surface in turn, it is often found that the surface emission is so large that many of the electrons fail to find their way through to the successive targets owing to internal repulsive fields among the electrons themselves. A prominent electron multiplier manufacturer has, therefore, devised a simple scheme which it is claimed will overcome this defect. The secondary emissive electrode surfaces are made in a concave form, with the result that the

amplified electron stream tends to keep to a definite beam formation in its passage from the initial cathode.

### The Cinema and Television

THE Cinematograph Exhibitors' Association and the Kinematograph Renters Society have joined forces with the idea of putting their own case concerning television before the Postmaster-General. A request to the P.M.G. for an interview was not complied with immediately as the Postmaster stated that he would prefer to receive a report from the Television Advisory Committee first. This met quite recently, so it is expected that a deputation will soon be able to make known its points and obtain some declaration on television policy in so far as it affects the cinema industry. One factor which has caused a good deal of discussion is the fee which has to be paid to promoters in order to secure re-diffusion rights. It was understood from a B.B.C. report that the sum to be paid would be assessed roughly on seating accommodation in the theatre itself, but one cinema manager claims that in the case of the Farr-Burman match he was asked to pay a fee nearly three times the money-holding capacity of the theatre. It was felt that this would jeopardise the rights of the small cinema.



"London's police horses are wonderful," telephoned a viewer after seeing the first televised display by the mounted branch of the Metropolitan Police recently in the grounds of Imber Court, East Molesey. The illustration shows mounted police riding at the head of guardsmen and a brass band, being televised.

# TELEVIEWS

## Another Triumph

THE success which attended the B.B.C.'s outside television broadcast of the Cup Final gives further evidence of the excellent work of the O.B. department to ensure that the pictures provide not only entertainment, but are technically a triumph over all forms of adverse conditions. The weather for one thing was by no means in favour of the cameras, for the sky was overcast, and at repeated intervals the rain fell heavily. This in no way seemed to detract from the enjoyment of those who looked in on their home receivers (there was no rediffusion to cinemas on this occasion), a fact which was of course contributed to by the excitement of the game and a confounding of all the critics by an amazing triumph of the Portsmouth team. It is always easy to criticise any individual transmission without knowing the conditions which had to be met on the spot by the television engineers, but there were some annoying moments which hardly seemed justified. For one thing, the fades from

members keeping pegging away at the Postmaster-General in an effort to obtain some concrete promise in this connection. A few days ago Major Proctor asked the Postmaster-General whether he is aware that since broadcasting was instituted in this country, up to the end of last year the British Broadcasting Corporation received only £21,000,000 out of a total of £36,000,000 produced by the receipts from wireless receiving licences; and whether, in view of the fact that an extension of a television service to the whole country is held up largely as a result of lack of finance, he can now make arrangements for the Corporation to receive the whole of the revenue from wireless licences. Then Mr. R. Morgan asked the P.M.G. whether his attention has been called to the scheme of the Radio Manufacturers' Association for the immediate establishment of a television transmitter for the Birmingham area, under which the Association would be prepared to stand part of the loss involved if the scheme were not a financial success; and



Perfect reception of television can be obtained in the Isle of Wight, although nearly 100 miles from Alexandra Palace. Our illustration is from an unretouched photograph taken during a recent demonstration held at the Town Hall, Shanklin, I.O.W.

camera to camera were poor, and there was invariably an overmodulated signal produced when this occurred, and this gave such an increase in brightness that for a second or two the picture just dissolved into a brilliantly-lit screen. Again, there was one camera which appeared to be set too low, with the result that any play on the far side of the field just dissolved into the top of the picture. If the engineer had panned the camera up just a trifle, all would have been well. Then at the end, when the players were trooping off the field and making their way to the Royal Box for the cup and medal presentation, viewers saw a blackboard on which a hand was very laboriously writing down the score as if no-one looking in knew the result. The picture showing Their Majesties making the presentation did come on finally, but all the preliminaries so essential to give continuity to what was certainly an outstanding occasion were missing. In spite of these obvious defects, however, the transmission must be voted a great success, and the B.B.C. should be congratulated on their really fine effort.

## Pegging Away

THE campaign for an extension of television to the provinces inaugurated by the whole of the radio trade and undertaken by the R.M.A. shows no sign of abating, and even in Parliament certain

whether he has been able to accede to this request. In reply, the Assistant Postmaster-General stated that the total receipts from wireless receiving licences to the end of last year were about £36,000,000. Of this sum the Post Office has retained about £4,000,000 to cover its expenses; the British Broadcasting Corporation have been paid about £22,300,000, and the Exchequer has retained about £9,700,000. The percentage of the licence revenue paid to the Corporation has been progressively increased, and under present arrangements the amount accruing to them to cover all their services represents about 81 per cent. of the total licence receipts, while the Post Office retains nine per cent. for its expenses, and the Exchequer retains about 10 per cent. The question of extending the television service to cover the whole of the country raises numerous problems, both technical and financial. All aspects of the question, including the tentative proposals of the Radio Manufacturers' Association, are being investigated, but no decision has yet been reached.

## PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM

6/- or 6/6 by post from George Neumes, Ltd., Tower House, Southampton Street, W.C.2.

## ONLY 7 MORE DAYS

... in which you can take advantage of an amazing TROPHY offer. SEE LAST WEEK'S SPECIAL ANNOUNCEMENT

### Build Mr. Camm's 50/- Three Kit "A" Yours for 4/6 down

Kit "A" comprises all parts for building Mr. Camm's wouder economy receiver and includes specified Peto-Scott drive assembly, coils, choke, drilled chassis and panel, specified switch and gang condenser. Wire, flex, screws, etc., but less valves, batteries and speaker. Cash or C.O.D. 50/-, or 4/6 down and 12 monthly payments of 4/6. 3 specified valves, cash or C.O.D. 21/9, or add 1/9 to Kit "A" deposit and 1/11 to monthly payments. Peto-Scott specified set of Coils and Choke, 10 G. Peto-Scott specified Drive Assembly with calibrated station-name scale, 5/6. Peto-Scott specified Drilled wood chassis and panel, 5/-.

### PETO-SCOTT CO., LTD.

77, (Pr. 41.) City Road, London, E.C.1. Tel. Oldboid 9573. 41, (Pr. 41.) High Holborn, London, W.C.1. Tel. Holborn 3248.

## ELECTRADIX



**DISC RECORDING FOR MANY USES.**—Electric FEIGH set has ball bearing centre box and geared traverse rod. Set with Tracking Gear, pick-up and Tone-arm fitted with Diamond. Fitted on a Radio, gram enables hams to hear their own list. 37/6.

**BATTERY CHARGING ON A.C. MAINS WITH THE A.C. NITNDAY** will keep your battery fit without attention. Model N/A6, 100/250 volts A.C. and D.C. 6/8 volts 1 amp., 15/-; Model N/B6, 100/250 volts to D.C. 6/8 volts 1 amp., 25/-; Model N/C6, 100/250 volts to D.C. 6/8 volts 2 amps., 35/-; Model N/D12, 100/250 volts to 12 volts 1 amp., 32/-; Ditto, 12 volts 2 amps., with 6-volt tap, 55/-; 5 amp., 24/10/-.

**D.C. GENERATORS**, 120 watt, 1 Kw, 12/16 volts 30 amps. with vee pulley, 45/-; Shunt wound, 110 volts 1 amp., 15/-; 200 volts 1 amp., 17/6; 200 volts 1 amp., 26/-.

**WINDMILL GENERATORS**, totally enclosed, ball-bearing, start charging at 300 revs., 6 to 12 volt., 8 amps., 35/-; 25 amps., 45/-.

**TRANSMITTERS, MORSE AND SIGNAL KEYS.**—Ex W.D. balanced, solid brass bar, tungstl contacts, indicator lamp. Type KBSL, a guinea Key for 7/6. Other keys from 3/6. Learner's outfit complete, 4/9. Ask for special illustrated Key List "K.W."

**A.R.P. HELPS.**—Portable Field Telephone Stations and Exchanges, with Unbreakable cable. SIGNAL LAMPS, Lucas day and night portable, 23/10. Aldis, C.A.V. ditto, 23/5/-. Army type DIII double headphones, pocket type, 2/6 pair. Big Mains Alarm Bells, D.C. and A.C. Mains Motor Blowers D.C., 55/-; A.C. 65/-.

**RELAYS Nos. 1 to 15** have their magnet windings distinguished from the silver-tipped contact blades which carry about 250 m.a.

**TYPE "S" SELECTOR RELAY SWITCHES.**—As illus. 7 arms of 25 ways each. Relay solenoid operated for distant control. As used in Tote and Auto phone exchange, 10/-.

**S.F.C.O. RELAYS**, No. 5 type 309a, 80 m.a. G.P.O. Vertical Relays, 5/- to 15/-.

**SINGLE BLADE RELAYS.**—No. 1 type 80D, 1,000 ohms "on-off" s.p. 6 volts, 8 m.a., 7/-; No. 2 type 832 s.p. 2,000 ohms "off" only, 10 volts 5 m.a., 8/-.

**S.F.C.O. RELAYS**, No. 5 type 309a, 80 m.a. 450 ohms, polarised, 3 blade 2 volts, 20 m.a., 7/6. No. 6 type 194a, 325 ohms 2 bobbin, polarised, 3 blade, 6 volts 25 m.a., 8/6. Ditto, No. 7, 10,000 ohms, 20 volts, 21 m.a., 12/6. No. 8a, type W.E. on 4in. ebonite panel 40 ohms, 6 v., 30 m.a.

**MULTI-BLADERELAYS.**—No. 9 type A.G., 1,300 ohms, 2 coil, D.P. "on-off" 8/6. 22 volts, 150 m.a. No. 10 type A.H., 1,300/2,000 ohms 2 coil, 3 circuits, 6 blades "on-off" 15 volts, 100 m.a., 9/-; No. 11 type 831, 3,200 ohms, 8 blade, 3 circuits, "on-off" 3 circuits S.F.C.O., 12 volts 12 m.a. Blades removable, 12/6. No. 12 type 27E Spare, 1,000 ohm coil with armature, no contacts, for making relays, 2/6.

**L.R. SERIES RELAYS.**—No. 13 type LA, 1 ohm, 2 on 1 off, 12/6. No. 14 type LB ditto, 10 ohms, 12/6.

**HAND RELAY.**—No. 15 type 1450 coil, 1,300 ohms, trip contacts "on" until hand reset, 12/-; No. 16, ditto, but reverse, contact set "on" by hand, trip-off by relay coil, 1,500 ohms, 14 volts, 10 m.a., 12/-.

**SPECIAL LIGHT S.P. RELAYS** for model control. No. 3, type D 41 one blade "on-off" 10,000 ohms, 20 volts, 21 m.a., 12/6. No. 4, 2,000 ohms, 10 volts, 5 m.a., 10/6. No. 4a, 5 ohms, 2 volts, 1 amp., 7/6. Heavier Current Relays for Transmitters, etc. Sounder type 5 amps., 15/-; American Ham Relays, 7/6. Ship Magnetic Key Relay, 15/-; Creed high-class polarised 2-way Relays, 25/-.

**ULTRA-SENSITIVE MOVING COIL RELAYS.**—These work on really tiny currents from photo-cells, etc., and a small rectifier can be used for A.C. impulses. Two types: (1) The famous large double-acting Weston Relay, open type, model 30, 50/-; List price, 50 dollars; or mounted in mahogany case with glass top, 60/-; For panel use, the small 2in. meter type W1 works on 50 micros, with 150 mils. on main contact, 55/-.

**MAGNETIC SWITCHES.**—Overload Trip, 2 to 4 amps., 7/6; 6 amps., 10/-; 10 amps., 12/-; 15 amps., 14/-; 20 amps., 16/-; Verner 15-day Time Switches "on-off" 1 amp., 6 amps., 25 amps., 200 amps., cheap.

16-Page Bargain List. Free on request.

## ELECTRADIX RADIOS

218, UPPER THAMES ST., LONDON, E.C.4.

Telephone: Central 4611.

# An S.G. or All-wave High-frequency Choke

Constructional Details are Given in This Article of an Efficient Component for the Experimenter

**C**ERTAIN straight type receivers have a high-frequency choke connected in the anode circuit of the S.G. high-frequency valve, this being used in conjunction with a tuned grid coil for high-frequency coupling purposes (as described on page 140, "Wireless Coils, Chokes and Transformers").

A larger number of turns are required for this type of choke, and when used in conjunction with all-wave coils, a special section of side-by-side turns must be included for the short-wave bands.

The choke about to be described was constructed by the writer for fitting on top of the chassis, close to the S.G. valve and the coil unit, thus the reason for the bottom connecting wire, which was passed through a hole drilled in the chassis and soldered to the H.T. line. Should it be desired to mount the choke on the underside of the chassis, a different method of fixing might be found necessary, owing to the overall height of 5ins., and it might also then be found preferable to bring out the H.T. lead from the side, instead of from the bottom.

## Constructional Details

The former may either be turned from ebony or it can be made from separate paxolin or cardboard discs, 1½ins. diameter by ⅛in. thick, spaced ⅛in. apart on a ⅜in. diameter tube. If the latter method is adopted, a good plan is to slip the disc (which should be a tight fit) on to the tube, spacing each with strips of ⅛in. thick cardboard. These strips can be removed after assembly, and the former well shellacked, and left to harden thoroughly. When quite dry a sawcut should be made lengthwise through the discs, to allow passing the wire from slot to slot.

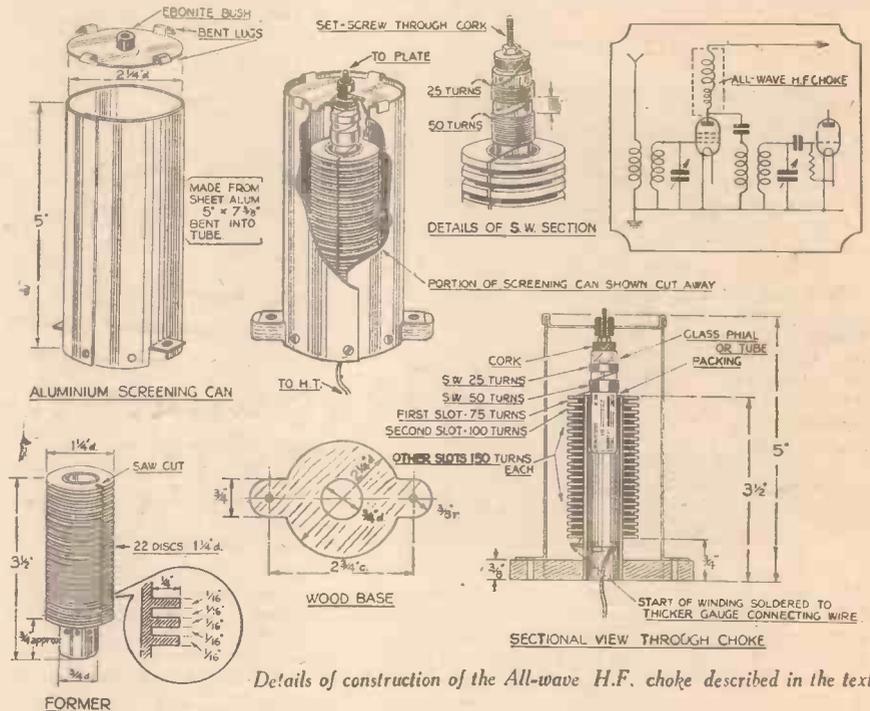
A simple form of winder is helpful when putting on the 3,000 odd turns of 38-gauge enamelled wire, though if time is no object, the winding can be done by hand, though this will be found rather laborious.

First a 12in. length of fairly stout gauge, say, 24 d.c.c. wire, is anchored in the three holes close to the bottom disc of the former, and the 38-gauge wire scraped clean and soldered to it. Put on the winding, 150 turns each in 19 of the slots, 100 turns in the 20th, and 75 in the 21st. Then remove the former from the winding machine (if used), but do not cut the wire at this stage. Next push the glass phial, or tube, into the top end of the former, leaving about ½in. projecting. If the glass tube is much smaller than ⅜in., a length of paper should be wound round until a good tight fit is obtained, but do not make so tight as to fracture the phial. Now pull out several feet of the wire and fix the spool. Then revolve the choke former in the hands and, keeping the wire taut the whole

time, wind on the 50 and 25 side-by-side turns, leaving a space of ½in. between the two sections. Make a notch in the cork (which is, of course, fitted with a set-screw, as shown), pass the wire into this notch and give a turn or two round the set-screw before cutting, cleaning and soldering.

as to project ½in. top and bottom. This disc is pushed into the top of the main tube and the four lug pieces clamped over the rim.

Lastly, a screened lead should be soldered to the projecting set-screw, and this wire then goes to the plate of the S.G. valve.



Details of construction of the All-wave H.F. choke described in the text.

Provided the turns are wound on tightly they should not slip, but a spot of shellac at each of the ends will make quite secure. Take care not to run the shellac over the turns.

The wooden base is cut out of a piece of hardwood or ply, ⅜in. thick, to the dimensions shown, and the choke pushed into the hole; the fit here should also be a tight one. Shellac or glue can be run into this joint, but make sure first that the former is truly perpendicular.

## The Screening Can

This can be made from a sheet of aluminium, 5ins. by 7⅜ins., bent into tubular form, as shown, to give an inside diameter of 2½ins. The two feet shown are formed by cutting and bending up at right-angles, and are ⅜in. wide. The screen is drilled and fixed by screws to the wood base, as shown. The top is in the form of a disc, having four lugs bent as shown, and is fitted at its centre with an ebonite bush ⅜in. long by ⅜in. diameter, which is forced into the centre hole so

Special care should be taken to see that the metal covering of this lead is fully insulated from the set-screw, otherwise the H.T. would be shorted to earth.

The part circuit (inset) is included merely to show where a choke of this type is necessary. The tuning coils would, of course, be of the all-wave type with appropriate switching.—R. L. G.

## WIRELESS TRANSMISSION FOR AMATEURS

Edited by F. J. CAMM.

Explaining how to Learn the Morse Code: Applying for a Licence: Building and Operating the Set. Illustrated by Many Practical Diagrams.

Price 2/6 or 2/9 by post

From George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.



# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

**R**ICHARD TAUBER has chosen two songs from the films for his latest recording on *Parlophone RO 20437*, both of which he sings in English. The first is "Waltz of My Heart," from the film, "The Dancing Years," and the other "Sweethearts" from the film of the same name.

There are a number of fine symphony recordings in the 12-in. "Classic Series." First there is the Berlin State Opera Orchestra playing "Alessandro Stradella" overture on both sides of *Parlophone E 11408*, the E.I.A.R. Symphony Orchestra, Turin, with a recording of "La Scala di seta" on both sides of *Parlophone E 11409*, and finally the Grand Symphony Orchestra with a two-part recording of "Banditenstreich" on *Parlophone E 11410*.

Vocals seem to predominate in the 10in. Classic Series, where Herbert E. Groh, the famous German tenor, heads the list with "Girls Were Made to Love and Kiss" and "Maxim's" from the "Merry Widow" on *Parlophone R 2651*.

Millicent Phillips, the young girl soprano, has recorded "One Day When we Were Young" from the film "The Great Waltz," and has coupled it with "Sweethearts" on *Parlophone R 2653*. "The Three Waltzes" selection (Oscar Strauss—after Johann Strauss, father and son) is played by Orchestra Georges Tzipine with the Grand Organ of the Gaumont Palace, Paris, on *Parlophone R 2655*, whilst the Orchestra Mascotte play "Acceleration," a Johann Strauss waltz coupled with Budapest waltz on *Parlophone R 2656*.

### Dance Music.

**H**ARRY ROY and his Orchestra have made two records this month. "There's a Ranch in the Rockies" and "Gotta Get Some Shut Eye" on *Parlophone F 1429*, and "I Can't Get You Out of My Mind," paired with "We Speak of You Often," on *Parlophone F 1430*. "Heaven Can Wait" and "The Same Old Story" is recorded by Billy Thorburn and his music whilst fans of Nat Gonella and his Georgians will appreciate "Gotta Date in Louisiana" and "Gotta Pebble in My Shoe," *Parlophone F 1409* and "The Spider and the Fly," and "Howdy, Cloudy Morning," *Parlophone F 1410*. Nat Gonella sings the vocals.

Dancing fans will welcome Victor Silvester's dance instruction records which are a new feature this month. Instructions for lady's and gentleman's steps are described by Victor Silvester on five 10in. records which are sold complete in an album with booklet giving details and personally autographed photograph of Victor Silvester for 12s. 6d. The records—*Parlophone F 1400-4*—describe the quick-step, waltz, slow fox-trot, tango and rumba, and, if desired, can be obtained separately for 2s. The booklet can also be obtained for 9d.

### Variety

**T**HAT popular combination, "The Organ, the Dance Band and Me," featuring Billy Thorburn at the piano and H. Robinson Cleaver at the organ, play "To Mother With Love," and "Little Gypsy of the Seven Seas" on *Parlophone F 1416*. Pianoforte solos in rhythm are supplied by Billy Thorburn with a "Waltz Medley" introducing "Where the Shannon Flows Down to the Sea," "Never Break a Promise" and "Sweethearts" and a "Foxtrot Medley" introducing "My Own," "Hurry Home" and "Thanks for Everything" on *Parlophone F 1407*, and Gerry Moore with "I Promise You," coupled with "Blame it on my Last Affair," *Parlophone F 1408*.

"Hutch" (Leslie A. Hutchinson) has made a recording of "Deep Purple," the hit tune which is now sweeping America, the coupling being another popular tune, "The Masquerade is Over," *Parlophone F 1412*. This popular radio star also sings "Prelude to a Kiss" and "Let Me Whisper" on *Parlophone F 1413*.

## PROGRAMME NOTES.

### Jan Berenska and His Orchestra

**T**HIS orchestra has a summer engagement at Cheltenham, and one of its Sunday evening concerts will be heard from the Montpellier Pavilion there on May 28th, in the Midland programme. The vocalist will be Andrew Clayton.

### Cinema Organ Recital

**I**N the evening on Whit Tuesday Leslie James will give a recital on the organ of the Rialto, Coventry. He is broadcasting for National listeners in the afternoon of the same day.

### Variety from Coventry

**A** VARIETY programme will be broadcast on June 2nd from Coventry Hippodrome. This theatre has provided many broadcasts since 1932, and was in the "Famous Music Halls" series last year. An attractive bill may be expected.

### County Cricket Commentaries

**C**OMMENTARIES on the county cricket games Glamorgan v. Nottinghamshire and Yorkshire v. Hampshire will be broadcast in the National programme at intervals during Saturday afternoon, June 3rd. E. W. Swanton will be the broadcaster from the Swansea ground and P. G. H. Fender will be at Bramall Lane ground, Sheffield.

## FREE VALVES!

Amazing Value in

### ALL-WAVE TESTED KITS

**WORLD ALL-WAVE S.G.3.** Wave-range 9-2,000 metres, slow-motion tuning. Station-name scale. Kit includes all parts with transformer, etc., and FREE S.G. Det. and Pentode valves. List value £4/15/0. BARGAIN 29/6 or 2/6 down and 12 monthly payments of 2/10. (See astounding coil offer below.)

**WORLD ALL-WAVE S.G.4.** Employs one more S.G. audio stage than the 3-valve model and all extra components. Station-name scale. 4 valves given FREE. Astounding BARGAIN at 42/- cash or C.O.D., or 2/6 down and 12 monthly payments of 3/6. **COILS.** Complete set of 10 coils, 9-2,000 metres. List 27/6. N.T.S. BARGAIN, 17/6, or add 1/6 to World Kit deposit and to each monthly payment. N.T.S. SHORT-WAVE BOOK with full kit descriptions and data FREE.

● **CHASSIS BARGAINS:** Send now for new list containing many wonderful Radio offers. N.T.S. Terms are the Best on all AVO, GARRARD, TROPHY and other popular proprietary lines. Quotations by return.

**NEW TIMES SALES CO., 56 (P.W. 41), Ludgate Hill, London, E.C.4. Tel.: City 5516**

## VALVE HOLDERS



The CLIX valve-holder range covers patterns to accept all the recognised English and American valves including the Midget and Acorn types.

Specified for the

### EXPERIMENTAL A.C. AMPLIFIER

Type VI. Four 4-pin 8d. ea.  
Type VI. One 5-pin 9d. ea.

### External Speaker CONTROL PANEL

Controls both Internal and External speakers by slight angular movement of plug.

Also specified for the Experimental A.C. Amplifier



Complete as Illustrated

CLIX Radio and Electrical Catalogue. Post Free.

## CLIX

British Mechanical Productions Ltd., 79a, Rochester Row, London, S.W.1.

## THE POLYTECHNIC REGENT STREET, LONDON, W.1

### A SPECIAL COURSE OF FOUR LECTURES ON MODERN TELEVISION

will be given by

**H. J. BARTON-CHAPPLE, Wh.Sc., B.Sc., A.C.G.I., A.M.I.E.E.**

on Thursday evenings, 7.30-9.0, beginning 8th June, 1939

The lectures will be illustrated by experiments, lantern slides, and demonstrations on modern television receiving equipment, including the reception of the B.B.C. Television Service at 9 p.m., after each lecture.

**FEE FOR THE COURSE 6/-**

Syllabus on application to the Director of Education

# WHAT IS A BI-MORPH?

An Interesting Explanation of the Function of the Crystal Used for Pick-ups, Microphones and Loudspeakers

MANY constructors are aware that to-day special crystal mikes and similar components are used, and are apt to think that these employ similar crystals to those used in a simple crystal receiver. Actually, of course, this is far from correct, and special types of crystal have to be employed for reproduction purposes. The Brush Company of America,

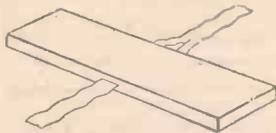


Fig. 1.—A typical bi-morph.

who specialise in the modern type of crystal unit, give a very interesting account of this crystal in a recent publication of theirs and the details will, undoubtedly, do much to clear up many of the points which have puzzled constructors in the past. If we take a Brush crystal unit and carefully remove the waterproof coating, we will have what appears to be a thin trapezoidal piece of crystal with electrodes on the outer faces. On close examination this will be seen to consist of two crystalline plates cemented face to face, probably (but not necessarily) with an electrode between them. The two plates appear to be identical but crystallographically are the exact opposite of each other with reference to the orientation of their electrical crystalline axes and the direction of electro-static stress when voltage is applied to the electrodes. The result of this is that when a voltage is applied, the plates expand or contract in opposite directions, and a bending or twisting motion results, depending upon the relation of the longitudinal dimensions of the plate with the other crystalline axes. Conversely, an applied bending or twisting motion will result in an electromotive force or charge on the surface. The fact that two plates of different form or orientation are used in the construction of the unit gives rise to the term "bi-morph," which is used as a general designation of this form of unit, whether the unit is of the bending or twisting type.

## How it Operates

To perceive readily the reasons for the advantages arising from this type of construction, it is necessary to review some fundamental experiments in piezo-electricity. In order to generate electricity by means of pressure we will take a block of Rochelle salt, say one inch wide, as in (1) Fig. 3. The A, B, and C axes are as shown and the "leads"  $V_1$  and  $V_2$  connected to an electro-static voltmeter (not shown). When the weight 3 is placed on the crystal block 1, the voltmeter will show a deflection. If the block and charge are short-circuited to bring the meter to zero and then the short is removed, the deflection will be equal and opposite when the weight is removed. The deflection will increase if the weight is increased and will be less for a lesser weight. If the electrodes on the blocks are connected in series at

$V_2$  with the electrostatic voltmeter connected to  $V_1$  and  $V_3$ , and the equal weights applied simultaneously, the deflection will be doubled. Since the faces connected at  $V_2$  must be of equal potential, the same result will be obtained if the blocks 1 and 2 are joined at the adjacent faces so as to form one block, and the weights 3-3 are joined and form one weight twice the mass of 3. The weight per square inch is the same as when one crystal block and weight were used, but the total weight has been doubled. It is thus evident that the piezo-electric effect is proportional to the total weight and independent of the weight per square inch when the dimension of the block is varied in a direction parallel to the "a" axis.

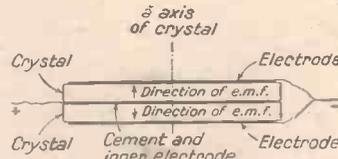


Fig. 2.—The construction of a bi-morph.

## Effects of Capacity

If we were well up in our piezo-electric theory, we would expect to get a voltage of about 14 volts per lb. In this we would be disappointed unless the external load,

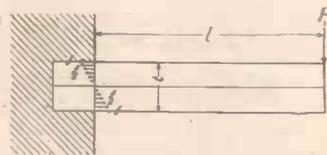


Fig. 4.—Forces present in a clamped bi-morph.

that is, the electrostatic voltmeter, had a capacity very much less than the capacity between the electrodes on the crystal portions and the leakage of the system was practically zero. The internal impedance of the block is inversely proportional to the capacity, and this capacity should be made as large as possible so as to make the internal impedance small, especially with reference to the connected load on the crystal. Moreover, the capacity and, therefore, the internal impedance vary with temperature so that when the above conditions are fulfilled, not only is the output of the crystal block increased, but the effect of temperature variations upon the output is minimised.

The most obvious way to increase the capacity is to make the crystal plate or block as thin as possible so that the distance between the electrodes will be as small as possible, and also to make the other dimensions of the plate as large as possible. Thus, the crystal plate tends to become very thin for its area. Any large force or weight applied edgewise tends to produce buckling and fracture, and so, since the piezo-electric effect is proportional to the total weight and not to the weight per square inch, we are not much better off than before, unless we can find some way to stress the crystal edgewise without buckling or breaking.

## Making a Bi-morph

One of the ways to accomplish this is to put two thin crystals (or a crystal and a thin piece of some other material as steel or bakelite) together face to face and cement or clamp them so that they will act as a unit when flexed and apply the force so as to bend the combination. If this is done with proper orientation of the axes, we have a bi-morph. In this way we

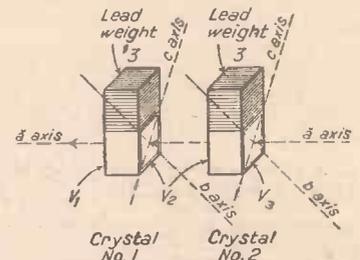


Fig. 3.—Diagram demonstrating that piezo-electric response is proportional to total weight.

accomplish several things at one time. First, the crystal plates are thin, reducing the distance between the electrodes and resulting in a large internal capacity and correspondingly low impedance. Second, the crystals are under constraint. It has been found experimentally that this reduces the temperature effect on the capacity and on the piezo-electric response. Third, the applied pressure is magnified by an amount directly proportional to the length and inversely as the thickness of the element.

This may be illustrated as follows: Consider a bi-morph as in Fig. 4 clamped at one end and having a force P applied at the other end. The length is l and the total thickness is t. The maximum bending moment is at the place where the bi-morph is clamped and is equal to Pl. The moment decreases uniformly to zero at the point P and the average value is Pl/2. The bending moment is balanced at any place along the bi-morph by a restoring couple acting about a line perpendicular to the neutral axis. The maximum restoring couple is at the point of support and is shown in Fig. 4. Here f is the maximum force and acts through a lever arm t/2, the resulting couple is ft/2. The couple decreases to zero at the neutral axis and increases to a maximum acting in the same sense on the other side of the neutral axis. The mean value of this couple for the top half is 1/3 x ft/2 or ft/6, and the sum of the couple on both sides of the neutral axis is ft/3. This may be equated and the result will show that the bi-morph construction has multiplied the pressure by 37 times and 12.5 times for the respective thicknesses.

## Mounting Difficulties

The mounting of a bi-morph is quite important, as it is desirable to permit as much as possible of the lateral curvature at right-angles to the direction of the bending. This is accomplished by using three flexible points of support arranged

(Continued on page 261.)

# The Latest in American Communication Receivers

Advance Details of a New Amateur Superhet released in the U.S.A.

BY McMURDO SILVER

THE new communication receiver to be described follows closely the designs described in the A.R.R.L. Handbook as the means of providing the maximum of results for the minimum of cost. It goes considerably beyond these earlier designs in that it includes a new noise limiter which is as effective as it is simple, covers the full range of five through 550 metres with sensitivity of about 1 microvolt absolute throughout, has the highest signal-to-noise ratio of any receiver the writer has ever operated, is completely free

book. Originally advocated, it is believed, by the writer in 1932-3 as the means in an I.F. amplifier of obtaining single-signal selectivity, its inclusion in first detector circuit also gives the high H.F. gain before frequency conversion so essential to good signal-to-noise ratio, as well as tremendously increasing effective image frequency selectivity. In this particular design the I.F. regeneration knob is no more critical than any variable selectivity control—actually simpler to operate than crystal filter controls—while H.F. regeneration once set need

attain such a quiet yet super-sensitive circuit.

This new set uses one 6K8 regenerative first detector-oscillator, one 7A7 "Loctal" regenerative I.F. amplifier, 7A7 audio-beat oscillator, 7A7 tuning meter V.T. volt meter valve, 6B8 second detector, A.V.C., first L.F. amplifier, and new noise limiter, 6V6 beam power output stage, 80 rectifier, and one VR150 automatic voltage regulator valve. Including A.C. power supply, it mounts on a chassis  $\frac{1}{8}$  in. thick for absolute mechanical rigidity which is only 15 $\frac{1}{2}$  in. long, 7 in. deep, and 3 $\frac{1}{2}$  in. high, with silver decorated black control panel, 17 in. by 9 $\frac{1}{2}$  in., on a grey enamel steel cabinet with hinged lid and removable back, 9 $\frac{1}{2}$  in. high, 17 $\frac{1}{2}$  in. long and 11 $\frac{1}{2}$  in. deep—with plenty of room behind the chassis to carry a six-volt battery power supply, dry L.T. and H.T. batteries for portable operation, or an improved form of the Diversity Coupler, which turns the "Silver-Super" into a full-fledged dual diversity receiver which substantially completely eliminates fading and its accompanying noise. The simplicity of parts layout, resulting in the extremely short and direct leads so essential to maximum efficiency, are clearly illustrated in Figs. 2 and 3.



Fig. 1.—The new receiver with separate speaker. Note the large tuning dial.

of "warm-up" drift, is both "portable" battery-operated, or "permanent" A.C. operated in the same unit, can be expanded into an anti-fading dual-diversity receiver at no increase in size, yet can be built by even a novice to use from three to eight valves with maximum complete chassis cost below \$50.00. Capable of being built from standard parts, it is also available as a completely assembled eight-valve kit, requiring only a couple of hours to wire and test. It can be aligned and tested without any service gear whatsoever, although a test oscillator makes the task most easy. When this receiver also has A.V.C., six low-C tuning bands, uses the newest all-glass "Loctal" valves, has nearly 22 ins. of effective dial length per band readable to one part in 5,000—which can be stretched to 11 ft. per band at slight extra cost—selectivity continuously variable from 12 kc/s "high-fidelity," right up to the sharper than 1 kc necessary to single-signal c.w. reception, 4.25 watts undistorted power output, and appearance and controllability, which are outstanding, even among very expensive communication receivers, it comes close to being the ideal. Yet this is what numerous amateurs, young and old, who have tested the new "Silver-Super" have found it to be.

### Regeneration

All of this is made possible through regeneration, amazingly neglected considering its tremendous benefits by factory-built receivers, yet recommended in every receiver described in the A.R.R.L. Hand-

never be touched again. Thus no criticism of possible complexity of operation in the bands of amateur or short-wave DX-er is justified, while the gains from the intelligent use of regeneration is amazing.

One particular advantage is the elimination of valves which regeneration makes possible. This reduces cost and power drain, but even more important, cuts circuit noise to a surprisingly low minimum. Actually, in the "Silver-Super," inherent noise is only 2 milliwatts at 1 microvolt absolute sensitivity. No greater recommendation is necessary, for in his experience of designing hundreds of receivers over nearly three decades, including sets used by Admiral Byrd at the South Pole, on two successive Arctic expeditions by Velin on the Bowdoin-Kent's Island Expedition, and the winner of the Grand Prize at the Paris International Exposition in 1937, the writer has never before been able to

### The Controls

Fig. 1 shows all of the controls essential to the fine communication receiver. At the centre is the 7 $\frac{1}{2}$  in. satin chromium dial, accurately calibrated for six wave-bands from 540 to 61,000 kc/s inclusive. It can be turned fast by its centre knob, or at 15 to 1 reduction by the round knob at its lower right—smooth, easy, and positive in drive and carefully located at just the right height for long periods of tuning without hand or wrist fatigue. The outer edge of

(Continued on next page)

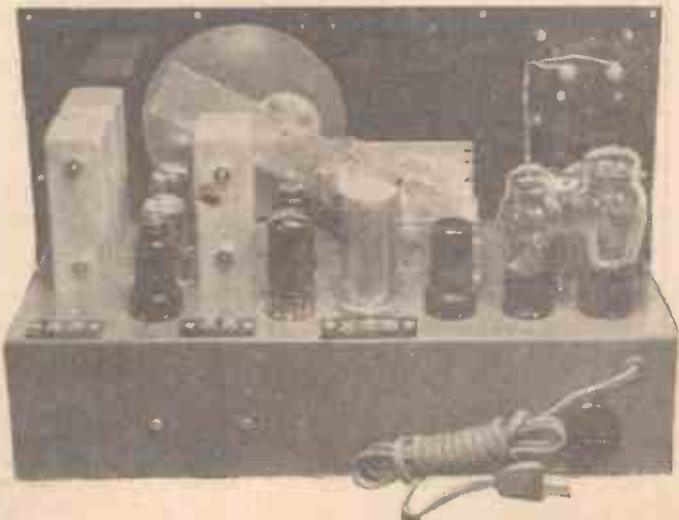


Fig. 2.—A neat chassis layout showing the geared driving for the band-setting dial.

## THE LATEST IN AMERICAN COMMUNICATION RECEIVERS

(Continued from previous page)

this dial carries 500 well-separated vernier divisions which, read with the 0-10 decimal indicator at the top of the close-spaced transparent anti-parallax dial indicator, gives a direct readability of one part in 5,000 over nearly 22 ins. of effective dial length per band. Where greater band-spread is desired, a simple 12 : 1 gear train can be slipped over the condenser shaft behind the panel, and projecting through a panel hole beneath the right centre of the main dial, carries an 0-200 degree, 4 in. band-spread dial which then "peeks out" at the upper right of the main dial to be read against a second decimal vernier indicator to give 11 ft. of dial length per band, with a readability of one part in 21,600.

At the lower left of the dial is the wave-change knob operating four separate insulated switches beneath the chassis. These have double-spaced contacts spread over a full 360 degrees to give short connecting lead lengths and the lowest possible inter-circuit capacity. H.F. and oscillator circuits are simultaneously switched, with all unused coils short-circuited to prevent dead-end or absorption losses, which can become very serious indeed at short wavelengths. The extreme high-frequency coils, where every 4 in. of lead length must be seriously guarded, are mounted right on the wave-change switches themselves, as are the oscillator high-frequency padding condensers which set dial calibration. These padding condensers are compression mica on ceramic bases, not air-trimmers. Through special secret processes, these particular condensers are actually as stable as good air-dielectric condensers, and of very low losses. H.F. coil sizes are such as to produce optimum Q versus shield proximity, and represent the sum total of experience gained in building millions of coils for many of America's largest radio manufacturers.

At the upper left of the panel is the calibrated S-meter, with below it the noise limiter knob, the extreme upper right knob being the beat oscillator pitch control. Along the bottom, left to right, are tone-control on-off switch, headphone jack, aerial trimmer, beat oscillator, on-off switch, wave-change switch, vernier-tuning, send-receive switch, L.F. volume control, A.V.C. on-off switch, and I.F. selectivity control. Attention is called to the aerial-trimmer knob—manual control of circuit tracking is provided in order to ensure the very best possible results, and to take no chances of different aerials upsetting circuit tracking—in line with recent sensible trends in this direction.

### Valve Combination

The receiver uses a 6K8 valve as detector-oscillator. Numerous tests of many different combinations of different valves, single and separate, showed the 6K8 to be definitely the best converter available to-day in terms of stable oscillator output right down to 5 metres, maximum conversion gain, and freedom for interaction between first detector and oscillator circuits. Regeneration independent of wavelength and permanently set upon installing the receiver is adjusted by a potentiometer connected to the feed-back condenser. Stable and permanent regeneration is secured in a manner new to receivers. An H.F. choke in the plate-return lead provides H.F. voltage, which is fed back from the arm of the potentiometer shunting the choke to the grid circuit A.V.C. return through the feed-back condenser. At first this may appear inoperative, but consideration of the capacity ratios of the condensers should

make it clear that regenerative feed-back does occur. Tuning condenser capacity is, 140, mfd.—amply low for maximum gain and far lower than is found in most all-wave or even communication receivers. High-impedance aerial primaries prevent differences in aerials upsetting regeneration or circuit tracking, but no chance is taken with hard-to-get signals and the trimmer is made manually variable.

### Permeability Tuning

The I.F. amplifier uses two permeability tuned, high-quality I.F. transformers. These are the most stable types known to-day, for their tuning capacities cannot vary—being "Silvercones," in which silver is directly plated on to mica, so that capacity cannot change. They are really fixed condensers, with tuning effected by micrometric adjustment of powdered H.F. iron cores inside each I.F. coil. These two transformers represent much research and experiment to allow them to be regenerated without any frequency shift. Ordinary 455 kc/s transformers used in a regenerative I.F. amplifier will show up to 10 kc/s frequency shift for different degrees of regeneration, and this is, of course, highly undesirable, if not intolerable. Careful adjustment of coupling and stray capacities

hardly-needed high gain, as to provide the simplest noise limiter imaginable. Varying the screen voltage on a pentode controls its plate current—in effect, controls its "saturation" or the strength of the signal it can handle. This characteristic allows noise louder than signal to be held down to no louder than signal by variation of screen voltage. This can be done automatically, which does not give most satisfactory results in operation, for then the system becomes a true "hole-puncher," silencing reception when noise appears. So operated, such automatic silencer is so effective that loud noise will actually shut off reception during its duration. A manual control is obviously more desirable, and so is provided. By permitting noise to be held down to signal volume, it gives the impression of having almost completely eliminated noise so great is its seeming reduction. This noise limiter is equally effective on all types of noise, at all wavelengths, and is so effective as it is simple.

A 7A7 fed from the audio-diode load resistor to operate the S-meter ensures maximum S-meter sensitivity on weak signals. L.F. gain control is in the 6B8 grid circuit, with tone control and headphone jack in its plate circuit, which is followed by a 6V6 beam-power output valve

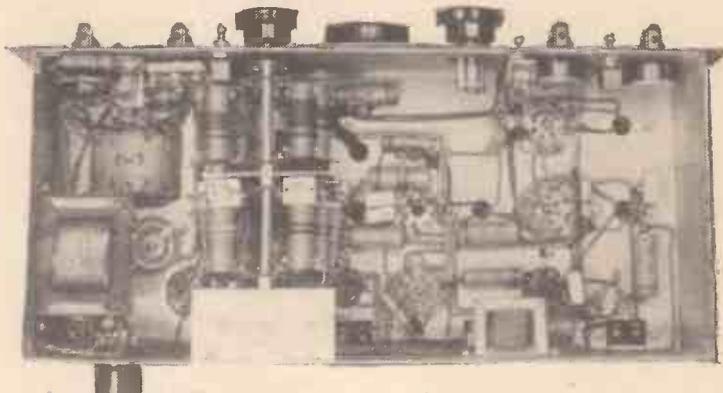


Fig. 3—Under-side of chassis showing the coil assembly.

results in the "Silver-Super" showing no measurable frequency shift at any degree of regeneration. The I.F. valve is the new 7A7, all-glass "Loctal" type. In this new valve element leads enter a flat base or stem, instead of running up through the usual 1½ in. long stem tube, and so providing harmful capacity and inductance. Having no moulded bakelite base, but rather contact pins set directly in the glass itself, base losses are a thing of the past. A small metal socket aligning-cap shields the base so that both grid and plate leads come out at the same end—the new "single-ended" type of H.F. pentode construction. Gain is higher than for the older 6K7, for the "Loctal" idea makes real sense in the tube design. A second 7A7 is the beat oscillator, coupled to the second detector by capacity provided through judicious parts placement, and tuned from the front panel by a knob controlling its powdered iron core so as to permit optimum choice of beat note for single-signal selectivity, zero beating for broadcast reception, or different beat-note pitches to reduce heterodyne interference—which is noticeably absent due to the extreme selectivity possible. I.F. regeneration is through cathode bias with feed-back through slightly augmented grid-plate capacity of the 7A7 I.F. amplifier.

The diode second detector and A.V.C. of the 6B8 is essentially conventional with optimum values chosen, and switch provided to cut out A.V.C. without effecting detector action when desired, as for code reception. The pentode of the 6B8 is used for first L.F. stage—not so much for its

for loudspeaker operation—and this set will "rattle the speaker" on almost any signal that can be heard, so sensitive and powerful is it. Power supply is essentially conventional, with chassis-mounted power transformer of ample size for good heat radiation, large, very high effective inductance-filter choke and plenty of sealed-in-metal-can dry electrolytic capacity of generous voltage rating for extreme safety. Sockets are provided for one VR150 automatic voltage regulator valve for the user who desired the frequency stability usually associated only with the fine frequency meter, but seldom with receivers. This valve is essential, but a distinctly worthwhile refinement.

In line with attaining extreme stability, the send-receive switch is used in a new way. Instead of breaking only one or two plate circuits to mute the receiver during transmission the S-R switch cuts the entire H.T. supply to all valves, including power to the filter. Thus, the operator desiring a taste of real receiver frequency stability for a change may leave the on-off switch on all the time—or turn it on in the morning before an evening of operation—so that valves and set will have reached stable temperature and there just won't be any frequency drift.

## NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

5/-, or 5/6 by post from

GEORGE NEWNES, 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.)

## Station YM4AZ

SIR,—I have recently received a letter from YM4AZ in which he states that he wants reports from S.W.L.s in Great Britain and wishes to QSO with G stations on 14 mc/s C.W. Will QSL contacts and reports 100 per cent. Also foto for foto. QRA: Ulrich Kühl, Mackensen-Aflee 46, Zoppot, Danzig.—PAUL W. GIFFORD (Bournemouth).

## A Car-radio Set!

SIR,—I have been a regular reader of your valuable publication PRACTICAL AND AMATEUR WIRELESS for two years, and I have found it very interesting and useful.

During this time I have seen in it many references to car-radio systems, but I have never seen an actual car-radio set described in your pages. I am sure many of your readers who enjoy the benefits of radio and motoring, would appreciate a set of this type. It need only be a three or four valver, but it should incorporate built-in suppressors, and, if possible, run entirely from the 6- or 12-volt car battery. If this is not possible it would be permissible to install a separate high-tension supply.

The set could be run from a roof aerial, and could be installed under the instrument panel, with extension controls.—W. G. R. BOWDEN (Bromsgrove).

[What do others think of this suggestion? —Ed.]

## A 20-m. Log from Southport: Correspondent Wanted

SIR,—I enclose a log of stations received on 20 m. which I trust may be of interest to other readers.

The following have been received during the past two weeks, 10.55 p.m. to 11.30 p.m.: Cuban, CO6OM, best heard; other Cubans: 8RQ, 2GY; Ws: W4BML, 1BLO, 1BUZ, 5FIY, 2JHJ, 1HKK, 1AXA, YR5AA, YN3BG; VO1Y, KA1FH, KA1LB; ZL2BE, ZS5BZ, and J2MI.

I shall be glad to get in touch with any other reader residing in U.S.A. or Australia who would like to correspond with me on S.W.L.—ERIC A. WRIGHT (Alton House, 25, Mill Lane, Southport.)

## "Audible Radiations"

SIR,—While not disputing A. Robinson's statement regarding his crystal set, I would like to point out that G. J. D. stated three stations were, at times, heard simultaneously. This does not sound to me like inductance from a bi-programme relay service.

Has G. J. D. tried his amplifier with the pick-up detached, as I still hold my theory?—E. YALDEN (London).

## A 14 mc/s Log from Balham

SIR,—I enclose a list of stations heard here during the past month. The receiver I use is a simple 0-v-2, built from articles given in the Short-wave Section

of PRACTICAL AND AMATEUR WIRELESS from time to time. My aerial is a 40ft. wire pointing due west at the free end. With this particular aerial I can receive the six continents under normal conditions on 14 mc/s. Operation on the short-wave bands is rather difficult, owing to the large number of local amateurs. I should say there are about twenty-five within a radius of three miles, the nearest only a few doors away! Having often heard squeals from a detector-L.F. type of set nearby, I think there is another S.W.L. not far away, and I would be very pleased if he would call to see me at the address given below on any week-day evening.

On 14 mc/s:  
VS7RA, VU2FA, VU2LJ, VE3QL, LL; VQ2CM; VK4PF, JP, 3KX, 3HG, 3DG, 5RN, 2AGJ, 2ADE; VP3CO, VP6FP, 6YV, VP9G.

CE3AT; CO6OM, 7AS, 7CX, 8BC, 2WM; CX2CO; HH2B, HI3N, HR5C; K4FSP, FAY, DSE, EBF; K6NYD, KA3KK; LU5CZ, 3DF; PY2BH, 2DA, 2DV, 2MI, 2BA, 1MS, 6AG; T11AF; UK3AH; YV4AE, 5ABQ; ZETJH, JR; ZS5Q, 6EO; ZC6HS; W6GRL; W7ESK.—DONALD CLAPP (136, Cavendish Road, Balham, London, S.W.12).

## CUT THIS OUT EACH WEEK

# Do you know

- THAT cathode-ray tubes for television purposes may be obtained with different coloured screens.
- THAT three Class B valves may be used in a three-stage transmitter.
- THAT the H.T. positive feed from an A.C. mains transformer need not be taken from a centre-tap on the heater winding of the rectifier valve.
- THAT in an A.C./D.C. receiver the heaters are wired in series, but some care is necessary in arranging the order of the valves.
- THAT for band-pass tuners there are several forms of coupling—link, capacity, resistance, or a combination of these.
- THAT pilot lights in a Universal mains receiver should preferably be wired in the heater line.

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.

## Back Numbers of "Practical and Amateur Wireless"

SIR,—I have just come across about four years issues of PRACTICAL AND AMATEUR WIRELESS starting from No. 1, and in good condition. If any of your readers would like these and could pick them up, I should be pleased to hand them over.—S. COSGROVE (99, Drayton Bridge Road, Hanwell, W.7 (near West Ealing).

## Our Handbooks

SIR,—Many thanks for publishing my letter, asking for a correspondent, in your May 13th issue. Apart from reading your paper, I also read your excellent books. At present I have "Wireless Transmission for Amateurs," "Sixty Tested Wireless Circuits," "Wireless Coils, Chokes and Transformers, and How to Make Them," and lastly, "The Television and Short-Wave Handbook." I hope to get more of your fine books in the near future.—ALEXANDER BERGOL (Erdington).

## Those Crooners Again!

SIR,—I read with amusement J. H. Laughton's contribution to "What I Would Do With Crooners," particularly the sentence suggesting sending them to the opera and "proms." Is Mr. Laughton aware of the fact that over 90 per cent. of jazz musicians and crooners are ardent admirers of classical music? Surely, the discussion is not upon the type of music, but upon the way in which it is rendered? Thereby Mr. Laughton misses the point of the debate. A famous boxer is also a crooner, which makes me sincerely hope that he will meet this "degenerate" in the street when perhaps he will carry out the threats which he has so far only set down on paper. At all events, if Thermion and his friends are so strongly opposed to crooners the most obvious way of satisfying themselves is to tune into another station, as even they have not the power to influence the B.B.C. programmes.—F. E. ROSE (2FHV) (Raynes Park).

## WHAT IS A BI-MORPH?

(Continued from page 258)

in the form of a triangle with the apex towards the point of application of the force. This makes for faithful transformation of mechanical impulses into electrical energy but further complicates the pre-determination of the voltage to be expected from an applied bending pressure since the actual length  $l$  is then somewhat in doubt. The simplified treatment above given, however, shows how a bi-morph acts and illustrates the "why" of the advantages obtained by this construction.

Thus far the only case considered has been that where a force is applied to produce a bending movement. The converse case where an electromotive force is applied to the crystal to produce mechanical force or motion is entirely analogous, but space limitations prohibit a detailed description. The same relationships hold in the case of the torque bi-morphs, which can be analysed as two bending components having their line of flexure at an angle and acting in opposite directions. In general the bi-morph construction results in a more efficient use of the crystal—more electromotive force is available from a given applied force and more motion from a given electromotive force. The use of thin crystalline plates is made possible and temperature effects are so minimised as to be negligible when the output of the bi-morph is impressed upon a network of suitable impedance.

# 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.

## SLOUGH AND DISTRICT SHORT-WAVE CLUB

Headquarters: 35, High Street, Slough, Bucks.  
Meetings: Alternate Thursdays at 7.30 p.m.  
Sec.: Mr. K. A. Sly, 16, Buckland Avenue, Slough.

At the last meeting, held on May 11th, the main item of interest was a demonstration, by a member, of "High-Voltage Electrical Phenomena." The members were enthralled throughout the demonstration, and especially surprised to find that a comparatively large high-frequency current could be taken through the body without any shock being experienced. The technical explanation was that the high-frequency currents travel along the surface, and thus do not affect the nerves.

Some excellent practice was given to the slow morse class by three of our transmitting members, G6PE, G3GZ, and 2DDG. The club receiver proceeds apace under the direction of 2BWV; it should soon be ready for its preliminary tests.

Three of our members have enlisted in the Territorial Army, and among them Mr. R. J. Sly, who has therefore been forced to resign from his position as secretary, since he must necessarily be absent during a considerable part of the meeting, in order to attend drills. Mr. K. A. Sly (2FAU) volunteered to take over his brother's duties.

The next meeting will be held on Thursday, May 25th. New members are welcomed at any of our meetings.

The annual subscription is 2s. 6d., with an additional 3d. per meeting to cover the cost of hiring the club-room.

## DOLLIS HILL RADIO COMMUNICATION SOCIETY

Headquarters: Brantcroft School, Warren Road, N.W.2.

Hon. Sec.: E. Eldridge, 79, Oxgate Gardens, Cricklewood, N.W.2.

On April 11th a junk sale was held. Mr. Ash (G6OV) gave a talk on rendering first-aid in cases of electric shock on April 25th. This was of particular interest to our transmitting members. At the last meeting, May 9th, G8PI gave an interesting talk on the frequency control of amateur transmitters, in which the various causes of frequency shift were dealt with. Meetings are held on alternate Tuesdays at 8 p.m., and any readers of PRACTICAL AND AMATEUR WIRELESS are welcome.

## THE TUFNELL PARK RADIO CLUB

Headquarters: 33, Pemberton Terrace, N.19.

Hon. Sec.: J. G. Wright, 78, Gladsmuir Road, Highgate, London, N.19.

On Friday evening, May 5th, Mr. King gave a very enlightening talk on a well-known make of commercial superhet, and explained the circuit used; he also demonstrated how C.W. could be obtained.

On Tuesday evening, the 9th, an ultra-short wave converter was brought along and demonstrated by a member. A morse class is being held twice weekly.

Syllabus of talks to be given by members:—

Friday, May 26th, 9.30-10.15: "Reception of Wireless Waves."

Friday, June 2nd, 9.30-10.15: "Short-wave and Anti-interference Aerials."

Friday, June 9th, 9.30-10.15: "The Amateur Bands."

Friday, June 16th, 9.30-10.15: "Valves for Short-wave Working."

Friday, June 23rd, 9.30-10.15: "The Interpretation of Meter Readings."

Friday, June 30th, 9.30-10.15: "Learning the Morse Code, Hints and Tips."

Anybody interested is cordially invited.

## ROMFORD AND DISTRICT AMATEUR RADIO SOCIETY

Headquarters: Red Triangle Club, North Street, Romford, Essex.

Hon. Sec.: Rowland C. B. Beardow, 3, Geneva Gardens, Chadwell Heath, Essex.

At the test field day, held on April 15th, Brentwood ran in six minutes ahead of our first car. Southend entered unofficially, and seemed to know all the art of D.F. We have a very active year ahead, and the next joint day is organised by Southend, and it remains to be seen how we progress. A successful junk sale was held during the month and Dr. Bosch, of Vacuum-Science Products, Ltd., supplied us with very interesting information, which was greatly appreciated. The club amplifier was put to a good use at the National Service Rally at Maylands Aerodrome.

## EASTBOURNE AND DISTRICT RADIO SOCIETY

Hon. Sec.: T. G. R. Dowsett, 48, Grove Road, Eastbourne, Sussex.

On Tuesday, April 25th, Mr. J. A. Penfold gave a lecture entitled "The Short-wave Superhet." First of all he explained the theory of tuned circuits and the various factors which govern the efficiency; con-

tinuing, he explained the effect of connecting a valve to a circuit and how, as the frequency of the received signal increases the damping caused by the following valve increases considerably. He mentioned that valves have now been brought out which reduce this damping to a very large extent. Different oscillator circuits were also dealt with. Lastly, he told of some of his personal experiences with the superhet, which included some unusual occurrences.

## KILMARNOCK AND DISTRICT SHORT-WAVE SOCIETY

Headquarters: Wardneuk Receiving Station, Glasgow Road.

Secretary: Robert Mitchell (2FSU), 151, Bonnington Road, Kilmarnock.

A LECTURE was given on April 30th by Mr. A. Chaplin (GM3NK), of Glasgow, entitled "Electron-Coupled Oscillator and Signal Shifter," which the members found very instructive. The society's president, GM3PB, has started a course of lectures, one of which will be given every Thursday night; the lectures will cover from the fundamentals right up to the full theory of radio reception and transmission.

## THE MAIDSTONE AMATEUR RADIO SOCIETY

Headquarters: The Clubroom, 244, Upper Faut Road, Maidstone, Kent.

Hon. Sec.: P. M. S. Hedgeland, "Hill View," 8, Hayle Road, Maidstone, Kent.

A PARTY of eighteen members spent an extremely enjoyable evening on May 10th at the Medway Amateur Transmitters Society's "Ham Feast."

A questionnaire, comprising thirty-two questions, has recently been sent out to all the members, and when all copies have been returned the results will be analysed, and used for the guidance of the committee.

The president, Mr. S. A. G. Cook (G5XB) will be operating his portable station on Saturday-Sunday, June 3rd-4th, as an unofficial N.F.D. station, members of the M.A.R.S. co-operating with him. A direction-finding field day will be held in the vicinity of Maidstone on Sunday, June 18th. Members are constructing their own receivers under the guidance of G5XB, and a small prize will be awarded to the members finding the transmitter first. The transmitter will be operating on the 100-metre band. Anyone interested in either of these events is invited to get in touch with the hon. secretary.

The club receiver, an eight-valve communications superhet, is now under test, and it is hoped that it will be in operation in the clubroom within a week or two.

The club membership now includes two full calls, and eight A.A. calls. New members are always welcome, and should either come along to the Tuesday evening meetings, or get in touch with the hon. secretary at the address given above.

## THE MEDWAY AMATEUR TRANSMITTERS SOCIETY

Headquarters: Naval Wives' Club Hall, Dock Road, Chatham.

Meetings: Tuesdays, 8.15 p.m.

Hon. Asst. Sec.: R. Nicholson, 8, Pine Road, Strood, Rochester, Kent.

THE "Ham Feast," held on May 10th, was attended by radio amateurs from many parts of Kent, and proved very successful. G2IG's talk on television was most interesting, whilst G6WY held the attention of those present for a considerable time with his words of wisdom on the use (and mis-use) of the amateur bands. A re-arrangement of the weekly meetings has resulted in much more time being available for morse code training, technical instruction, etc. The transmitter is now complete, and it is hoped that the society's radiating licence will be granted very soon so that its capabilities can be tested over the air.

## ASHTON AND DISTRICT AMATEUR RADIO SOCIETY

Headquarters: Commercial Hotel, Old Street, Ashton-under-Lyne.

Meetings: Alternate Wednesdays.

Secretary: K. Gooding (G3PM), 7, Broadbent Avenue, Ashton-under-Lyne.

MEMBERS are hoping to fix matters up with regard to the new club-room very shortly, when a transmitting permit will be applied for, and suitable short-wave gear installed. G3BY has obtained permission to work portable on 56 mc/s during the summer. The members intend to take part in the 56 mc/s field day on July 9th, using G3BY'S Tx, consisting of GJ5 C.O. and 6V6 F.D., operating on a frequency of 59,212 kc/s. G3BY is at the moment experimenting with a W8JK antenna, and would welcome reports.

## SALE AND DISTRICT RADIO SOCIETY

Meetings: Weekly, on Thursday evenings, at St. Mary's School, Banker's Lane, Sale, near Manchester.

Secretary: S. C. O. Allen, 2FCQ, 31, Emmerdale Drive, Ashton-on-Mersey, Sale.

At the weekly meeting of the society it was reported that a reply had been received from Sir Edward Grieg, Member of Parliament for the Altrincham Division of Cheshire, following the recent resolution calling for a television station for the North. Sir Edward wrote: "I will gladly give all the support I can to this proposal."

Some time was given to discussing technical problems suggested by members, and morse tuition was given. It was decided to obtain a copy of the Call-book for the use of members.

## Flashes from Around the Globe

### Our Oldest Colony Calls

VOFB, St. John's (Newfoundland) would appear to be testing on two channels, namely, 24.37 m. (12.31 mc/s), and 31.15 m. (9.63 mc/s). The power of the station is 500 watts. Reception of signals on the lower wavelength has already been reported by readers.

### Guatemala City Logged Again

LISTENING on the 30-metre band between B.S.T. 04.00-05.00 recently, some excellent signals were secured from TGWA, Guatemala City, on 30.98 m. (9.685 mc/s). The call was: *Broadcasting Nacional, La Voz de Guatemala*, and the military band concert was relayed from the main park in the capital. Local time is 7 hours behind B.S.T., the distance from London being approximately 5,300 miles.

### The Temple Bells are Ringing

XYO, Mingalodon, calling Radio Burma on 49.94 m. (6.007 mc/s) with a power of 1.2 kilowatts, is on the ether daily from B.S.T. 14.00-17.40, with a news bulletin in the English language at 16.15. Reports should be addressed to Station XYO, Burma P.T.T. Department, Central Telegraph Office, Rangoon (Burma).

### Further Experimental Broadcasts from Hungary

IN addition to test transmissions emanating from HAAQ2, Budapest, on 25.32 m. (11.85 mc/s), recently reported in these notes, the station is also trying out another channel, namely, 41.5 m. (7.228 mc/s) in the early hours of the morning.

## TELEVISION LECTURES

A SPECIAL course of four lectures on Television will be given by Mr. H. J. Barton-Chapple, B.Sc. (Hon., Lond.), etc., on Thursdays (7.30 to 9 p.m.), commencing June 8th, 1939, at the Polytechnic, Regent Street, London, W.1.

Syllabus:—

Lecture I. June 8th.—General principles. The modern electron camera. Studio and O.B. transmission technique. Electronic multiplication. Cable and radio links. Terminology.

Lecture II. June 15th.—Ultra-short waves. Questions of service range. Types of aerials and feeders. The cathode-ray tube. The time base generator.

Lecture III. June 22nd.—Focusing. Synchronising. Vision and sound chassis. Typical receiver arrangements. Circuit analysis.

Lecture IV. June 29th.—Fault location. Symptoms and cure. Installation and service problems. Cathode-ray tube projection. Big screen developments.

The lectures will be illustrated by experiments, lantern slides and demonstrations on modern television receiving equipment, including the reception of the B.B.C. Television Service at 9 p.m. It is hoped that a demonstration of big screen projection will be possible.

The fee for the course is 6s.

**The CYCLIST - - 2d.**

Every Wednesday.



# QUERIES and ENQUIRIES

## Making Resistance Element

"I have some carbon sticks ground to powder and want to renew the carbon paper in my volume and tone control as I can't get carbon paper. How do you get the powder carbon to stay on paper? What sort of paper is used? How do you tell how many ohms are needed?"—H. N. (Belfast).

FIRSTLY, it may be difficult for you to attach the carbon powder to ordinary paper, and if an adhesive is used the particles will undoubtedly be insulated from each other and a very unsatisfactory control will result. The usual procedure is to rub a soft lead pencil on the paper, and if your carbon is ground fine enough you could rub it into the paper with a piece of rag. To know what resistance is needed you must first find the value of your original component and the new element will obviously have to be measured on a resistance meter in order to ascertain its value. We would point out, however, that you will probably find it impossible to obtain the original value by the means you outline as special elements are generally employed and you may be unable to obtain the necessary high resistance with ordinary carbon powder. It would be preferable to buy a new control.

## Contrast Expander and Tone Control

"I read with much interest the article on the combined contrast expander and tone control and I am wondering if you would consent to make a modification to suit my own particular needs. My wireless set has a very efficient tone control for bass and treble and therefore I should like to build the expander only and so cut part of the cost. If you are willing to supply a diagram I will remit for same."—R. T. S. (Diss, Norfolk).

IT would be possible to cut out the tone-control section and thereby save expense. The H.T. current taken by the tone-control valve is quite small and therefore no alteration to the rectifier or smoothing circuits would be needed. The heater circuit would have to be provided with a shunt resistor to avoid undue voltage rise on the remaining valves, and a value of 2 ohms should be used. The second switch, volume control and the tone controls will be omitted and the output sockets will be joined to earth and to the lower left-hand contact on the left-hand switch in the theoretical circuit in the issue in question. If you wish to omit the switch then the lead from the junction of the .1 mfd. condenser and 1 megohm lead connected to the second grid should be taken to the output socket, the input socket being joined direct to the .1 megohm resistance, connected to the first valve.

## Wind-charger

"In May 6th issue you described a wind-charger which I am interested in, but you did not say what kind of wood was used in the propeller. I have made one myself and used ash, 6ft. long, and I believe that it is too heavy and that it will warp in the summer."—J. F. R. (Deuglin).

ASH should be quite suitable, or any similar hard wood. To avoid the effects of the weather you can give it a good coat of coach-varnish, dressing the propeller annually. The weight should be of no account, provided the propeller is properly balanced, and this process should be carried out on a work-bench before mounting on the generator. The best wood for the varying weather conditions is Douglas Fir, if you can obtain this.

### 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 queists.

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.

## Gramophone Motor Speed

"I have a synchronous gramophone motor and turntable of the one-hole fixing type and this runs at a definite speed without any speed control. Is there any way in which I could fit a speed regulator to this so that I can run records at various speeds, or must it be left as it is?"—L. E. R. (Highbury).

THE type of motor in question runs at a speed dependent upon the frequency of the supply and the number of teeth on rotor and stator. Accordingly the only way of modifying the speed is to modify the frequency of the supply or the number of teeth—both of which are impracticable. Although you could fit up a friction brake to operate against the edge of the turntable this is inadvisable as it will cause the motor to heat up and you may burn out the windings. By using a friction device when starting the turntable you can, however, make the rotor turn at exactly half speed and keep in step at that speed, but other speeds are out of the question.

## Using a Pentode

"I have a circuit showing a power valve in the output stage. Could I use a pentode instead and, if so, where does the extra connection go?"—A. R. B. (S.W.11).

IN most circuits it is quite possible to change a power and pentode valve positions, but there are two points which need attention. A pentode will not handle the same input as a power valve and therefore if there is more than one L.F. stage preceding the output stage you may experience distortion due to overloading. Secondly, the speaker used may not be

provided with a transformer suitable for providing correct matching for the higher impedance of the pentode and again the maximum performance would not be obtained unless this were possible. In other respects the valve may be used, and the extra connection (which is the suppressor grid) is taken to H.T. positive.

## Extension Speaker

"I have been trying to use an extension speaker with my set, but I get a shock when I connect the extra leads and the volume is lost. What is the best way of making the connection, so that I can use either one speaker or the other without shocks, and to get the correct volume?"—R. S. (W.4).

THE extension speaker should preferably be of the low-resistance type, having the same resistance as the speech coil of the existing speaker. You can then use one of the Clix L.S. control panels and wire both speech coils as shown in the diagram accompanying the article on an Experimental Amplifier in this issue. By this means you can obtain correct matching with either speaker, and the volume will not suffer unduly when both are used together.

## S.S. One-valver

"I have made this simple receiver but whilst I am fully satisfied with the performance on the medium waves I find that when tuned to long waves I can hear the London Regional in the background. Is this due to my locality or is there something wrong with the set?"—L. F. (Hendon).

OWING to the simple coil circuit it may be found in some districts that a medium-wave station will break through and interfere with reception when the set is tuned to the long waves. If this is experienced, the following arrangement will overcome the trouble. On a small coil former having an internal diameter of 1in., and fitted with cheeks of 1½in. diameter, wind 200 turns of the same wire as that used for the reaction coil. The completed coil should then be joined between the aerial and the tuning coil when it is desired to receive the long-wave transmissions. On medium waves it is not required and should be removed or short-circuited.

## 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.

A. G. (Stornoway). There are various methods, the most common being to use an inverting circuit, the message being passed through an opposite type of circuit at the other end to make it intelligible. We would not recommend the crystal sets in your case.

J. H. W. (Mr. Bolton). You have probably shortened the wiring and when buttons are out the coil length is reduced in some way.

D. H. T. G.-L. (Merton Abbot). We cannot supply diagrams to individual requirements.

H. K. (Dorchester). The detector may be obtained from The Jewel Pen Company, of Great Sutton Street, London; any standard dual-range coil may be used, and the clip may be obtained from Bulgin or any good radio dealer.

B. J. B. (Tankerton). We have no details of the G.E.C. set and accordingly are unable to suggest how to substitute the coils. The wire sample was 26 D.C.C.

W. S. (Cambridge). The type of coil referred to is the original two-pin plug-in type.

W. S. (Dublin). All of the points raised by you have been fully dealt with in various issues. Your points cannot be dealt with in a brief reply, but on receipt of a stamped envelope we will answer your difficulties.

P. A. T. (Mall Green). The trouble may be due merely to interaction between components and leads, and not to ineffective smoothing.

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

# Practical and Amateur Wireless BLUEPRINT SERVICE

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.

## PRACTICAL WIRELESS No. of CRYSTAL SETS. Date of Issue. Blueprint

Sixty Blueprints, 6d. each.  
1937 Crystal Receiver .. PW71  
The "Junior" Crystal Set .. 27.8.38 PW91

### STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.  
All-Wave Unipen (Pentode) .. PW31A  
Beginners' One-Valver .. 10.2.38 PW85  
The "Pyramid" One-valver (HF Pen) .. 27.8.38 PW93  
Two-valve : Blueprints, 1s. each.  
Four-range SuperMag Two(D, Pen) .. PW36B  
The Signet Two (D & LF) .. 24.0.33 PW76  
Three-valve : Blueprints, 1s. each.  
The Long-range Express Three (SG, D, Pen) .. 24.4.37 PW2  
Selectone Battery Three (D, 2 LF Trans) .. PW10  
Sixty Shilling Three (D, 2 LF RC & Trans) .. PW34A  
Leader Three (SG, D, Pow) .. 22.5.37 PW35  
Summit Three (HF Pen, D, Pen) All Pentode Three (HF Pen, D (Pen), Pen) .. 20.5.37 PW39  
Hall-mark Three (SG, D, Pow) .. 12.6.37 PW41  
Hall-mark Cadet (D, LF, Pen (RC)) .. 16.3.35 PW48  
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) .. 13.4.35 PW49  
Genet Midget (D, 2 LF Trans) .. June '35 PM1  
Cameo Midget Three (D, 2 LF Trans) .. 8.6.35 PW51

1936 Sonotone Three-Four (HF Pen, HF Pen, Westcopter, Pen) Battery All-Wave Three (D, 2 LF RC) .. PW53  
The Monitor (HF Pen, D, Pen) .. PW55  
The Tutor Three (HF Pen, D, Pen) The Centaur Three (SG, D, P) .. 21.3.33 PW02  
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) .. 31.10.36 PW69  
The "Colt" All-Wave Three (D 2 LF RC & Trans) .. 18.2.30 PW72  
The "Rapide" Straight 3 (D, 2 LF RC & Trans) .. 4.12.37 PW82  
F. J. Camm's Oracle All-Wave Three (HF, Det., Pen) .. 28.8.37 PW78  
1938 "Triband" All-Wave Three (HF Pen, D, Pen) .. 22.1.38 PW84  
F. J. Camm's "Sprito" Three (HF Pen, D, Det) .. 26.3.38 PW87  
The "Hurricane" All-Wave Three (SG, D (Pen), Pen) .. 30.4.38 PW89  
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet) .. 3.9.38 PW92

Four-valve : Blueprints, 1s. each.  
Sonotone Four (SG, D, LF, P) .. 1.5.37 PW4  
Fury Four (2 SG, D, Pen) .. 8.5.37 PW11  
Beta Universal Four (SG, D, LF, Cl. B) .. PW17  
Nucleon Class B Four (SG, D (SG), LF, Cl. B) .. 6.1.34 PW31B  
Fury Four Super (SG, SG, D, Pen) Battery Hall-Mark 4 (HF Pen, D, Push-Pull) .. PW46  
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) .. 20.9.36 PW67  
All-Wave "Corona" 4 (HF Pen, D, LF, Pow) .. 9.10.37 PW79  
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B) .. 12.2.39 PW83  
The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC)) .. 3.9.38 PW90

Mains Operated.  
Two-valve : Blueprints, 1s. each.  
A.C. Twin (D (Pen), Pen) .. PW13  
A.C.-D.C. Two (SG, Pow) .. PW31  
Selectone A.C. Radiogram Two (D, Pow) .. PW19

Three-valve : Blueprints, 1s. each.  
Double-Diode-Triode Three (HF Pen, DDT, Pen) .. PW23  
D.C. Ace (SG, D, Pen) .. PW25  
A.C. Three (SG, D, Pen) .. PW29  
A.C. Leader (HF Pen, D, Pow) .. 7.1.39 PW35C  
D.C. Premier (HF Pen, D, Pen) .. 31.3.34 PW35A  
Ubique (HF Pen, D (Pen), Pen) .. 28.7.31 PW30A  
Armada Mains Three (HF Pen, D, Pen) .. PW33

F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) All-Wave "A.C. Three (D, 2 LF RC) .. PW51  
A.C. 1938 Sonotone (HF Pen, HF Pen, Westcopter, Pen) .. PW56  
Mains Record All-Wave 3 (HF Pen, D, Pen) .. 5.12.36 PW70  
All-World Ace (HF Pen, D, Pen) Four-valve : Blueprints, 1s. each.  
A.C. Fury Four (SG, SG, D, Pen) A.C. Fury Four Super (SG, SG, D, Pen) .. PW34D  
A.C. Hall-Mark (HF Pen, D, Push-Pull) .. 24.7.37 PW45  
Universal Hall-Mark (HF Pen, D, Push-Pull) .. 9.2.35 PW47  
A.C. All-Wave Corona Four .. 6.11.37 PW81

SUPERHETS.  
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 "Vitesse" All-Waver (5-valver) .. 27.2.37 PW75

Mains Sets : Blueprints, 1s. each.  
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 PW59  
F. J. Camm's Universal £4 Superhet 4 .. PW60  
"Qualitone" Universal Four .. 16.1.37 PW73  
Four-valve : Double-sided Blueprint, 1s. 6d.  
Push-Button 4, Battery Model .. 22.10.33 PW95  
Push-Button 4, A.C. Mains Model .. 22.10.33 PW95

SHORT-WAVE SETS.  
One-valve : Blueprint, 1s.  
Simple S.W. One-valver .. 9.4.38 PW98  
Two-valve : Blueprints, 1s. each.  
Midget Short-wave Two (D, Pen) .. PW38A  
The "Fleet" Short-wave Two (D (HF Pen), Pen) .. 27.8.38 PW91  
Three-valve : Blueprints, 1s. each.  
Experimenter's Short-wave Three (SG, D, Pow) .. 30.7.38 PW30A  
The Perfect 3 (D, 2 LF RC and Trans) .. 7.8.37 PW63  
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen) .. 1.10.38 PW63

PORTABLES.  
Three-valve : Blueprints, 1s. each.  
F. J. Camm's RLF Three-valve Portable (HF Pen, D, Pen) .. PW65  
Parvo Flyweight Midget Portable (SG, D Pen) .. 10.6.37 PW77  
Four-valve : Blueprint, 1s.  
"Imp" Portable 4 (D, LF, LF, Pen) .. 10.3.38 PW86

MISCELLANEOUS.  
S.W. Converter-Adapter (1 valve) .. PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.  
Blueprints, 6d. each  
Four-station Crystal Set .. 23.7.38 AW427  
1934 Crystal Set .. AW444  
150-mile Crystal Set .. AW450

STRAIGHT SETS. Battery Operated.  
One-valve : Blueprints, 1s. each.  
B.B.C. Special One-valver .. AW387  
Twenty-station Loudspeaker One-valver (Class B) .. AW449  
Two-valve : Blueprints, 1s. each.  
Melody Hanger Two (D, Trans) .. AW388  
Full-volume Two (SG det, Pen) .. AW392  
Lucerne Minor (D, Pen) .. AW426  
A Modern Two-valver .. WM409

Three-valve : Blueprints, 1s. each.  
Class B Three (D, Trans, Class B) Fan and Family Three (D, Trans, Class B) .. 25.11.33 AW410  
£5 5s. B.G.3 (SG, D, Trans) .. 2.12.33 AW412  
Lucerne Ranger (SG, D, Trans) .. AW422  
£5 5s. Three : De Luxo Version (SG, D, Trans) .. 10.5.34 AW435  
Lucerne Straight Three (D, RC, Trans) .. AW437  
Transportable Three (SG, D, Pen) Simple-Tune Three (SG, D, Pen) .. June '33 WM327  
Economy-Pentode Three (SG, D, Pen) .. Oct. '33 WM337  
"W.M." 1931 Standard Three (SG, D, Pen) .. WM351  
£3 3s. Three (SG, D, Trans) .. Mar. '34 WM354  
1935 £6 6s. Battery Three (SG, D, Pen) .. WM371  
PTP Three (Pen, D, Pen) .. WM389  
Certainty Three (SG, D, Pen) .. WM393  
Mintube Three (SG, D, Trans) .. Oct. '35 WM396  
All-Wave Winning Three (SG, D, Pen) .. WM400

Four-valve : Blueprints, 1s. 6d. each.  
65s. Four (SG, D, RC, Trans) .. AW370  
2HF Four (2 SG, D, Pen) .. AW421  
Self-contained Four (SG, D, LF, Class B) .. Aug. '33 WM331  
Lucerne Straight Four (SG, D, LF, Trans) .. WM350  
£5 5s. Battery Four (HF, D, 2 LF) The H.K. Four (SG, SG, D, Pen) .. Feb. '35 WM381  
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen) .. Apr. '36 WM401

Five-valve : Blueprints, 1s. 6d. each.  
Super-quality Five (2 HF, D, RC, Trans) .. WM320  
Class B Quadradyne (2 SG, D, LF, Class B) .. WM344  
New Class B Five (2 SG, D, LF, Class B) .. WM340

Mains Operated.  
Two-valve : Blueprints, 1s. each.  
Cosmoelectric 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  
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 WM329  
Harris' Jubilee Radiogram (HF Pen, D, LF, P) .. May '35 WM386

SUPERHETS.  
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) .. WM379  
Mains Sets : Blueprints, 1s. 6d. each.  
Heptode Super Three A.C. .. May '34 WM359  
"W.M." Radiogram Super A.C. .. WM366

PORTABLES.  
Four-valve : Blueprints, 1s. 6d. each.  
Holiday Portable (SG, D, LF, Class B) .. AW393  
Family Portable (HF, D, RC, Trans) .. AW447  
Two H.F. Portable (2 SG, D, QP21) .. WM365  
Tyers Portable (SG, D, 2 Trans) .. WM367

SHORT-WAVE SETS—Battery Operated.  
One-valve : Blueprints, 1s. each.  
S.W. One-valver for America .. 15.10.38 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 AW436  
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.  
Simplified Short-wave Super .. Nov. '35 WM397

Mains Operated.  
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 : Blueprint, 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

MISCELLANEOUS.  
S.W. One-valve Converter (Price 6d.) .. AW320  
Enthusiast's Power Amplifier (1/6) Listener's 5-watt A.C. Amplifier (1/6) .. WM387  
Radio Unit (2v.) for WM392 (1/-) Harris Electrogram (battery amplifier 1/-) .. Nov. '35 WM398  
De Luxe Concert A.C. Electrogram (1/-) .. Mar. '36 WM403  
New Style Short-wave Adapter (1/-) .. 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

**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.

**SOUTHERN RADIO'S Bargains.**

5/- BARGAIN Parcels of Useful Radio Components, coils, transformer resistances, condensers, wire, circuits, etc., value over 20/-; 5/- per parcel, TELSEN W349 Midget Iron Core Coils, 3/6.

A.C./D.C. Multi-meters, 5-range, 8/6; Aco "P.O." microphones, 4/-.

2/6 ORMOND Loud Speaker Units, new and boxed, 2/6 each.

36 ASSORTED 1-watt Wire-ended Resistances, 5/6; 24 tubular condensers, assorted capacities up to 0.5 mfd., 6/-; volume controls, assorted capacities (less switch), 7/6 dozen; with switch, 11/6 dozen; mica condensers, assorted, 1/9 dozen; Mansbridge type condensers, 1 mfd., 2 mfd., 4 mfd., 8 mfd., 8/- dozen; valveholders, 5-pin, 7-pin, 9-pin, 2/6 dozen; battery leads, multi-way, 6/6 dozen; parcel of assorted servicing components comprising resistances; tubular, mica, variable, electrolytic and block condensers; wire; sleeving; volume controls; valveholders; etc., etc., 10/- each; parcel containing at least 100 articles.

SOUTHERN RADIO, 46, Lisle Street, London, W.C. Gerrard 6653.

RESISTANCES!—Parcels of 50, 1-watt to 2-watt consisting of 20 useful values, only 1/9 for 50.—Harrison & Co., 89, Great Portland Street, London, W.1. Langham 2471.

VAUXHALL.—All goods previously advertised are still available; send now for latest price list, free.—Vauxhall Utilities, 163a, Strand, W.C.2.

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, 100 watts output, £2/10/0. 150-watt Model for operating Radiogramophones, £3/10/0. Send for lists.—Chas. F. Ward, 46, Far- rington Street, London, E.C.4. Tel.: Holborn 9703.

**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.—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 Re- paired, 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. Battersea 1321.

LOUDSPEAKER repairs and rewinds. Cones and coils fitted. Quick service.—Looker, 106, David- son Road, East Croydon.

**NEW LOUDSPEAKERS**

3,000 SPEAKERS from 6/6 each, P.M. and en- ergised 4in. to 14in., including several Epoch 18in.—Sinclair Speakers, Alma Grove, Copen- hagen Street, N.1.

**NEW RECEIVERS AND CHASSIS**

ARMSTRONG IMPORTANT ANNOUNCEMENT: For the convenience of our customers we have moved to modern offices and showrooms at Writers Road, Holloway. Writers Road adjoins Holloway Arcade and is readily accessible from all parts of London. ARMSTRONG CO. will gladly demonstrate 1939 range of Radio chassis at the new premises. Kindly note in future all correspondence to Armstrong Manufacturing Co., Writers Road, Holloway, London, N.7.

**PREMIER RADIO**

Auto Transformers. Step up or down A.C. Mains between 100—250 volts. 60 watts, 9/-; 100 watts, 11/6.

**PREMIER SHORT-WAVE KITS**

Complete to the last detail including all Valves and coils, as well as theoretical and wiring diagrams and lucid instructions for building and working. Each kit is supplied with a steel Chassis and Panel and uses plug-in coils to tune from 13 to 170 metres.

- 1 Valve Short-Wave Receiver or Adapter Kit 17/6
- 1 Valve Short-Wave Superhet Converter Kit 20/-
- 1 Valve Short-Wave A.C. Superhet Converter Kit 22/6
- 2 Valve Short-Wave Receiver Kit 25/-
- 3 Valve Short-Wave Screen Grid and Pen- tode Kit 58/6

**PREMIER 3-BAND S.W. KITS**

11-86 metres without coil changing. Complete Kits of Parts with Valves and Circuits. One Valve, 12/6; Two Valve, 19/6.

PREMIER U.S.A. QUARTZ TRANSMITTING CRYSTALS. 7 mc. Band, 10/- each, with Calibration Certificate. Enclosed holder and Base, 3/-.

PREMIER SHORT-WAVE COILS, 4- and 6-pin types, 13-20, 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, 33-86 metres. Suitable any type circuit, 2/6.

UTILITY Micro Cursor Dials, Direct and 100.1 Ratios, 3/9.

PREMIER Short-Wave Condensers, all-brass construction, with Trolitul insulation. 15 mmf., 1/6; 25 mmf., 1/7; 40 mmf., 1/9; 100 mmf., 2/-; 160 mmf., 2/3; 250 mmf., 2/6.

TROLITUL DOUBLE SPACED TRANSMITTING CONDENSERS. 15 mmf., 2/9; 40 mmf., 3/6; 100 mmf., 4/-; 160 mmf., 4/6.

NEW TROLITUL SPLIT STATOR CONDENSERS, 50 x 50 mmf., 10/6.

COIL FORMERS, 4- or 6-pin low-loss, 1/- each. AMERICAN VALVES. We hold the largest stocks of U.S.A. tubes in this country and 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.

EUROPA MAINS VALVES, 4 v. 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 H.F. Freq. Ch., 8/6; Tri. Grid Pen., 10/6; 34-watt D.H. Triode, 7/6. 350 v. and 500 v. F.W. Rect., 5/6. 13 v. 2 amps. 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.

**MATCHMAKER UNIVERSAL MODULATION TRANSFORMERS**

Will match any modulator to any R.F. load. 50 watts, 17/6; 150 watts, 29/6; 300 watts, 49/6. MATCHMAKER UNIVERSAL OUTPUT TRANSFORMERS. Will match any output valves to any speaker impedance. 11 ratios from 13: 1 to 80: 1. 5-7 watts, 13/6; 10-15 watts, 17/6; 20-30 watts, 29/6. Send for full details.

PREMIER A.C./D.C. MOVING IRON METERS, 2 1/2 in. diam. Flush Mounting. All ranges. 10 m.a., 30 m.a., 50 m.a., 100 m.a., 250 m.a., 500 m.a., 5/9 each.

AMMETERS, 1, 3, 5, 10 or 30 amps., 5/9 each. PREMIER 1939 HIGH FIDELITY AMPLIFIERS A New Complete Range of 7 High Fidelity P.A. Amplifier for A.C. or A.C./D.C. Mains operation. Completely

	Kit of Parts with Valves	Wired and Pested
3-watt A.C. Amplifier	£2 0 0	£2 15 0
3-watt A.C./D.C. "	£2 0 0	£2 15 0
6-watt A.C. "	£5 5 0	£6 0 0
8-10 watt A.C./D.C. "	£4 10 0	£5 5 0
15-watt A.C. "	£5 15 0	£7 0 0

Black Crackle Steel Cabinet 15/- extra.

NEW PREMIER SELF-POWERED RF TUNING UNIT, incorporating a Var.-Mu pentode amplifier followed by a power grid detector. Designed for high-fidelity reception. Wave range 200-560 and 800-2,000 metres. £4-9-6 complete with valves. CONDENSERS. CARDBOARD ELECTROLYTIC, 4 mf. or 8 mf. 500 v., 1/8 each; 8-4 mf. 500 v., 2/3; 8-4 mf. 500 v., 2/6; 4-4-4 mf. 500 v., 2/6; 18-4 mf. 500 v., 3/6.

TUBULAR METAL CAN ELECTROLYTICS by famous makers. 4 or 8 mf. dry, 500 v., 2/6 each. 8 mf. wet, 450 v., 2/3. 8 mf. 650 v., Peak dry, 4/-. Orders 5/- and over sent Post Free. Under 5/- please add 6d. postage.

Have you had our 1939 Catalogue, Handbook and Valve Manual? 90 pages of Radio Information and Bargains and interesting Data. **Price 6d.**

ALL POST ORDERS TO: Jubilee Works, 167, Lower Clapton Road, London, E.5. Amherst 4723. CALLERS TO: Jubilee Works, or our NEW PREMISES, 169, FLEET ST., E.C.4. Central 2833, or 50, High St., Clapham, S.W.4. Macaulay 2381.

**MISCELLANEOUS**

THERE'S MONEY IN RADIO!—If you understand radio you can make substantial profits in spare time. For hints and ideas get MONEY-MAKING MADE EASY, by L. Harvey Wood. Available from all booksellers, 2/6 net, or by post, 2/10, from the Publisher, C. Arthur Pearson, Ltd., Tower House, Southampton Street, London, W.C.2.

"THE OUTLINE OF WIRELESS," by Ralph Stranger. Fifth Edition. 8s. 6d.—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, or by post 9s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

THE 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, or by post 4s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

EVERYMAN'S WIRELESS BOOK, by F. J. Camm, 3s. 6d. An invaluable book of reference, explaining the operation, upkeep and overhaul of all types of wireless receiver. 200 illustrations. From all Book- sellers and Newsagents, or by post 4s. from George Newnes, Ltd. (Book Dept.), Tower House, Southamp- ton Street, Strand, London, W.C.2.

SIXTY TESTED WIRELESS CIRCUITS, by F. J. Camm, 2s. 6d.—This handbook contains every modern circuit complete with instructions for assembling, component values, and notes on operation. Obtainable at all Booksellers and Newsagents, or by post 3s. from George Newnes, Ltd. (Book Dept.), Tower House, Southampton Street, Strand, London, W.C.2.

Indispensable to the Modern Handyman

**THE HOME MECHANIC ENCYCLOPAEDIA**

An up-to-date and comprehensive guide to the Mechanical, Scientific and Technical Interests of the Day

3/6 NET From all Booksellers

Or direct by post 4/- from the Publishers

GEORGE NEWNES LTD. (Book Dept.)  
Tower House, Southampton Street, London, W.C.2.

**FREE ADVICE BUREAU**

**COUPON**

This coupon is available until June 3rd, 1939, and must accompany all Queries and Wrinkles.

PRACTICAL AND AMATEUR WIRELESS,  
27/5/39.

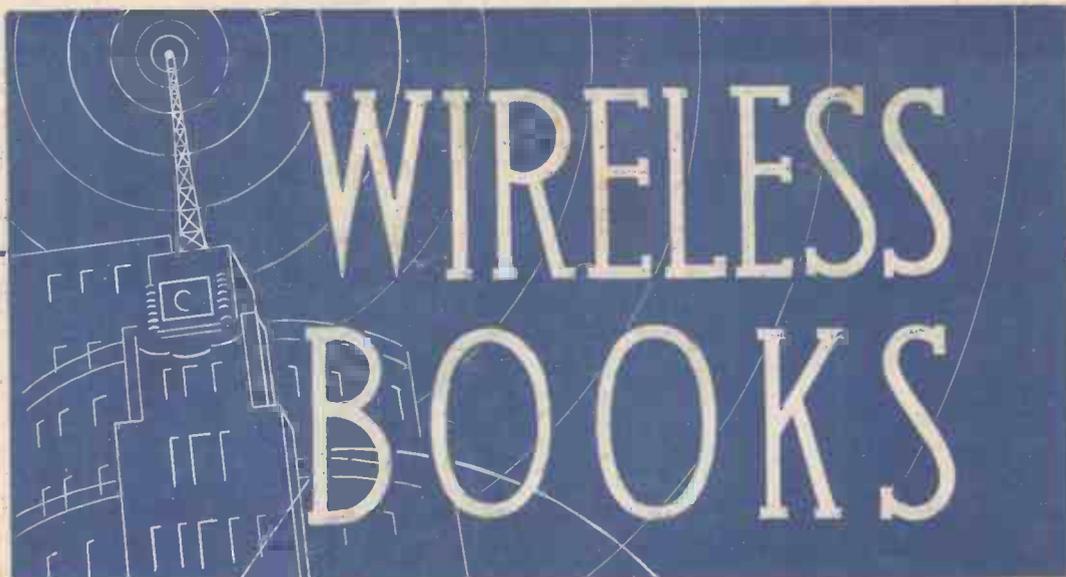
**ENGINEERING OPPORTUNITIES**

**Free!**

268 PAGES

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 qualifica- tions. 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 Engi- neering, Building, Government Employ- ment, 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



**1. TELEVISION AND SHORT-WAVE HANDBOOK**

By F. J. CAMM

**Contents** :—Television Principles Simply Explained, The Transmitting System, Analysing the Signal, Frequency Bands and D.C. Lighting, The Scopphony System, The Cathode Ray Tube, Modulating the C. R. Tube, Reception on C. R. Tubes, Radio Reception and Television, Reception Faults, C. R. Tube Focusing, Single Control Operation, Cutting out Static Interference, Projecting Television Pictures, Electron Multipliers, Television Receiver Design, Solving the Mains Problem, Making a C. R. Tube Power Unit, Metal Rectifier for Television Apparatus, The Time Base, Operating a Television Receiver, Components for Television Apparatus, Receiving the U.S.W. Signals, Receiving Television Sound Only, Aerials for Television, Television Applications, An Introduction to Short-Waves, Skip Distance and Fading, Circuits for the Short-Waves, Superhets for Short-Waves, etc. Profusely illustrated. 5/- net (By post 5/6)

**2. WIRELESS TRANSMISSION FOR AMATEURS**

By F. J. CAMM

A book which covers fully and clearly the whole field of wireless transmission for the amateur enthusiast, from the obtaining of an amateur transmitting licence to the construction and operation of a transmitter. With 120 illustrations. Contents: Valves. Transmitting Circuits. The Radio-Frequency Power Amplifier. Modulation Systems. Electronic Radiation. One-Valve Battery-Operated Transmitter. Aerials. Station Layout. Frequency Meters. Making Coils, etc. 2/6 net (By post 2/10)

**3. 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! The book deals with: Arithmetic. Algebra. Powers and Roots. Differential Calculus. Integral Calculus. Trigonometry. The Slide Rule. Logarithms. Efficiency. Curves and Graphs in Wireless. 5/- net (By post 5/6)

**ASK YOUR BOOKSELLER TO**

get you the book or books you require at the usual price, thus saving postage. Alternatively, send the form to the publishers, with postal order (plus extra on each book to cover postage), and the book or books will be sent direct to you.

George Newnes, Ltd.

**4. EVERYMAN'S WIRELESS BOOK**

By F. J. CAMM

A Radio Consultant for the Listener, Expert and Amateur Constructor, with Special Chapters on the Principles of Radio Telephony, Installation and Systematic Fault-finding. With 200 illustrations and Diagrams. General Principles of Wireless Receivers. Testing. Special Remedies for local conditions. Noises, their Cause and Remedy. Equipment Troubles. Short-Wave Troubles. Improving the Quality of Reproduction. Accumulators and Batteries, etc. 3/6 net. (By post 4/-)

**5. SIXTY TESTED WIRELESS CIRCUITS**

By F. J. CAMM

Modern circuits of every type. Diagrams and instructions for assembling and wiring. Details of components and notes on operation. Including Chapters on Circuits for Battery and Mains-Operated Receivers, Adaptors, Units, Portables, Short-Wave Receivers, All-Wave Receivers, Amplifiers, and a Room-to-Room Communicator. 2/6 net (By post 2/10)

To the Book Publisher, GEORGE NEWNES, Ltd., TOWER HOUSE, SOUTHAMPTON ST., LONDON, W.C.2. Please send me by return the book or books encircled below, I enclose Postal Order for the necessary amount.

If you hand this form to your bookseller please state the titles you require.

1. 2. 3. 4. 5.

P.O. No. is..... Value.....

Name .....

Address .....

P.W. 27.5.39