

12 Searc

**TRIODE versus PENTODE—See Page 150.**

# Practical and Amateur Wireless

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

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 10. No. 24L  
May 1st, 1937.

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ficates expire.

# EUROPE'S OLDEST S.W. TRANSMITTER SEE PAGE 158.



## Practical and Amateur Wireless

Edited by **F. J. CAMM**  
 Technical Staff:  
 W. J. Delaney, H. J. Barton Chapple, Wh.Bch.,  
 B.Sc., A.M.I.E.E., Frank Preston.

VOL. X. No. 241. May 1st, 1937.

### ROUND *the* WORLD of WIRELESS

#### Quality Reception

**T**HERE are two distinct classes of listener—those who wish to hear as many stations as possible, and those who desire the highest possible quality of reproduction and are satisfied with only the local station. It is an undoubted fact that for the highest possible quality, the receiver is restricted to a station situated within a very few miles, and any attempt at increasing the range of reception will in most cases result in a deterioration in the quality of the received signal. For the highest quality there are many aids to reception, such for example as contrast expanders, but these devices require very careful design in order to avoid harmonic distortion and other forms of trouble. With the ordinary domestic speaker and room acoustics, it is possible to make a quality receiver which is simple to build and operate and which employs normal components. On pages 156 and 157 we give details concerning the design of circuits of this type and examples of three receivers in theoretical form, and all those who are interested in this type of receiver should follow the details there given.

#### Insects Broadcast

**A**T the N.P.S., Teddington, a neat microphone-amplifier has been perfected for use in detecting the presence of destructive insects in timber. It is so sensitive that it has been found possible to distinguish between the different kinds of insects or larvae by noting the differences in the sounds which they make, although they may be far below the surface of the timber.

#### More Listeners

**T**HE figures issued by the authorities for March show that there is yet another increase in the number of licences issued. The total figures were 616,582 issued, and 616,084 expired, showing a net increase of 41,498. This brings the total number of licences in force in England, Scotland, Wales and Northern Ireland (including freelicences issued to the Blind) to 8,131,450.

#### Rudy Vallee Next Week

**L**ISTENERS who remember the original Savoy bands will remember the saxophonist who took his christian name from Rudy Wiedoft, upon whose saxophone technique he based his playing. When Rudy Vallee returned to America he crooned

in addition to his playing, and as a crooner has made fame. His most famous number in America was the "Stein Song," and for some years Rudy has been one of America's highest paid artists as a crooner and band leader. He sailed for England on April 23rd, and will broadcast in a special half-hour of his own design from the National transmitters on May 8th.

#### A Gala Revue

**A**NOTHER high spot in Coronation week is a Gala Radio Revue which will be broadcast on May 11th from the Nationals, and on May 13th in the Regional programmes. A full programme is not yet arranged, but the B.B.C. announce

outside the Abbey and Buckingham Palace and along the route, and 15 for English and foreign observers. The whole system of wiring for this broadcast has been carried out by engineers of the Post Office. It should be realised, in order to understand the magnitude of this task, that each microphone point also has to be arranged with two-way communication between all points, and in addition, all circuits are duplicated in case of breakdown.

#### Blackpool Dance Festival

**T**HE seventeenth Blackpool Dance Festival comprising ballroom dancing and stage dancing competitions for amateurs and professionals takes place early in May. On May 6th, P. J. S. Richardson is to broadcast in the Northern programme a running commentary on parts of the British Amateur Championship from the Empress Ballroom. On the following night commentaries on the British Professional Dancing Championship will be broadcast in the Empire programmes.

#### Music Items

**A** BROADCAST performance of unusual interest on May 5th (National) will be that of the Cinhalese artist, Surya Sena, who will sing a programme of folk music from Ceylon, Peru, Nepal and Sicily. Surya Sena is a Cinhalese artist of international repute, and this programme should prove of exceptional interest.

On May 6th (Regional), the first act of Gluck's "Alceste" will be broadcast when it is presented by a joint company of artists from the Paris Opéra and Opéra Comique, whose visit will be one of the features of the season.

The second act of "Aida" will be broadcast on May 7th (Regional), and the second act of "Carmen" on May 11th (Regional), the eve of the Coronation.

On May 7th (National), Joseph Lewis will conduct a Sullivan programme consisting of the Prelude to Act 4 of "The Tempest" and the Symphony in F, and on the same day (Regional), the celebrated violinist Juan Manen will broadcast a recital of music arranged or written by himself.

#### Variety from Southampton

**O**N May 5th a variety programme will be broadcast from the stage of the Hippodrome, Southampton.

ON OTHER PAGES	
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that George Robey, Wilson Hallett, the Western Brothers and Mabel Constanduros have already been engaged. The production is by John Watt and the book is being specially written by Douglas Furber, who is probably best known for his songs "The Bells of St. Mary's" and "Limehouse Blues."

#### Fifty-eight Microphones

**T**HE relaying of the Coronation ceremony will involve the use of 58 microphones, of which 32 will be used for relaying the Abbey service, 11 will be used for effects

# ROUND the WORLD of WIRELESS (Continued)

## Radio Beacons for Africa

PLANS are well advanced for the installation of 27 new radio direction-finding stations over Africa to assist pilots, and to make possible the operation of increased air mail and passenger services thousands of miles over the Empire air routes.

## Two More Acts for Coronation Music-Hall

FLANAGAN and Allen and Billy Caryl and Hilda Mundy have been engaged to take part in the 90-minute Music-Hall programme on May 15th—the last variety show of Coronation Week. Incidentally, Flanagan and Allen have just signed a contract for six B.B.C. Music-Hall dates, the biggest contract of its kind ever issued. They will be “on the air” once before their Coronation Week broadcast.

## Birmingham Cathedral Bells

THE newly recast peal of bells at St. Philip's, Birmingham, the Cathedral Church of the diocese, are to be dedicated



The final stage of the modulator unit in the Empire Station at Daventry. The mechanical water interlocks, which prevent the supply of power to the valves until the cooling water is flowing, are clearly visible.

and to ring their first peal on St. Philip's Day. On May 1st listeners will hear a short description of the bells and their first peal. The inscription on the bells records that they were recast for the Coronation of King George VI, chiefly through the generosity of Sir Charles Hyde.

## INTERESTING and TOPICAL NEWS and NOTES

### Coronation Creates Radio Export Boom

WITH only twelve days to go to Coronation Day, the wireless industry is faced with so many orders for sets that it is working day and night to fulfil them, and thousands of British people overseas will now receive their sets too late for the Coronation broadcast.

According to a G.E.C. official there has been an enormous demand from overseas, and hundreds of thousands of people in the Empire, and all over the world, are demanding the latest sets in time for the Coronation so as to ensure perfect reception. The rush of last-minute orders has been very great, and in the past few weeks the General Electric Company alone has sent thousands of sets abroad. These orders are for short-wave sets, and the main destinations are South America, India, South Africa and British Malaya.

### Cup Final Broadcast

MOST listeners will be interested to know that George Allison and Ivan Sharpe will broadcast a commentary on the Cup Final at Wembley Stadium on May 1st. This year's contest is between two northern teams, Sunderland and Preston North End. Ivan Sharpe, who will broadcast the first half of the match, a northerner himself, will be able to give listeners an intimate picture of the struggle between these two famous northern teams. Mr. Sharpe, it will be remembered, was one of the commentators at last year's Cup Final.

George Allison, who, because his own team, Arsenal, were one of the finalists last year, was unable to broadcast, is to describe the second half of this year's match. As a contrast, listeners will be taken over immediately after the Cup Final to the opening of the cricket season at Old Trafford, where Lancashire are opposed to Derbyshire.

### Bournemouth Municipal Orchestra

THE Bournemouth Municipal Orchestra, led by Harold Fairhurst and conducted by Richard Austin, will broadcast from the Pavilion, Bournemouth, on May 2nd. The soloist will be Garda Hall (soprano).



Stella Roberta, the well-known vocalist in Mantovani's orchestra, is here seen with her new "Pilot" receiver.

### Glinka and Smetana

ON May 8th the B.B.C. Scottish Orchestra, conducted by Guy Warrack, will play the Overture and a Suite from "Russian and Ludmilla," by Glinka, and the Overture and three dances from "The Bartered Bride" and the Overture to "Libussa," by Smetana.

### Orchestral Concert from Bristol

THE Grand Hotel Orchestra, under the direction of Adolphe Trotman, will broadcast from the Grand Hotel, Bristol, on May 3rd. The orchestra specialises in light music of the gipsy type, and every member has had experience of broadcasting, Edgar Hawke (1st violinist) having his own broadcasting combinations.

### The New Vic

ON May 7th the Rutland Square and New Victoria Orchestra, directed by Frank Gomez, will broadcast from the New Victoria Cinema, Edinburgh. The programme will include: "The Procession of the Sirdar," by Ippolitow-Iwanow; "Brise d'Été," by Sanderson; Selection, "This England," arranged Debroy Somers; "The Crack Regiment Patrol," by Moses Tobani; Selection from the "Harlequinade" Ballet by Franz Gomez; "Song of the Troubadour," by Metra; Selection of Scottish Tunes, arranged Colin Campbell; Novelty Rhythmic Duet "Snakes and Ladders," by Engleman, arranged Mayerl; Irish Folk Tune, "The Gentle Maiden," arranged Reginald Redman; and a Selection of Sullivan Melodies, arranged Dan Godfrey.

## SOLVE THIS!

### PROBLEM No. 241

Excessive hum developed in Wallace's A.C. mains receiver and when measurements were made the current consumption of all the valves and the anode voltages were found to be excessive. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions 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. 241 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 3rd, 1937.

### Solution to Problem No. 240

The switch contacts across the intervalve coil long-wave winding were not making when the control was switched for medium-wave reception. The following three readers successfully solved Problem No. 239 and books are accordingly being forwarded to them: C. W. Picken, 2, Glebe Cottage, St. Stephens, Canterbury; A. Davie, 41, Kimberley Road, Edmonton, London, N.18; C. Roslyn, 51, Alredale Road, Balham, London, S.W.12.

# TRANSMITTING TOPICS

THE "electronic" theory states, speaking in a practical sense, that an electric current is really nothing more than a movement of electrons (i.e., the smallest quantity of negative electricity which, with the proton, is the basis of all matter), and if the movement is in one direction, it is usual to refer to the current as being "direct current." It will be remembered, however, that it is also possible to make the flow of electrons reverse periodically and set up what is known as an "alternating current."

## Radiation

Radiation, when applied to the subject under consideration, refers to the radiation of energy from the transmitting source.

The energy takes the form of "electromagnetic waves," waves which have an electric and a magnetic component, and which travel at the same speed as light, namely, 186,000 miles or 300,000,000 metres per second.

This energy is only radiated when the electrons are forced to get a move on or are pulled up with a jerk; in other words, a circuit carrying "direct current" will not radiate during normal current flow, but only at the moment of switching on and off, i.e., starting and stopping.

With a circuit carrying "alternating current" (A.C.), however, the conditions are very different as the electrons are in a continuous state of starting and stopping, producing electro-magnetic waves as long as the current is switched on.

This state of affairs exists with all commercial A.C. supplies, but as the frequency is so low, usually 50 cycles per second, the energy radiated is very very small. The greatest radiation is produced by circuits carrying A.C. having very high frequencies; in fact, it will be found that the amount of energy radiated increases with frequency, i.e., the short wavelengths.

The waves have another characteristic in common with those of light, they can be reflected and refracted, as will be explained further on in this article, thus allowing direction of maximum radiation to be predetermined, as in the case of "beam" transmissions.

## Characteristics of Radiated Waves

For normal broadcast requirements, it is possible to design transmitting aeri- als which will allow very even radiation in all directions, particularly in the case of long waves. Under such conditions, the strength of the signal at the receiving aerial will more or less depend upon its distance from the transmitter, the signal gradually getting weaker and weaker as the distance is increased.

With the higher frequencies (short waves), however, one cannot apply the same reasoning, as the behaviour of short waves is, to say the least, very erratic and greatly influenced by the items mentioned below.

## Earth or Surface Waves

For clearness I am dividing the electromagnetic waves into two groups, one of which can be classified under the above heading, and we will consider that one first. When short waves are radiated from a transmitting aerial system some of them travel over the earth's surface or in the

The Characteristics of Radiated Waves, "Sky" Waves and Fading, are Among the Subjects Dealt With in this Article.

By L. ORMOND SPARKS

lower atmosphere, which is, comparatively speaking, fairly dependable, but, owing to the absorption of energy by earthed objects, such as trees, houses and the actual earth itself, they become attenuated or weakened rather rapidly and their effective range is, likewise, very limited. The effect becomes more pronounced as the frequency is increased, in fact, if the wavelength is down in the ultra-short band, the effective range almost becomes equal to the optical range, although, in view of the strange results now being obtained with the television transmissions, it does not seem possible to form any hard and fast rule.

## Sky Waves

For the second group, I do not think a better

To get a clearer understanding of this "ionised atmosphere," I would mention that the air molecules are ionised by collision due to bombardment by solar and cosmic radiations, and what really happens is that certain electrons and ions are rendered free to travel about, so to speak, on their own. The happy free state, however, doesn't exist for long; as the smashing up business goes on the free electrons and ions recombine to form neutral molecules, but, during their freedom the electrons have been on the move, and it is their movement which is chiefly responsible for the refraction of the waves which penetrate the ionised layer.

The whole idea will be more readily understood by referring to the accompanying illustration. Let "T" represent the transmission station; R and R1 receiving stations; and the shaded band "a" and "b" the ionised layer, or Heaviside Layer. The shading in the band "a" "b" is intended to represent the density of the layer, i.e., the greatest number of free electrons in the centre of the layer.

The station "R" is at a distance from "T" which comes within the range of the "earth or surface" waves, and the strength of the received signals will depend on the amount of absorption of energy by earthed objects between the two points. The other station, "R1," however, is beyond the effective range of the "earth" waves, and will depend on the "sky" waves for its signals, their path of travel being indicated by the dotted line "s" "s."

It will be noticed that the path is turned back towards the earth by the ionised layer, and the turning process is due to a combination of reflection and refraction, according to the frequency of the waves. The higher the frequency, the greater the depth of penetration of the layer, and, consequently, the greater the distance between "T" and the point where they come in contact with the earth.

A peculiar point about the Heaviside Layer is that its height is greater at night and this, in turn, again affects the range of the "sky" waves, as many amateurs will have, no doubt, noticed during reception tests.

It is assumed that there are other layers besides the Heaviside; in fact, it is known that another does exist, and it is known as the Appleton Layer, which varies in height according to the season. It is estimated to be as much as 300 miles above the earth's surface during certain periods.

## Skip Distance

If the diagram is examined, it will be noted that any station situated in the area between "R" and "R1" does not receive either the ground or sky waves; in other words, it is in a "dead" area, and as the waves literally "skip" that distance it is usual to refer to such as the "skip distance."

(Continued overleaf)

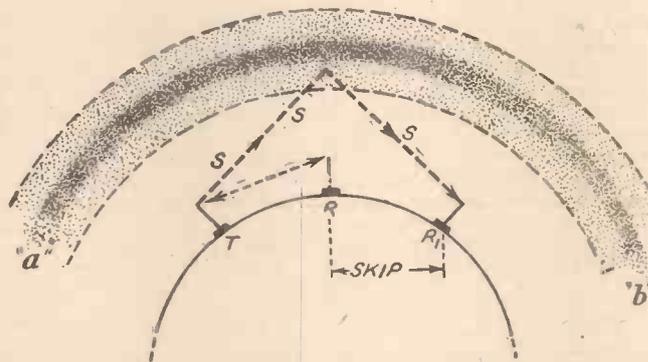


Diagram showing the effect of the reflected and direct waves of two separate receivers.

name can be found than that given above.

Though speaking about "Earth Waves" it must not be thought that all the energy is radiated in that manner; far from it, as the greater amount of energy is, undoubtedly, radiated skywards at a small angle to the horizontal, and thus clears all surrounding earthed objects.

It is quite possible that these waves would go on travelling higher and higher and be of no use for communication purposes, if it were not possible for them to be reflected and refracted in the same manner as light.

## Heaviside Layer

At approximately 60 to 70 miles above the earth's surface there exists a layer of ionised atmosphere which is known as the Heaviside Layer, after Oliver Heaviside, who, in 1902, put forward the theory of its existence.

## TRANSMITTING TOPICS

*(Continued from previous page)*

It will be appreciated, therefore, that a transmitter might, quite possibly, not be received by a station, say, 50 miles away, but his signals would be received at good strength by a station many hundreds or thousands of miles away.

As the frequency is reduced, i.e., wavelength increased, the sky wave is bent back earthwards at a more acute angle; in fact, above 80 metres, the waves will return earthwards within the range of the "earth" waves, besides, of course, greater distances as well.

## Fading

Before connecting the two paths open to electro-magnetic waves with fading, it is necessary to get a general idea, even though it is a brief one, of "phase" relationship.

If two alternating currents are flowing in the same circuit, and they have identical frequencies, they will augment or nullify each other, according to whether they are in phase or out of phase with each other.

Assuming that they are "in phase" with each other, then the maximum amplitude will be equal to the arithmetical sum of the two, and, when such conditions exist, it is usual to state that the currents are "synchronised."

As the currents get "out of phase" the maximum amplitude will decrease, until when the phase difference or angle becomes 180 degrees, the amplitude falls to zero. This condition is known as "phase opposition."

I have mentioned that it is possible for a receiving station to be affected by earth waves and sky waves. Well, it is also possible for a time difference to exist between the reception of one and the other, such difference resulting in a phase difference between two groups of waves.

To make matters worse, the phase difference is not constant; it is possible for it to vary from moment to moment, and the resultant effect is to produce, by virtue of the brief explanation given above, fluctuations in signal strength which are often classified under the heading of "fading."

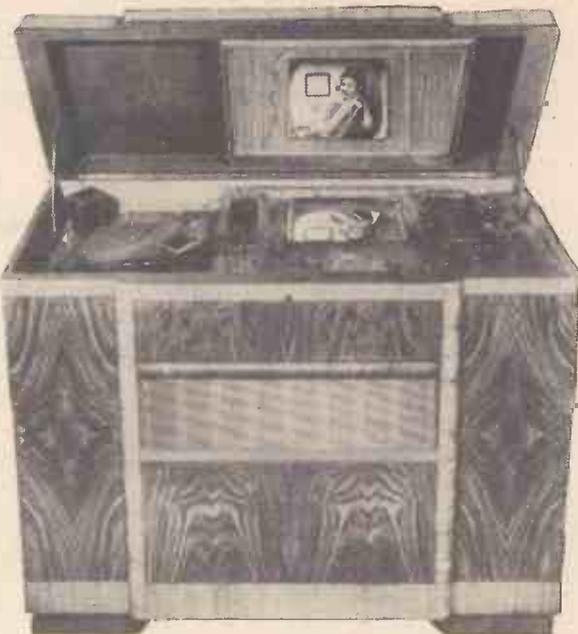
# NEW MARCONIPHONE TELEVISION RECEIVER

Details of the Latest Development in Television Technique

BY the release of Model 703, the Marconiphone Company have brought into the de luxe market the complete home-entertainment provider. This consists of an all-wave radio receiver, plus an automatic record-changer, plus a complete cathode-ray tube television receiver. The overall size of the cabinet has been kept down to quite reasonable dimensions, in spite of the inclusion of so much apparatus, and the accompanying illustration shows how the various sections have been disposed. The automatic record-changer is on the left, with the radio receiver on the right, and the cathode-ray tube is vertically disposed in the centre, the picture on the tube end being viewed in a mirror set into the lid of the cabinet. This is provided with a patented stay or support, permitting the lid to be raised to 45° for viewing the television picture, or to 90° when using the gramophone section.

A concealed lamp is mounted in such a position that the television controls are floodlit, presumably so that the apparatus may be used in a darkened room without difficulty. The size of the picture is 10in. by 8in., and the mains consumption, when used on television, is 270 watts. The radio receiver covers four wavebands—16.7 to 53, 46 to 140, 185 to 560, and 750 to 2,200 metres. The radio section on the television wavelength is fixed-tuned. Among the many novelties

included in the complete equipment may be mentioned the elliptical loud-speaker, which provides a non-directional radiation of the sound waves and increased high-note response; a high-intermediate frequency providing freedom from image reception on all wavebands. A complete special dipole television aerial is installed free by the E.M.I. Service Company when the receiver is put into service. The price is 120 guineas.



A general view of the new Marconiphone Auto Television Receiver, showing the arrangement of controls, screen, etc.

## Important Broadcasts of the Week

## NATIONAL

Wednesday, April 28th.—"East Lynne," a play adapted by Tod Slaughter from the novel by Mrs. Henry Wood.

Thursday, April 29th.—Military Band programme.

Friday, April 30th.—B.B.C. Concert of Contemporary Music—7: British Music, to be given before an audience in the Concert Hall, Broadcasting House.

Saturday, May 1st.—A commentary on the F.A. Cup Final, from Wembley.

## REGIONAL

Wednesday, April 28th.—Dance Band music, from Holland.

Thursday, April 29th.—"East Lynne," a play adapted by Tod Slaughter, from the novel by Mrs. Henry Wood.

Friday, April 30th.—Dance Band programme.

Saturday, May 1st.—Music in the Air: The Life and Work of Edward Elgar; orchestral and choral programme.

## MIDLAND

Wednesday, April 28th.—Midland Football Clubs: West Bromwich Albion, a

sketch of the Club's history, policy, and players, past and present.

Thursday, April 29th.—String Orchestral programme.

Friday, April 30th.—Music Hall Music: Orchestral programme, from the Hippodrome Theatre, Coventry.

Saturday, May 1st.—Music in the Air: The Life and Work of Edward Elgar, orchestral and choral programme.

## WESTERN AND WELSH

Wednesday, April 28th.—Variety programme, from the Pavilion Ballroom, Bournemouth.

Thursday, April 29th.—Western Salon: a programme of Chamber Music performed in the Tudor Music Room at Marston Court, Marston Magna, in Somerset.

Friday, April 30th.—A Programme of songs and duets.

Saturday, May 1st.—Mendip Cave Crawl, feature programme.

## NORTHERN

Thursday, April 29th.—A running commentary on the Yorkshire Darts Cham-

pionship Final, from the New Stadium, Leeds.

Friday, April 30th.—Northumberland Night: A programme of music, sketch and verse.

Saturday, May 1st.—Part of the Welsh Gymnast, from the Surrey Street Methodist Chapel, Sheffield.

## SCOTTISH

Wednesday, April 28th.—The Ceremony of conferring the Freedom of the City of Edinburgh upon the Duchess of Gloucester, from the Usher Hall, Edinburgh.

Thursday, April 29th.—Choral programme.

Friday, April 30th.—Sleep, a miscellany devised by Kathleen M. Macleod.

Saturday, May 1st.—Scots Songs.

## NORTHERN IRELAND

Wednesday, April 28th.—Instrumental programme.

Thursday, April 29.—City Centre, feature programme.

Friday, April 30th.—A Mixed Bag of Short Plays: 1, The Wedding, by Thomas Carnduff; 2, The In-Laws, a personal story by M. J. McHugh; 3, The Cunning of Shamus O'Connell, by F. Marriott Watson.

Saturday, May 1st.—Orchestral programme.

# Constructional Details of "Practical Wireless" Receivers—2

**B**LUEPRINT No. 4 shows the wiring required for the original version of the Sonotone four-valve receiver employing an H.F., Detector and 2 L.F. stages. It is still possible to obtain the coils specified for this receiver from certain stores, although they are no longer a standard line. In the original receiver volume control was effected on the H.F. and L.F. stages, in the former case by a rheostat connected in the filament lead. The receiver may be brought up to date by

Continuing the Series of Articles Describing Receivers Which are Still Available in Blueprint Form, We Give This Week the Modifications Required to the "Sonotone Four"

obtained. Thus, the changes necessary to bring this receiver into line with modern designs are a replacement of the coils and the substitution of a high-resistance volume control for the low-resistance component formerly used.

### Wiring Alterations

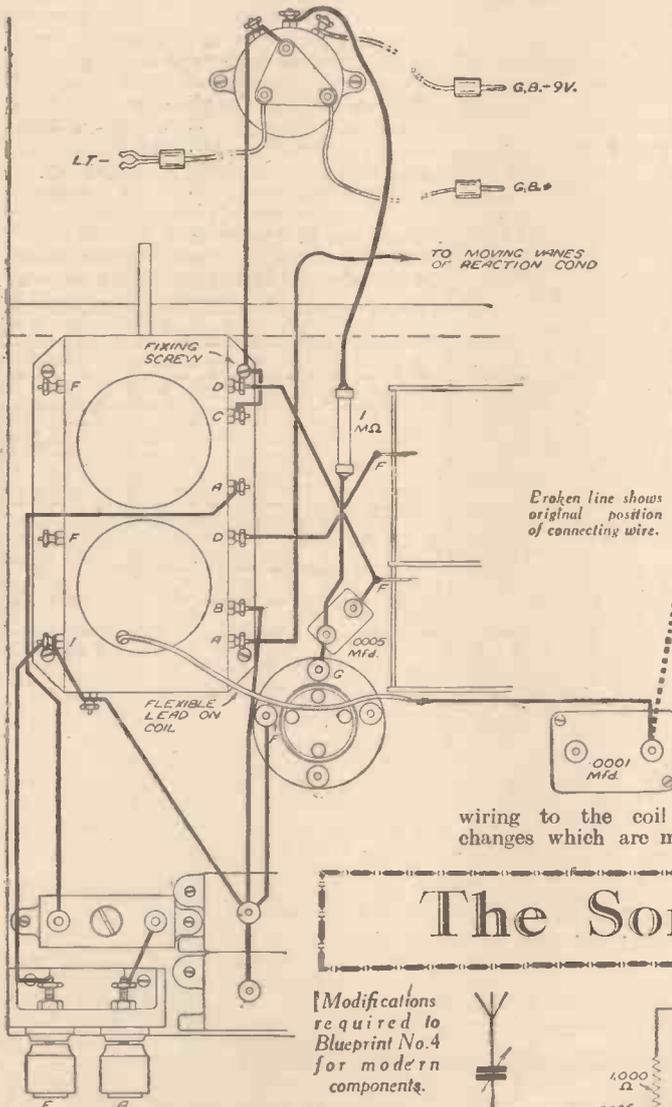
The alterations required in the wiring are very few, and no difficulty should arise in making the change. The volume control is mounted on the panel in place of the filament rheostat, and two leads in the blueprint (other than those to the coil unit, of course) will have to be removed. These are the G.B. positive lead and the wire joined between the .0001 mfd. H.F. coupling condenser and the .0003 mfd. grid condenser. The attached diagram shows the wiring to the coil unit and the other changes which are made, and it will be

seen that the .0001 mfd. fixed condenser just referred to is connected to the flexible lead extending from the top of the coil can. It should be noted that the filament terminal on valveholder V1 should be connected to the earth line as the rheostat is not in use and in two cases (volume control and terminal C on the coil unit) the fixing screw which holds the coil unit to the baseboard is used as an earth return point. The two-gang condenser may still be obtained, but in the event of any difficulty a modern two-gang condenser with separate vernier trimmer (concentrically operated) should be used.

### LIST OF COMPONENTS FOR THE "SONOTONE" FOUR.

#### Blueprint P.W.4.

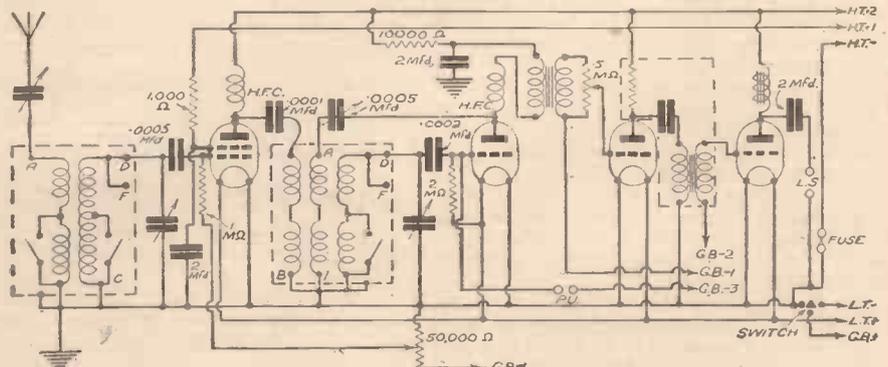
- 1 BP.114 coil unit (Varley).
- 1 two-gang .0005 mfd. condenser with concentric trimmer (Wilkins and Wright).
- 1 .0003 mfd. pre-set condenser (Formo).
- 1 .0003 mfd. reaction condenser (Compax) (Polar).
- 3 2 mfd. Type 50 fixed condensers (T.C.C.).
- 1 .0002 mfd. Type S.P. condenser (T.C.C.).
- 1 .0001 mfd. Type S condenser (T.C.C.).
- 1 .0005 mfd. Type S condenser (T.C.C.).
- 1 Bulgin standard screened H.F. choke (Bulgin).
- 1 Junior H.F. choke (Bulgin).
- 1 L.F.16 L.F. choke (Bulgin).
- 1 3-1 L.F. transformer (B.T.S.).
- 1 Transfeeda Unit (Benjamin).
- 1 1,000 ohm 1-watt resistor (Dubilier).
- 1 10,000 ohm 1-watt resistor (Dubilier).
- 1 2 meg. grid leak (Dubilier).
- 1 volume control with 3-pt. switch, Type VS36 (Bulgin).
- 4 4-pin valveholders, baseboard type (B.T.S.).
- 1 500,000 ohm volume control, Type V.C.63 (Bulgin).
- 1 Microfuse, 100 mA. and holder (Microfuses).
- 3 Belling-Lee terminal mounts (Belling-Lee).
- 6 Type R terminals, A, E, L.S.—, L.S+, P.U. and P.U.
- Five-way Belling-Lee battery cord.
- 5 wander plugs, G.B.—, G.B+, G.B.1, G.B.2, G.B.3. (Belling-Lee).
- 1 wooden baseboard 12" x 10".
- 1 120-volt H.T. battery.
- 1 19-volt G.B. battery.
- 1 12-volt L.T. accumulator.
- 1 W.B. Junior Stentorian loudspeaker.
- 1 Mazda VP.215 valve.
- 1 Mazda HL.210 valve.
- 1 Mazda L.2 valve.
- 1 Mazda P.220A valve.



wiring to the coil unit and the other changes which are made, and it will be

## The Sonotone Four

[Modifications required to Blueprint No.4 for modern components.



Theoretical circuit of the Sonotone, modified to employ a Varley coil unit, and a variable-mu H.F. stage.

replacing this with a modern form of H.F. volume control (utilising a variable-mu H.F. valve) and by using modern iron-core tuning coils, in which case the Varley BP.114 Unit is specified. This will be found to fit nicely in place of the original two-coil unit, but it does not include an on/off switch which was in the original unit. However, this matter is easily overcome as the volume control which is required now may be obtained with a self-contained switch, and to avoid a constant drain on the grid-bias battery, one of the three-point type should be

# Triode *versus* Pentode

An Impartial Comparison Bringing Forward the Advantages of the Triode. By PERCY RAY

A GREAT deal has been written on the advantages of pentodes over triodes.

Unquestionably, pentodes have some advantages in the direction of sensitivity, but nowadays this is not a feature of paramount importance, as high gain is fairly easy of attainment in the other stages. The question, therefore, of the relative merits of triodes and pentodes resolves itself into a consideration of quality of reproduction.

It has been said so often that "the pentode valve is capable of giving quality equal to that of the triode, providing that, etc. . . ." but never does one see any suggestion of the quality of the pentode

the writer would suggest that output stages are almost invariably overloaded from time to time, and this in itself would account for the phenomena under discussion.

### Causes of Distortion

It should be borne in mind that the distortion arising in the triode is caused by undue exaggeration of the second harmonic, and in the pentode the third harmonic, and there is no question whatsoever but that the ear will tolerate second harmonic distortion far more readily than third harmonic distortion, and if the output stage is to be overloaded, each valve will

of the triode output valve. Particular attention is drawn to the fact that these two valves were most carefully monitored, so that each was fully loaded to give the same output; consequently, the triode was producing second harmonic distortion to the extent of 5 per cent., and the pentode third harmonic distortion to the same extent. It is apparent, therefore, that the distortion in both valves is equal, and that the sweeping preference in favour of the triode valve is solely due to the fact, as outlined above, that the human ear is tolerant to 5 per cent. second harmonic distortion, but objects to the same extent of third harmonic distortion.

### A Question of Quality

Before the quality from a pentode output stage could be raised to the level that it was indistinguishable from that of the triode, it was necessary to employ a very much larger valve used under working conditions that enabled it to develop the required output while accepting a grid sweeping of rather less than half the capacity,

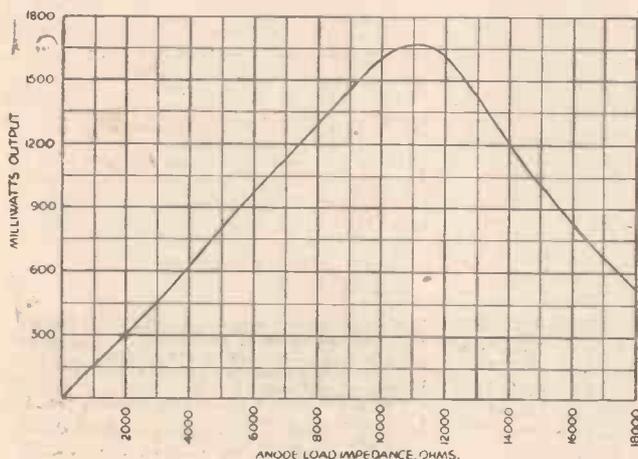


Fig. 1 (left).—Output curve of a pentode valve showing that the anode impedance is very critical.

being better than the triode. So much has been said about the wonders of the pentode that the reader is asked to read the foregoing remarks with an open mind. Fig. 1 shows the inefficiency arising from incorrect matching between a pentode valve and its output circuit. The vertical direction shows efficiency (output), while the horizontal shows a range of anode impedance. It will be seen that the small discrepancy in matching brings about a very serious drop in efficiency.

Fig. 2 shows exactly the same curve plotted for a triode valve, from which it will be seen that, within reason, this type of valve is indifferent to its anode load over a wide range of impedance.

From the above remarks it is quite evident that where careless matching is employed the triode will give satisfactory quality, but the pentode, when fully loaded, will give bad quality in proportion to the discrepancy in its anode load.

Because the pentode requires far more intelligent handling than the triode, it would not be fair to condemn it, so after mentioning this rather interesting difference let us take the argument a little further. From now on, it may be assumed that each valve, where mentioned, is considered to have its correct anode load. After listening to a triode and pentode output stage with the care necessary for such an experiment, the writer maintains that the minimum of nine out of ten people will consider the quality from the triode to be superior, both on sustained notes, and in the handling of transients. Providing that neither valve is overloaded, there is no special reason why this should be, but

Fig. 2.—Output curve of a triode valve. Note how a too-high anode load has very little effect compared with the pentode, as shown by the curve in Fig. 1.



undoubtedly produce the type of distortion peculiar to it to a degree proportionate to the extent of the overload.

The writer has been carrying out experiments with a triode and pentode arranged for quick change over, and monitored at a cathode-ray oscillograph to see that neither valve was overloaded, and with an output meter to see that they were both giving the same output. With this arrangement, a small party in ignorance of the nature of the test voted each time in favour

but to the trained ear there was still an unpleasing response to transients, which, in the writer's opinion, is due to instantaneous bad matching due to a violent change in working valve impedance.

The pentode has undoubtedly served the listening public well, but with the slow increase of the superhet. and other forms of receivers with adequate gain, it seems safe to prophesy that the pentode will wane in popularity. After all, the pentode costs more money than the triode, in return for which the user is rewarded (in the writer's opinion) with inferior quality and unrequired sensitivity. The pentode will, however, probably remain popular in the output stage of short-wave superhets., where extra sensitivity really is required, and where it will be useful to accentuate deliberately the higher frequencies which have been cut either accidentally or in the interest of noise suppression.

While perhaps a little outside the true theme of this article, it may be useful to mention that directly-heated triode output valves are slightly preferable to those indirectly heated, as the anode current-anode volts curve of the former has a considerably greater straight portion than that of the latter.

**THE WIRELESS CONSTRUCTOR'S  
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# Practical Television

May 1st, 1937.

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## POINTS TO WATCH IN TELEVISION RECEPTION

IN the early days of radio many peculiar reception effects were experienced which tended at first to destroy some of the pleasure of listening, but this soon gave way to a fascination in fathoming the cause of these effects, and then trying cures. PRACTICAL AND AMATEUR WIRELESS was always to the fore in assisting its readers in this work, and now that television has a growing circle of lookers-in, the same service will be rendered for those taking advantage of the dual sight and sound transmissions. The propagation characteristics of the signal medium employed, that is ultra-short waves, are as yet a relatively unknown quantity. The original optical range of signal reception is being extended very materially, and sets are now installed at points which were thought to be right outside the signal area. Anyone who has looked in either regularly or occasionally cannot fail to be impressed with the results, and while in no way perfect they form a basis of investigation which gives ample food for thought and work for intelligent hands.

### A Tuning Point

Carefree switching on and looking-in may be desirable in many cases, but it is as well to realise that on some occasions faults evidence themselves and make their appearance on the screen in a variety of ways. For a television receiver to operate satisfactorily it must pass the full picture frequency which extends from zero to over two million cycles. In consequence many of the sets working on the superheterodyne principle have intermediate frequency stages of the bandpass type, and the carrier wave should operate in the middle of the bandpass if the full frequency range is to be encompassed. It is possible, however, to adjust the tuning of the set over the narrow range usually allowed so that the receiver lies on one edge of the bandpass. The signal frequency is therefore attenuated by one side of the bandpass and the picture will bear evidence of this by showing a lack of definition due to the higher modulation frequencies being absent.

### Interference Duration

This course is to be preferred in some cases where the received signal is quite low in magnitude and the gain of the set has to be increased to such an extent that the signal-to-mush ratio is reduced. The picture then exhibits a spotted or meshed appearance which destroys partially the pictorial effect and picture detail. On the other hand, if the degree of mistuning under the conditions mentioned is carried too far, then a peculiar form of distortion becomes apparent, which for want of a better name is often referred to as "plastic." The subjects portrayed in the reproduced picture seem to stand out in relief, while the loss of both the upper and lower frequencies of the modulation range destroy quite a proportion of picture detail, so that the condition should be avoided.

Quite a lot has been said concerning the effects of interference on a television picture

and the nature of the effect will, of course, depend on the source from which the trouble emanates. Motor-car ignition systems are still the worst offenders, and the degree of annoyance produced increases as the field strength of the vision signal decreases. Sometimes the small white splashes of light evidence themselves as wide bands stretching right across the picture and moving either up-or-down. On other occasions the spots are distributed quite sparsely over the screen. The length of each splash of light will enable the duration of the spark ignition to be calculated. Since the line frequency is just over ten thousand per second, each line takes a fraction under one ten thousandth of a second to trace. Assuming that in a picture 12ins. wide the length of the interfering light splash was  $\frac{1}{4}$  in., then the spark time would be less than one four-hundred-thousandth of a second. Figures of this nature make one realise the enormous speed with which the spot on the screen traces out the light and shade of the received picture.

increase above ground level up to approximately 50ft. In other words, therefore, if a television set user by means of a mast raises his aerial by only 20ft., then the television signal increases by 6 decibels or is twice the strength of the previous value. Service installation engineers should not be looked upon as pedantic, therefore, if they seem to stress unduly to a would-be television set purchaser that the results will be improved materially if a tall mast is employed for accommodating the aerial.

### Special Aerials

If it is awkward to position the mast on the house roof itself, or if the residence is on a main road, then it is essential to erect the pole at the end of the garden so as to be as free from interference as possible, and to obtain a high input signal. The radiated television signal from the London station is vertically polarised so that the receiving aerial should be vertical also, although when quite close to the transmitter a horizontal aerial inside the house will suffice. In localities of poor reception strength, or where the electrical interference is severe, special aerials can be employed, and it is known that most of the television companies are carrying out experiments in this connection.

With an ordinary simple vertical ultra-short-wave dipole the length should be just slightly less than half the wavelength it is desired to receive. With the television service now operating sound and vision are radiated on two separate and distinct wavelengths. Since most sets use one aerial for



An animated scene from "Café Cosmopolitan," which gives full scope to present-day television technique.

### Aerial Questions

In an effort to reduce the visible effects of interference many expedients have been tried. One suggestion was to incorporate a device which converted the white spots to black, so that although still present they would be less conspicuous to the eye. Repositioning the aerial will in many cases prove beneficial, especially if additional height is secured. The value of height cannot be over stressed too much and it is quite a good scheme to fix a mast to the chimney breast and place the aerial at the top. Field strength measurements have already been undertaken by the B.B.C. with the Alexandra Palace transmitter, and it is claimed that the signal increases in magnitude by 0.3 decibel for every foot

both signals a certain latitude is possible, but if it is desired to raise the vision signal to the maximum strength possible, then the dipole length should favour this wavelength (6.67 metres). If, on the other hand, the sound shows greater evidence of being upset, then the reverse will hold. The dipole aerial should give equal reception from all directions, provided it is not in close proximity to any form of metal shielding. To improve its reception in the direction of the desired television station, a second aerial of equal length, but having no electrical connection to the first, can be placed behind the main aerial. The distance separating the two can be a quarter of a wavelength, although half this distance may

(Continued overleaf)

### PRACTICAL TELEVISION

(Continued from previous page)

be found satisfactory in some cases. It is advisable, therefore, to carry out a few experiments to determine the best arrangement for your own locality. The effect of this reflector is to induce signal energy in the main aerial which will add to that picked up from the Alexandra Palace transmitter. With interfering signals from the opposite direction, however, the reflector interference energy induced in the main aerial is in the opposite direction. It is seen, therefore, that the reflector assists the desired signal but cancels out or materially reduces the undesired signal, and set performance is naturally improved.

#### Sudden Light Changes

In dissecting or reassembling a picture into its component light values there are enormous differences in the rapidity with which the light changes have to be effected, quite apart from the enormous number of light variations which constitute a complete picture. This can produce some peculiar effects which, under certain circumstances,

are visible on the picture screen, and since there is a mechanical analogy many television engineers have called the effect "ringing." Taking the case of a black section, say, the black evening dress coat of a male artist standing before a white background, when the scanning spot passes from black to white an enormously high frequency is represented. If either the transmitter or receiver amplifiers are incapable of extending up to this frequency, then the reproduced picture edge of black to white, which should be sharp, is "fluffy" or ill defined.

On the other hand, the magnitude of the signal impulse may be so great that, due to over-correction of the high frequencies involved, the light intensity change on the receiver screen may be forced beyond its proper level. The white edging to the black coat then becomes much whiter than it should be for an infinitely small space of time before it acquires the correct shade. This over-shooting or ringing effect (so called because of the struck bell analogy) is annoying, for it looks as if there are two

pictures of the same thing not quite coalescing. The white edging will always be seen on the right of the scanned object, since the scanning spot movement is from the left edge of the picture to the right. A careful examination may reveal two or three light-intensity changes like rings over the width affected, showing that the circuits have "resonated" before the damping restored the correct light level.

Of course, the same thing happens with a white dress against a black background, but since the edging is now black it is difficult to observe on the black background. If the fault is not in the transmitter amplifiers an overhaul of the vision receiver circuit will effect a cure, and it must not be confused with the "ghosts" which arise as a result of reflections from the upper electrified layers discovered by Watson Watt. By measuring the width of the edging it is possible to calculate the particular frequency which is over-emphasised in exactly the same way as was shown earlier in the article for car-ignition interference.

## TELEVISION NOTES

#### Feeder Wires

THE feeder wires connecting a dipole aerial to a television receiver should not, generally speaking, be joined. Should it be necessary to move the receiver, necessitating a longer aerial lead, it is desirable to substitute a new lead altogether. Although a join can sometimes be carried out satisfactorily, the danger is that it will cause reflections, giving rise to a double image on the screen.

Reversal of the output of the receiving section of a television receiver will cause a negative picture to appear on the screen. A similar effect is obtained when the receiver is situated so close to Alexandra Palace that a signal of exceptional amplitude is fed to the receiver. This is caused by the modulating arrangements in the cathode-ray tube working beyond the straight portion of its characteristics, so that an increase on the modulating arrangements brings about a decrease in the electron beam, the electrons being scattered, and prevented from passing through the gun.

#### Dipole Aerials

AMATEURS experimenting with television may be tempted to fix up a dipole aerial made of wire to avoid the trouble of making the conventional dipole with comparatively thick metal rods. While such an arrangement may appear satisfactory, it should be regarded with some suspicion, as a dipole so constructed is very sharply tuned, and may tend to cut the wide side band range of the vision transmission, with consequent loss of picture definition.

#### Multi-stage Amplification

MANY readers have enquired why it is necessary for so many stages of amplification to be used in a television receiver for the vision side, when only a normal number of stages are necessary for the sound side, particularly when it is remembered that the cathode-ray tube requires less input than the loudspeaker.

The sound transmission is of a sensibly normal character and permits of inter-

mediate frequency amplification of normal stage gain. The vision transmission has an abnormal side band width of nearly 2 megacycles (2,000 kilocycles). It is therefore necessary to design the I.F. amplifier to pass this enormous band width, which forces the coils to be designed with very low dynamic resistance, resulting in a very small stage gain, making four or more stages necessary to obtain quite a moderate overall gain. The I.F. coils are, in fact, shunted with resistance over both primary and secondary of abnormally low value

### EMPIRE RADIOTELEPHONE RATES.

The Postmaster-General announces that, on the occasion of the Coronation, the charges on the main Empire radiotelephone routes, which for the most part are at the rate of £1 10s. a minute, will be reduced to £1 a minute during the period from the 1st to the 31st of May inclusive. The £1 rate will apply to calls from any part of this country to Australia, Canada (First Zone), South Africa, India and Kenya.

Corresponding reductions will be made in the charges for extensions of these services, making the rate per minute for calls to New Zealand, £1 2s. 6d.; Southern Rhodesia, £1 3s.; Northern Rhodesia, £1 5s.; Ceylon, £1 2s.; and the Second, Third and Fourth Zones of Canada, £1 4s., £1 8s., and £1 12s. respectively. In the Canadian service, the reduced rates will be applicable only to calls over the direct London-Montreal route. All overseas calls are chargeable for a minimum period of 3 minutes.

of the order of 2,000 ohms. I.F. coils in ordinary broadcast receivers reach 200,000 ohms or more.

#### More Cable

MARKED speeding up in the laying of co-axial cable round London is noticeable for the large drums, clearly marked, are to be seen at many points on the planned route. The advantages of this cable are manifold, and a modified type is used in those large, flat installations where the transference of signals to the many receiving points has to be undertaken without any appreciable loss in strength, and a complete absence of amplitude or phase distortion. In the case of the very

long cable links, however, it must be borne in mind that before they can be put into daily service a long period of testing must be undertaken, for as yet the performance is a relatively unknown quantity in so far as television signals are concerned. This is due partly to the fact that repeater stations have to be added in order to compensate for the drop in signal, which must of necessity occur when sending any form of electrical signal over miles of cable.

#### Extra Programme Time

IT is stated in some quarters that viewers are to have an extra hour's transmission of television in the afternoon. The suggestion so far is that films only will be televised during this period, and that it will follow the usual 3 to 4 p.m. session. This is a step in the right direction, but it is most important to ensure that additional time is given in the evening when those in possession of receiving sets have a better opportunity of looking in. In any case, the B.B.C. of late has quite frequently overrun the allotted period by a further fifteen minutes. There is no necessity to work to exact time schedules as is the case with the network of the B.B.C. sound stations, and the efforts now being made to add to the variety and quality of the television programmes is most marked. Another point to consider is that technically the pictures are not yet up to the full standard possible with a 405-line definition.

#### For the Blind

IT has already been stressed how the deaf and dumb with a knowledge of the lip language can enjoy many of the present television programmes, whereas they cannot take advantage of the ordinary radio transmissions. Since television is a sight service, however, it is a little difficult to appreciate how it can be made suitable for appeal to the blind. This is the intention of one inventor, according to current reports, who is working on a scheme for the blind to "see" television pictures through their fingers. Due to the light intensity distributed over the resultant received picture an assembly of rods will be brought into action so that their ends raise from a level surface according to light values. Just as a blind person reads words through the Braille alphabet, so the resultant form of embossed picture produced by the rods will become intelligible to those without sight.

# On Your Wavelength

By THERMION



### The Search for Material

I SEE that Mr. Anthony Bertram has just left the B.B.C. for a tour of the country to visit listeners' homes where he will collect data for a series of talks. He will call on housewives and discuss their bathrooms, laundries, kitchens, the garden, and any other subject which, as a result of discussion, will tend towards the improvement of domestic conditions. I hope he pays particular attention to some of the baths, for many of those which I have seen in the blocks of modern luxury flats where people are herded together like sheep are deficient when it comes to human cleanliness. Everything there is for swank, and to give the impression that, although you are in service flats, they are really more expensive than a private dwelling. If you wish to bath you must squeeze yourself into some horrible little box.

### Germany's Short-wave Stations

ONE of the morning papers recently devoted a large proportion of its leader page to an article on Germany's Short-wave Stations. Our new stations at Daventry will be ready shortly, but the B.B.C. has not at its disposal the sums of money which the German Government provides for the building and maintenance of its short-wave stations.

We must remember that after the B.B.C. has paid the crooners and the muck bands, they have very little money left for development, and they really do very well.

I note that an average programme from Zeesen is as follows: 6 a.m., German folk songs; 6.10 a.m., concert; 7 a.m., news bulletin; 7.55 a.m., greetings; 8 a.m., news bulletin; 8.15 a.m., what's happening in Germany; 8.30 a.m., concert; 9 a.m., Hitler Youth calling; 10 a.m., bal-

lads and songs of Grieg; 10.30 a.m., news bulletin; 11 a.m., women's hour.

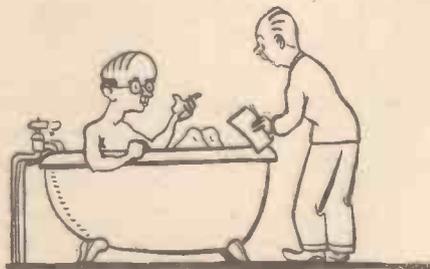
### Speakers' Voices

AT a recent conference at Birmingham Councillor Norman Tiptaft said: "The horrible examples



Germany's programmes.

we get sometimes of broadcast speakers with voices between a fog-horn and a crow wheezing out uninteresting platitudes like an old barrel-organ grinding out obsolete tunes are no good for talks on industry. Speakers' voices should be more carefully tested. The difference between an industry and a crooner is that the best industry is vitally alive, and the only good crooners are those that are irrevocably dead. This being a national institution, however, one must assume that somebody wants them, and agree on occasions to their filling the air with their



The bath in the modern flat.

horrible bleatings." Lady Bridgeman, Governor of the B.B.C., declaimed at the same meeting: "We have discovered it is not possible to please

everyone, at the same time one trouble is that the taste of the listening public does not stay put."

The italics are mine. If the taste of the listening public does not stay put, why do they continue with dance bands and crooners—mostly foreign crooners? No wonder there is so much unemployment among English variety turns.

### Brought to Task

A. P. R., of Bromley, brings me to task because he says he deplores the waste of my limited space in bandying words with K. B., of Hull. He says that a man in my position must always be open to receive scurrilous and impertinent letters, but as long as they are not libellous I ought to ignore them. He then makes the soft impeachment by saying that after all I am not a schoolmaster, but a much read columnist, and, as I have so often remarked, my success must be judged by the fire I draw.

### Gradually Coming

ON my way to town the other morning I noticed a large hoarding outside a wireless store proclaiming the fact that they were the leading television specialists for that district. Wireless started that way, and I am sure that it will not be long before the whole country is served with television programmes. I understand that most of the Stores which have been enterprising enough to install television receivers have been disgusted at the programme material, for the customers almost without exception say that they would not spend £80 to see such poor programmes. The programmes are too airy and highbrow. Why not a little more nonchalance, sang-froid and bonhomie?

The B.B.C. is hard up for money, and I suggest that it could conveniently sack about one-third of its staff and make the others work up to normal standard. There are far too many people floating about doing

about one erg of work per day and being paid mighty highly for it. Why not make them work? That's what they would have to do in any ordinary commercial business. The system seems to be to give a man a job, to give another man the job to do the first man's job, to provide the second man with an assistant, and an assistant for the assistant to the assistant of the assistant to the assistant of the man who should really do the job. You know, the Colonel told the Adjutant, the Adjutant told the Company Sergeant Major, who told the Corporal, who told the Private! There is too much signing of forms and too much writing of interdepartmental memos. B.B.C. men waste a dickens of a lot of their day writing notes to someone else in the same building and reading them from other colleagues in the same building. They could do the job in half the time, but, of course, they must set it on record that they have asked a question about a certain subject. It impresses people so! My advice to the B.B.C., and I have been in business for just a few more years than they have, is that a business can be ruined by red tape, and eventually you find the whole staff doing nothing else but filling in forms and keeping card indexes up to date. When the B.B.C. becomes businesslike and scraps a large chunk of its unnecessary personnel, we shall have better programmes.

#### Live Wires!

**I**NCIDENTALLY, here is the way they do things in America. We often grumble at the lack of "news values" or topical items, and this extract is taken from an American radio News Service sheet issued by a well-known network.

"Bob Booth, red-headed Mobile Unit engineer of 500,000-watt WLW and WSAI, is ready to call a halt on evening fires.

"Tired and dirty after a day in his laboratory, where he is perfecting a new unit, Booth went home about 6 p.m., March 31st and got under the shower. At 6.45 p.m., the WLW-WSAI news room called him.

"Big warehouse fire. Get the Mobile Unit there," snapped H. Lee MacEwen, news editor.

"Booth jumped into his clothes without drying, sped to the scene and several times during the fire WSAI listeners heard graphic descriptions of the blaze. The fire burned for hours and it was 5 o'clock the next morning before Booth finally dragged home to complete his shower and have dinner."



#### Eliminator H.T. Supply

**R**ELIABLE eliminators are found to be quite suitable for supplying H.T. to most receivers. There are several points to be considered when choosing an eliminator, however. Most of the commercial types employ a metal rectifier, and their voltage output is governed to a great extent by the consumption of the valves used in the set. If the valve consumption is low the voltage output is high, and vice versa. The eliminator should, therefore, be chosen to suit the receiver in use. If the receiver consumption is 10 mA., an eliminator having an output of 120 volts at 10 to 12 mA should be used. This type would be unsuitable for a set consuming 20 mA, however, as overloading of the eliminator rectifier would result. On the other hand, an eliminator having an output of 120 volts at 25 mA should not be used to supply a receiver requiring only 120 volts at 7 mA unless the manufacturers state that the output is reasonably constant up to approximately 30 mA.

#### For the Vitesse

**W**HEN a receiver has more than one H.T.+ lead a further precaution has to be taken—the tappings on the eliminator must provide the correct voltage. The voltage obtained at the tapping will be governed to a great extent by the current passing through the lead connected to the tapping, and, therefore, voltage measurements must be made by means of a high resistance meter when the set is working. Eliminators used for supplying the Vitesse should have two tappings, preferably of the variable type, so that the critical voltages for the screens and oscillator anode can be carefully adjusted.

#### Checking Data Sheet Voltages

**W**E often receive letters from readers stating that the voltage readings on their PRACTICAL AND AMATEUR WIRELESS receivers correspond with those on our published data sheets at all points except the S.G. screen and detector anode. When further inquiries are made, it is generally found that a cheap meter has been used for the tests. A cheap low-resistance meter will give a reasonably accurate measurement of battery voltages and voltages at points in the receiver where maximum voltage is applied, such as to the anode of the output valve and H.F. pentode. At points where the voltage has been dropped by means of resistances a high-resistance meter must be used if sufficiently accurate readings are to be obtained.

#### Radio Societies—Correction

**W**ITH reference to the list of clubs which I gave in the issue dated March 27th last I have now heard from Mr. Lawton, who was stated to be connected with the New Eltham Ratepayers Assn. Radio Section. He disclaims all connection with this society, and it appears that his name had somehow been confused. He is, of course, the secretary of the North Manchester Radio Society.

#### Useful Work

**A**S an example of the valuable work carried out by some Radio Clubs, listen to the following details, culled from a copy of the Coronation programme which the Southend Radio and Scientific Society recently produced:—

"Our chief obligation is the huge installation at the Southend General Hospital—presented by the Society at a cost of more than £600. Mr. H. Jagged and Mr. A. R. Knipe are immediately responsible for the efficiency of the equipment in the wards—175 pairs of headphones, 20 loudspeakers, and miles of wiring, not to mention plugs, volume controls and other auxiliary apparatus, all of which needs constant attention. The small band of helpers (including Miss Pauline Durrant, a lady member) give a large percentage of their spare time to this labour of love. Mr. Buckwell looks after the Crowstone Home for the Blind, and Mr. J. G. Ward does inestimable work, supervising the satisfactory working of no less than 60 receivers in the homes of necessitous blind persons. Then there is the Stamford Hill Cripples Home, which is similarly cared for. All of this work is carried on under the able direction of the Society's Honorary Charities Secretary, Mr. Fred Waller, of 49, Fermoy Road, Thorpe Bay, who would be very glad to hear from anyone who would care to help this work forward in any way. Disused receivers, which can be renovated and given to the blind people, would be especially welcome.

"We do everything—periodical visits, replacements, and repairs—and our services are given entirely free. All this costs not only the valuable time of our members but also much money. Every visitor to the Exhibition can help, if only by purchasing a shilling ticket in our Prize Scheme. WILL YOU?"

#### 50 Tested Wireless Circuits

By F. J. CAMM

(Editor of "Practical and Amateur Wireless")

Obtainable at all Bookstalls, or by post, 2/6  
2/10 from George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

A PAGE OF PRACTICAL HINTS

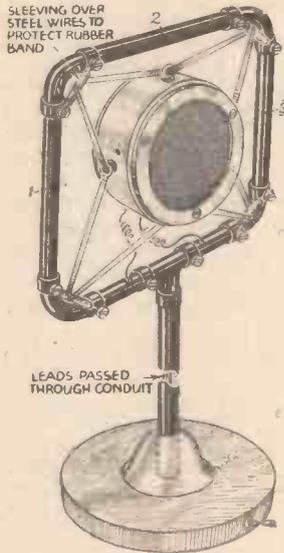
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Microphone Stand

A STRONG microphone stand can be made with metal conduit tubing, as shown in the sketch. First cut pieces 1, 2 and 3 to suit the diameter of the microphone, and to allow for the elbow pieces. Screw the parts together with a T-piece in the centre of the bottom member to take the upright piece of tubing which can be cut to a suitable length either for a table or floor stand model. A circular wooden block with a raised centre part is drilled a good fit for the centre upright through which the leads are passed. The design of the microphone will decide the method of suspension, but a good way is to attach short pieces of steel wire, covered with sleeving, across the corners of the framing, as clearly shown in the sketch. The sleeving protects the rubber suspension bands.—J. R. TWEEDY (Morpeth).

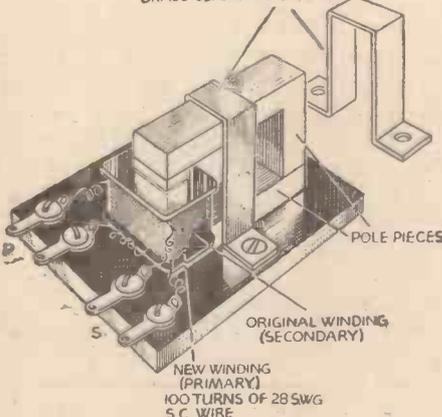


How a novel microphone stand may be built up.

A Home-made Oscillograph

WITH the aid of a moving-iron loud-speaker unit a simple but effective oscillograph, which may be used to analyse the output of a receiver, test for mains hum, etc., may be easily constructed. The

BRASS CLAMPING STRIP

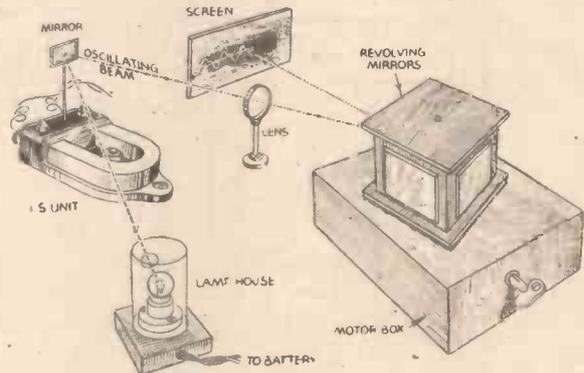


Mr. Lacey's suggestion for constructing a midget transformer.

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.

speaker unit is fixed in the centre of one end of the baseboard, with the armature stem arranged vertically. To this stem a small mirror is fixed. A flashlight bulb in a small lamphouse at one side of the baseboard is made to throw a beam of light on to this mirror, from which it is reflected and made to pass through a reading glass or other lens, which focuses the beam on to revolving mirrors. These mirrors consist of four pieces of mirror, each about 2in. square, arranged on the sides of a square box, as shown in the sketch, and mounted on the shaft of a clockwork or electric motor. The mirrors must revolve absolutely truly with no wobbling or jumping, and the motor must run at constant speed for a reasonable length of time. From the mirrors the beam is reflected on to a ground-glass screen, or it may be focused through a slit and thrown on to a screen. The speaker unit is connected to the output terminals of the set to be tested, when the output wave form will be shown on the screen. This simple oscillograph may be used for numerous other purposes.—F. W. GOODWIN (Tottenham).

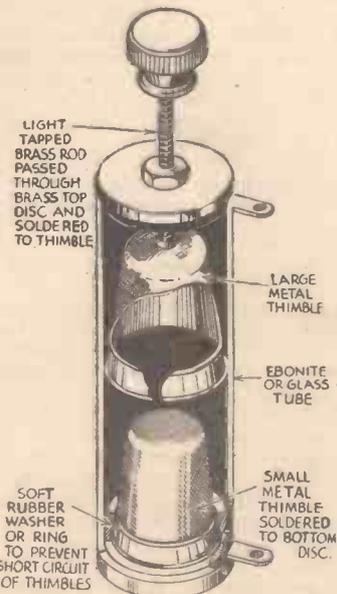


A novel home-made oscillograph.

the cost is next to nil. I first soldered a length of tapped rod to the largest of the thimbles, and after the other had been soldered to the base the whole was encased in an ebonite tube. An insulated terminal head provides the necessary control for capacity adjustment.—A. T. BASSETT (Edgware).

A Midget Transformer

A SERVICEABLE midget transformer, for use with the button type of microphone, can easily be made with a few



For very fine tuning a micro-variable condenser may be made as shown here.

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# LOCAL STATION

## The Pros and Cons of High Power and Circuits for Local Stations Discussed in

**F**AITHFUL radio reproduction, in the strictest sense of the word, is impossible, since the various processes of conversion, transmission, and reconversion all introduce limitations and are not good enough to ensure that what is heard is an exact replica of the original. Even a listener to the original is himself limited by the type of room in which the performance takes place, by his position therein, and also by his own hearing.

Unless the room in which the original is being played is free from reflections and echoes, the microphone, amplifier, control panels, land lines, transmitter, atmosphere, receiver, and loudspeaker are all 100 per cent. perfect, true reproduction cannot be obtained. Actually, every link in the chain between original and listener introduces some distortion, while, at the receiving end, exactly what is heard is limited by the fact that the ear is not equally sensitive

receiver required to produce this effect depends on the size and acoustic properties of the room, the position of the speaker in the room, and the listener himself. In other words, if an orchestral performance is being broadcast, the output from the receiver must be such as to render the reproduction of the same strength to the listener in his small room as it would appear to him in the larger concert hall.

Thirdly, the receiver must be designed so that it will accommodate the occasional extra loud passages without distortion or valve overloading, and it is essential, therefore, to have ample reserve power in hand.

freely suspended. Unfortunately, there is not a speaker available at the moment which will reproduce exactly what is fed into it by the receiver, but any of the larger "auditorium" models on the market will at least give a reasonable approximation to the original.

It is not generally realised that one of the most important components in a quality receiver is the output transformer, which must be designed as carefully, if not more so, than an intervalve model. Its characteristics should be such that:—

- (1) Its self-capacity is very low.
- (2) Its primary inductance is very large to avoid low note losses.
- (3) Its resistance must be low.
- (4) Its ratio must be such as accurately to match the output valve or valves to the loudspeaker.

### The Output Stage

The first question that governs the output stage is the source of H.T. supply, and it is clear that, since a minimum of six watts is necessary for faithful reproduction, valves of the PX.25 (or PX.4 in push-pull) type will be necessary. This means that A.C. mains will be necessary in order to provide the high H.T. voltage required.

The use of two triode valves in push-pull provides the equivalent of double the audio output of a single valve of the same type and, at the same time, cancels out harmonic distortion and hum, due to the valves working in opposite phase. Push-pull calls for more anode current at a lower voltage, it is very stable, and matched valves are not necessary. Overloading is practically avoided by this method, which is greatly

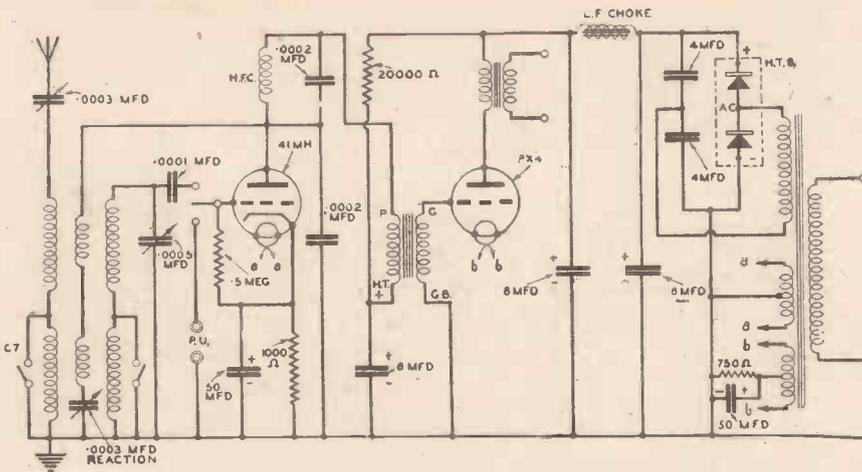


Fig. 2.—A 2½-watt mains receiver, ideal for the beginner in search of quality.

over the whole frequency range, and that different listeners' hearing imposes different limitations. That is why the "tone" of some receivers appeals to some more than to others.

For all practical purposes, it is safe to assume that the transmitted programme is free from distortion, and our problem is to design a receiver and loudspeaker which will reproduce this transmission exactly without any distortion or added effects. We want to design not a radio set, but a musical instrument.

### Frequency Range

Firstly, the frequency range of an average ear ranges from about 30 to 15,000 cycles per second, and it is necessary for the set to be able to reproduce these frequencies all at the same strength, i.e., the response curve of the receiver must be absolutely straight, so that a frequency of, say, 50 cycles will be amplified to the same degree as one of 1,500, 5,000 or 15,000 cycles per second.

Loud bass notes appear to minimise the effect of the treble, but the importance of this effect depends on the strength of the performance. If it is reproduced too loud as a whole, the bass becomes excessive, while the reverse occurs if volume is too low. Listeners must have noticed the different "tone" assumed by the voice of an announcer when reproduced at natural volume, whispering, or shouting. We see, therefore, that it is essential for faithful reproduction that the volume is that of the original, and the power output of the

A musical note consists of a complete range of frequencies and harmonics, and a small amount of harmonic distortion is permissible. A greater percentage of harmonic distortion, however, gives rise to harshness and, finally, to choking of the higher notes.

### Important Conditions

We can, therefore, summarise our design of a receiver to give faithful reproduction as follows:—

- (1) It must have a level response curve from 30 to 15,000 cycles per second.
- (2) It must have an undistorted power output, suitable for the room in which it is to be used and for the actual listener.
- (3) It must be able to accommodate occasional loud passages without distortion, i.e., the output stage must not be fully loaded on average volume.
- (4) Harmonic distortion must be low.

All the conditions referred to above are governed by the audio-frequency and output stages of the receiver, and these are, provided suitable components are used, quite easy to design. Even then, however, reproduction may be badly marred by the loudspeaker itself, and it is essential to use the best. It should have a diaphragm of at least 10in. diameter, and the cone must be

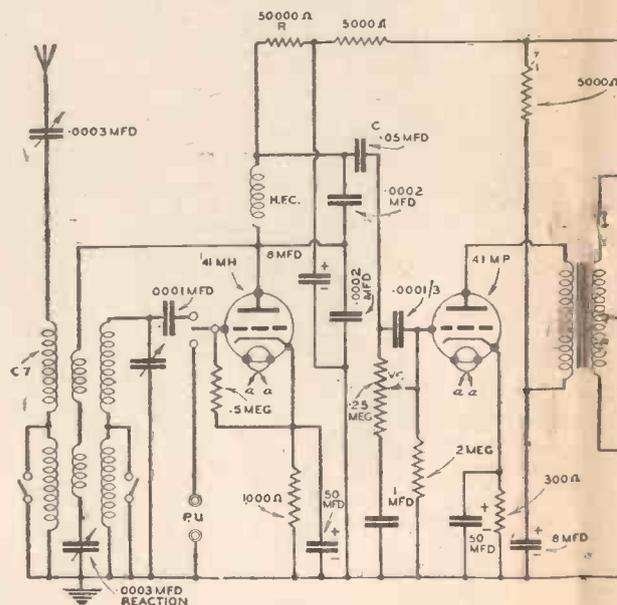


Fig. 1.—This quality receiver will give

# QUALITY SETS

h Fidelity Reproduction  
Station Reception are  
this Article

preferred to using a larger single output valve to provide the same output.

Pentodes, Class B or Q.P.P. amplification will provide the same audio output more simply, but these systems all contain a large percentage of harmonic distortion, and cannot be considered when quality of reproduction is the primary object.

To secure high and uniform amplification by the intervalve coupling, a good transformer is necessary. Much has been written about the defects of transformer coupling as opposed to the resistance capacity method, but if the transformer possesses the properties of high primary inductance, low leakage and low self-capacity, then it is to be preferred, as resistance capacity coupling gives but little amplification for the stage and great care must be exercised in the values of the components, choice of valves, etc. Even so, the latter method gives true amplification of even the very low notes, but the high anode resistance necessary for this means that a high H.T. supply is necessary. Otherwise, the voltage applied to the valve will be such that it is working on the curve of its characteristic, and hence it will introduce distortion. Further, it would be easily overloaded. It is, however, the ideal coupling where a large stage gain is not necessary, such as between the first and second stages of an amplifier, where the first valve is a leaky-grid detector.

The push-pull output stage referred to above using PX.4 valves or their equivalent, requires a total grid swing of about 75 volts peak, and this is a further recommendation for transformer coupling, as one valve with resistance capacity coupling could not deliver this output without overloading. A further valve would be required

to provide another push-pull stage prior to the output valves. One intermediate audio-frequency stage is used, and the valve chosen has a fairly low amplification with high mutual conductance. It is able to deliver the required grid swing for the output stage with a maximum detector output of 10 volts.

Unfortunately, perfect reproduction is only available to a listener who lives near to a local transmitter, and who listens to that station only, for an H.F. stage prior to the detector means added selectivity, and a narrower band width to avoid interference. This introduces distortion due to high note cut-off and the inherent characteristics of H.F. valves.

the maximum undistorted output of the receiver is six watts.

## Power Pack

The power pack consists of a mains transformer and a Westinghouse metal rectifier style H.T.11 giving an unsmoothed H.T. supply of 525 volts at 110 mA, allowing ample reserve to be dropped in the speaker field which should have a resistance of 2,500 ohms. The reservoir condensers should be rated at 1,000 volts D.C. working, to avoid breakdown under high H.T. surges when the set is first switched on.

The output stage is fed direct from the field winding, but the other valves are fed through a further L.F. choke, with appropriate decoupling condensers and resistances in order to give absolute stability with hum-free reproduction. The L.F. choke not only acts as a filter for the first stages, but also prevents any audio-frequency currents

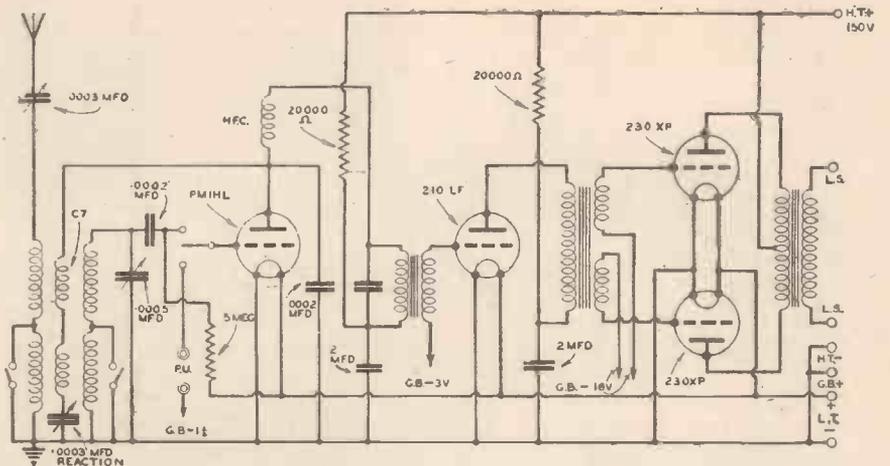


Fig. 3.—For the battery user this circuit will provide an output 1 watt, and may be operated from a battery eliminator if desired.

## The Detector Stage

Having dispensed with the H.F. stage, our choice of the detector stage is limited to two—anode-bend or grid leak rectification. Readers are referred to our article "The Importance of the Detector Stage" which appeared in the February 27th issue, from which it will be seen that the obvious choice is leaky-grid rectification, since it has an output free from distortion from the low input available, requires a low anode voltage, and thus lends itself to R.C. coupling between it and the intermediate audio-frequency valve, and its selectivity is quite sufficient for our purpose. If we use highly selective tuned circuits prior to the detector valve we shall defeat our own object by providing a band width at, at the most, 10 kc/s, and thus introduce high note cut-off. An H.F. transformer will be sufficient to give the required selectivity, and at the same time allow the set to reproduce all the received signal as it appears on the aerial.

The foregoing gives us the outline of our receiver, and it now only remains to ensure that the correct values of condensers, resistances, etc., are used to provide adequate decoupling, and give stability and absence of hum. The completed circuit diagram is given in Fig. 1 and

in the output power supply from getting back into the previous stages, and thus causing instability and motor boating.

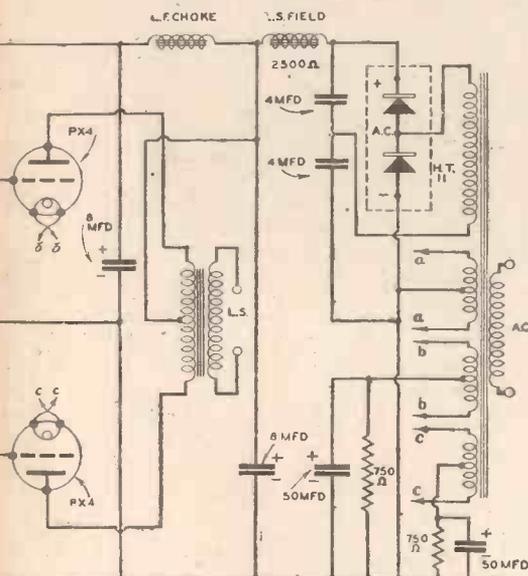
Note the separate filament supplies and biasing arrangements for the output valves. The output and intervalve transformers have already been discussed, and it is sufficient to add that the remaining components should be as carefully chosen.

The volume control is in the form of a variable grid leak for V.2, with special condenser arrangements to give constant tone, i.e., the treble and bass always bear a constant relation to one another, whatever the setting of the control. This arrangement gets over the difficulty usually met with in a volume control in this position, viz., that of poor high note response at low volume.

## Condenser and Resistance Values

The value of the coupling condenser C must be chosen with great care. If too small, there is a loss of bass, if too large distortion is introduced. The values of C and the volume control VC, and the anode resistance R all bear a constant relation to one another, and the values given are such that the amplification at 50 cycles is 90 per cent. of the maximum. The rule is—the anode resistance should be two or three times the valve impedance, the grid leak four or five times the anode resistances, and the value of C in mfd. multiplied by the value of the grid leak in megohms should equal 0.1.

(To be continued)



an output of 6 watts undistorted.

# Europe's Oldest S.W. Station

A Brief Résumé of Ten Years of Inter-Continental Broadcasting,  
with Particular Reference to the New Short-wave Station PCJ

**T**HE tenth anniversary of the first short-wave broadcast from Europe to the East is a notable wireless occasion that has recently been celebrated, and the romantic story lying behind it is one that cannot fail to be of interest to readers of PRACTICAL AND AMATEUR WIRELESS.

In the early days of wireless transmission the long and medium wavelengths were the only ones utilised to any great extent, but these proved by no means reliable and regular over distances of more than a thousand miles, and it became obvious that the key to the bridging of greater distances lay in the short wavelengths.

## First Short-wave Programme

The laboratories of the Philips works at Eindhoven, in Holland, thereupon took the initiative, and, after the most careful and comprehensive investigations, it was decided to construct an efficient short-wave transmitter. The result was seen on March 11th, 1927, when for the first time the voice of the new Dutch short-wave transmitter encircled the earth on a wavelength of 30.2 metres. From a small studio, the walls of which were hung with loose lengths of cloth to prevent reverberation, the first short-wave programme was sent forth on its long journey from Europe. Incidentally, it is interesting to note that it consisted mainly of gramophone records which were changed before each call signal.

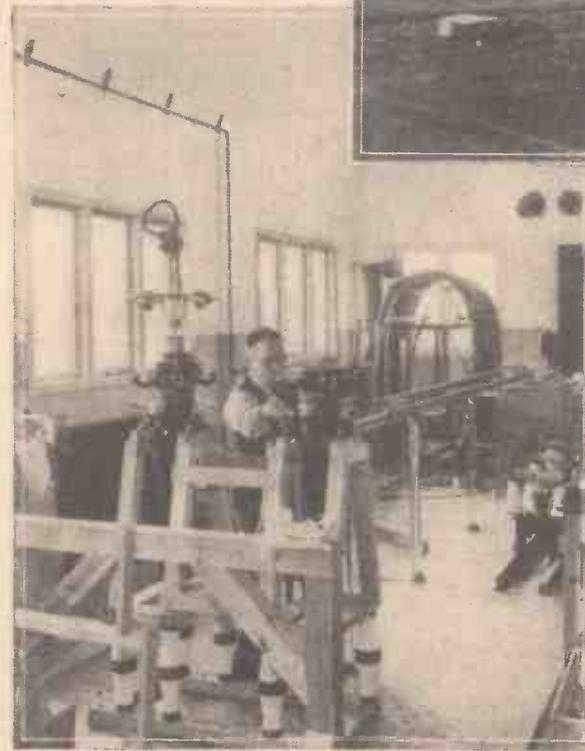
Success was immediate, and the next day a brief cable reading, "Marvellous short-wave reception," was received from Bandoeng, in the East Indies, and this was only the forerunner of many others recording excellent reception in Australia, New Zealand, South Africa, British India, South America, Canada, and even Japan. In fact, listeners in the United States reported that they could hear PCJJ—the call-sign of the new station—as clearly and powerfully as their own local stations!

## The B.B.C.'s Request

Nothing could better illustrate the success of this pioneer broadcast than the fact that on May 20th of the same year the B.B.C. requested the PCJJ transmitter to radiate the Daventry programme to the whole world. This transmission was also perfectly successful, so much so, that wireless stations in South Africa, Australia, New Zealand, and in many other parts of the world, picked up the short-wave programme and relayed it to their local listeners, using their

own wavelengths. Then, on June 1st of this historic year, PCJJ received its greatest honour when Queen Wilhelmina and Princess Juliana spoke for the first time direct to Holland's Eastern colonies.

The next problem was that of converting the experimental station into a permanent one. A plan was evolved which resulted in the formation of a limited company, "N. V. Philips Omroep Holland-India," briefly known as PHOHI, which was registered on June

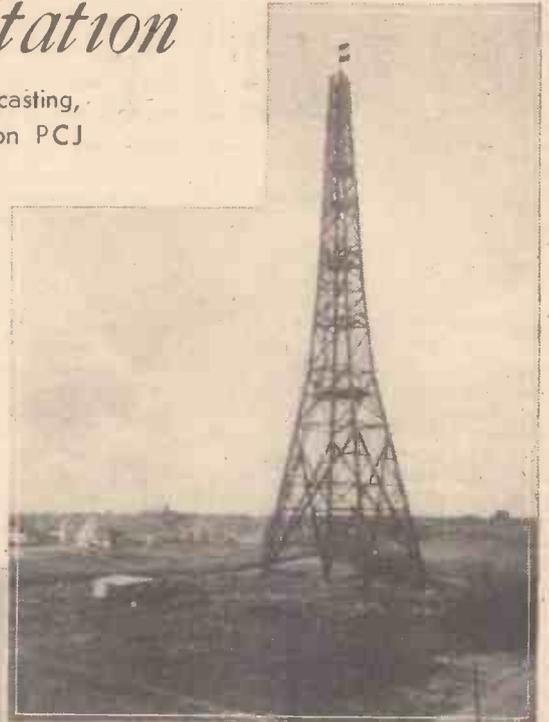


The upper illustration shows the aerial tower of the new PCJ station, and the lower is a view of the large water-cooled valves and tuning circuits.

18th, 1927. Regular transmissions henceforward took place on a wavelength of 16.88 m., with an output of 20 kilowatts, from a new short-wave transmitter built with the aid of the technical experience gained from PCJJ.

## S.W. Station "PHOHI"

In 1930, however, owing to certain difficulties in organisation, the successful activities of PHOHI were interrupted. The Dutch Government attempted to distribute the transmission hours of the new station to the political and religious broadcasting bodies, which resulted in the new station closing down. So well-known and liked was PHOHI, however, that protests were lodged from all parts of the world, and, as a result of these, transmissions were resumed after an interval of two years on December 24th, 1932.



It was then found that an extended period of sunspots had radically altered the conditions of reception. To meet these the transmitter was adapted for a second wavelength to be employed during the winter months. The experimental transmissions with the new wavelength of 25.57 m. gave such satisfactory results that in April, 1934, the PHOHI broadcasts were recommenced officially.

The old PCJJ transmitter, which was now given the call-sign PCJ, remained in service without interruption and acted as a relay station for the new PHOHI. Here, also, the transmitter was adapted for a second wavelength so that the two stations had four different wavelengths at their disposal, and, according to the season of the year, could use either the 16.88 m., 19.71 m., 25.57 m., or 31.28 m. wavelengths—an arrangement that remains to the present

day.

## Still Growing

Now modern radio conditions demand still further expansion, and a new PCJ is rising—on the shores of the Zuider Zee. Here, on the grounds of the PHOHI station at Huizen, the short-wave transmitter is being set up again and reinforced. The buildings are completed and, behind them, a steel auxiliary aerial tower is already being erected for the first experimental PCJ programmes.

Soon the wonderfully-shaped dipole aerial will be suspended in the high tower, there to carry the powerful voice of PCJ over countries and seas. When all is ready, PHOHI, supplemented by the reconstructed PCJ, will rank among the most powerful world radio transmitters.



Part of the new dipole-aerial ready for installation.

# THE BRITISH LONG-DISTANCE LISTENERS' CLUB

**A** MEMBER in Gibraltar sends an interesting report of some stations he has received and asks one or two questions concerning reception which other members may be able to answer. On March 21st he was listening at 16.45 G.M.T., when he heard on the 20-metre band station SVIKE calling "all stations on 10 metres." Signal strength was R7, quality poor, and the caller stated that he was standing by on 10 metres. After waiting a short time nothing more was heard of this transmitter. He says that there was also a German station causing some interference with G6AG, who was working SM5SV on 14,100 kc/s, and G6AG also heard it and remarked on the subject to SM5SV, stating that it might have been due to second-channel interference from one of the Zeesen transmitters. The German station, which was broadcasting a musical programme, closed down at 17.00 G.M.T. but no call was heard. What solutions can other members offer to this little problem, which may, of course, have been due to the particular local conditions?

This member also wishes to know



Mr. Croft in his 'den,' with a fine collection of QSL cards.

whether any other listener has heard a French-speaking station on about 8,950 kc/s broadcasting the programme of the medium-wave station at Algiers—heard at 20.45 G.M.T. on March 15th and 21.05 to 21.30 G.M.T. on March 21st. He states that announcements are also heard in Arabic.

## Japanese Programmes

From Mr. H. G. P. Williams, of Hove, we have received the following details concerning the Japanese Broadcasting Corporation's programmes, which may interest listeners:—

Stations JVM and JZJ, on 10,740 and 11,800 kc/s respectively, transmit daily from 19.30-20.30 G.M.T., announcing in Japanese and English. Programmes consist of news in English, and Japanese orchestral and social records, and originate

in the J. B. Corporation's studios at Atagoyama Field, Tokio. Starting to-day (March 25th), another transmission will be made, destined to America. Times of transmission, 21.00-22.00 G.M.T. Stations used, JVN, 10,650 kc/s, and JZJ, 11,800 kc/s. Also, on and from April 1st, an extension will be made to the languages used. On Mondays, Wednesdays and Fridays announcements will be made in English and German, while on Tuesdays, Thursdays and Saturdays English and French will be used. On Sundays English only will be used.

## Good Work

Member Croft, of Totterdown, Bristol, has sent a photo of his listening den, which we reproduce on this page. As will be seen, he has received a large number of veris, and since joining the club last September he has had 132 cards from 32 countries.

## Correspondents Wanted

Members who are anxious to get into touch with other listeners in different parts of the country may care to write to Mr. T. L. Stevens, of Post Office, Donnington Wood, Wellington, Shropshire. He is anxious to correspond with anyone in any part of the world and would like to start a Short-wave Club in his district. Mr. E. D. Fleming, of 6, Lindsay Place, Kelvin-dale, Glasgow, W.2, would also like to get into touch with other members of the B.L.D.L.C. in his district with a view to forming a branch.

# PETO-SCOTT EVERYTHING RADIO—CASH C.O.D. or EASY TERMS

**DO YOU KNOW?**

Do you know that you can obtain all your radio requirements from us either for CASH, C.O.D. or under our famous Easyway System? No matter whether you require complete Kits, or Loudspeakers, eliminators, pick-ups, or a selection of special components for a set you intend to build, we will be pleased to quote you our EASY TERMS without obligation. We are the oldest Radio by Mail House in the country and have been established since 1919, so you can order with confidence.

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**ALL-WAVE AERIAL**

- Eliminates Man-made Static.
- Increases Signal Strength on all Bands.
- Improves Selectivity.
- Waterproof and Weatherproof.
- Two Transformers.

Obtain utmost entertainment by using this Aerial Outfit, the first really economical solution for overcoming the noise of man-made static. **AERIAL OUTFIT COMPRISES** Duplex enamelled aerials, insulators, waterproof "lead-in" wire. Aerial and Set Transformers, assembled and ready with instructions and drawing illustrating the method of erection. **CASH OR C.O.D. 17/6** CARRIAGE PAID Or 8 monthly payments of 2/6.

## —CHARGE your L.T.— for 1/2d. A WEEK!

**Peto-Scott TRICKLE CHARGER**

- 12 months' guarantee
- Nothing to wear out or go wrong
- Modern metal rectifier
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- Charges your 2v. accumulator at 1/2 amp.
- 7 days' approval against cash

End outlay for accumulator re-charging. Never be "left without your Radio" because your L.T.'s run down. The new Peto-Scott 1/2-amp. Trickle Charger charges your 2-volt accumulator at 1/2 amp. while you sleep. Wonderful fully efficient. Simple to use. A.C. Mains. 200/240 volts, 40/100 cycles. Cash or C.O.D. 12/6. Overall dimensions: 3 1/2" high, 2 1/2" diam.

**CASH 12/6** PRICE

## NEW 6-valve 8-stage ALL-WAVE CHASSIS

**A.C. MAINS CHASSIS**

**4 WAVE BANDS** 11.9-2,000 metres.

Overall Dimensions: 9" high; 14 1/2" wide; 11 1/2" deep.

**Cash or C.O.D. £8:17:6** with 6 British Valves.

**12 MONTHS GUARANTEE.**

● 4 Wavebands: 12.9-35, 35-81, 200-550, 900-2,000 metres ● Inter-station noise suppressor ● Bandpass input ● A.V.C. ● Independent Volume and Tone Controls ● Station and wave-length calibrated dial.

**BRIEF SPECIFICATION.** The last word in 6-valve all-wave circuits. High quality output ensures excellent reproduction. Highest grade British components. Circuit: Bandpass input to Hexode-Triode, Frequency Changer valve as Detector Oscillator, Bandpass Intermediate Frequency Transformer coupled to Variable-Mu H.F. Pentode as I.F. amplifier. Double-Diode as second detector coupled to triode I.F. Amplifier, resistance-coupled to a power triode output valve giving 3 1/2 watts output. Full vision dial and slow motion drive are fitted. Supplied complete with 6 British valves. For A.C. Mains only, 200-250 volts, 40/80 cycles. Cash or C.O.D. Carr. Paid £8/17/6, or £1 down and 11 monthly payments of 18/-.

**£1 DOWN**

## —H.T. for 1d. a Week—

**Peto-Scott H.T. ELIMINATORS**

Costs only a penny a week to run!

Model A.C.12 Eliminator.—Suitable for sets operating on an output of up to 12 m/A. A.C. 200/250-v., 40/100 cycles. Output 120-v. at 12 m/A. 4 Tapplings, 60-v., 75-v., 90-v., and 120-v. Cash or C.O.D. Carriage Paid 30/-, or 2/6 down and 10 monthly payments of 3/-. MODEL MA 10/30 Eliminator and TRICKLE CHARGER, £2/19/6, or 5/- down and 11 monthly payments of 5/8.

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## Peto-Scott ALL-WAVE S.G.3 BATTERY CHASSIS

**with S.G., Det. and Pen. Valves.**

● 4 WAVE-BANDS: 14-31, 28-62, 200-550, 900-2,100 metres. ● Double ratio slow-motion drive, 8-1 and 100-1 reduction. ● New rotary type low-capacity switch, with silver-plated contacts ● Air-plane colour-coded dial (stations and wave-lengths) ● 12 months' guarantee.

**BRIEF SPECIFICATION:** For reception of a high order all day and every day, from all parts of the world. 3 British valves: Variable-Mu H.F. Pentode, High Efficiency Detector and Harries' High Efficiency distortionless output pentode. Variable selectivity by alternative aerial tapplings. Stove enamelled pressed-steel chassis. Screened air-cored Broadcast coils. Dual electrostatically screened short-wave coils. H.T. consumption approx. 12 m/A. Each chassis supplied complete with Screened Grid, Detector and Pentode output valves. Fully tested on all wavebands before despatch. Cash or C.O.D. Carr. Pd. £3/19/6, or 5/- down and 11 monthly payments of 7/8.

**5/- DOWN**

All Postal Orders must be crossed and made payable to Peto-Scott Co., Ltd. All currency must be registered. **PETO-SCOTT Co., Ltd., 77 (Pr.W.32), CITY ROAD, LONDON, E.C.1. Cissold 9875-6-7** 62 (Pr.W.32), HIGH HOLBORN, LONDON. W.C.1. Holborn 3248 ESTD. 1919

## BRIEF RADIO BIOGRAPHIES—8

By RUTH MASCHWITZ

### Claude Gardner

CLAUDE GARDNER has many experiences to tell of his career as a comedian, which sound amusing in retrospect but must have been extremely painful at the time.

His first job was in variety at a music-hall in the East End. He shared a dressing room with eight others and a number of snakes which were kept in a basket, but always managed to escape. On his last night, the confusion was so great that poor Claude lost his shirt. As he was making his way out the manager called him into the bar and suggested another booking. Claude was delighted and offered him a drink.

"Hi!" cried the manager to a group of men standing by. "This gentleman would like you to drink with him." To Claude's embarrassment, everyone immediately ordered a brandy and cigar! When he had paid the bill he had a penny left! This necessitated a walk from the East End to West Kensington, shirtless and clutching a huge paper parcel containing his costume and properties.

In those days acting was often a literally dangerous profession, for numbers of the audience used to go armed with a variety of missiles ranging from rotten eggs to 7lb. weights and knuckle-bones, which

they threw at anyone on the stage of whose performance they did not approve.

On another occasion, Claude's life was endangered by fire. During a fit-up tour he was on the stage doing his turn when he happened to look up into the flies and saw that the whole outfit was in flames. With great presence of mind, he went on with his patter and at the same time managed to attract the stage-manager's attention. The fire was put out by a stream of water which drenched the actors to the skin.

The longest journey Claude ever had to make to be in the theatre in time was when he accepted an invitation to fish in Scotland one Sunday. Inadvertently, he got into the wrong train, and when he arrived at his destination was told that there were no Sunday trains to Glasgow. To reach his matinee in time he had to cross to Larne in Ireland, go on to Belfast, then Dublin, catch a boat for Holyhead, go by train to Chester, and so to Glasgow. A good fishing story.

### Stanelli

STANELLI is best known over the air for his "Bachelor Parties" and the Hornchestra. He is also an able violinist and has studied music since the age of five.

His first public appearance at the age of 16 was a failure, for he got the bird! Thrilled to the core at having an engagement at the Chelsea Palace, he practised a long classical piece which was quite unsuitable for his audience. Half-way through his performance the crowd became restive, and before he had finished

they began to clap rhythmically. A wealthy patroness of Stanelli's was sitting in the stage box, and he was horrified that she, too, had joined the clapping. The curtain was rung down, and almost in tears Stanelli rushed to his dressing-room. Five minutes later there was a knock on the door and his patroness sailed in, wreathed in smiles.

"Splendid, my dear!" she said. "I was delighted. The audience was so pleased with your performance that it began to clap before you had finished, so, of course, I joined in!"

The Hornchestra, an instrument of Stanelli's own invention, has broadcast many times. It is composed of motor-horns of every size and shape, with varying pitch and tone, on which Stanelli plays tunes. The idea of such an instrument occurred to him one day when he ran out of petrol driving in the Haymarket, and held up the traffic for five minutes. The resultant blast of horns made by the block of cars behind him gave him inspiration!

It took three months to complete a comprehensive collection of "notes." One particular horn, heard in the West End, he tracked down to Leighton Buzzard. Its owner was filled with suspicion when he was offered a brand new Klaxon in exchange for his own hooter, which had cost 4½d.!

During the War, when his battalion was ordered to France, Stanelli was asked to take his violin with him. He protested, but an offer was made for transport, and from Dover to the front line the 14 men in his draft each took it in turn to carry the fiddle.

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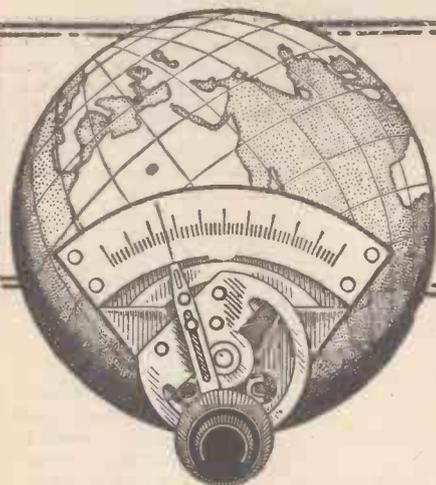
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# SHORT WAVE SECTION



## UNUSUAL S.-W. COIL DESIGN

Details of Some Short-wave Coils which May Be Constructed for Experimental Purposes - - - - - By W. J. DELANEY

**O**WING to the fact that coils for short-wave work only require a few turns, and that such complications as wave-change switching and ganging or matching are not required, the construction of these components provides the keen amateur with a very fruitful source of practical experiment. We have already given details for winding coils on the standard 4 and 6-pin formers which are now readily obtainable for the purpose (See PRACTICAL AND AMATEUR WIRELESS dated May 9th, 1936). But there are

STANDARD 4-PIN S.W. COIL FORMER.

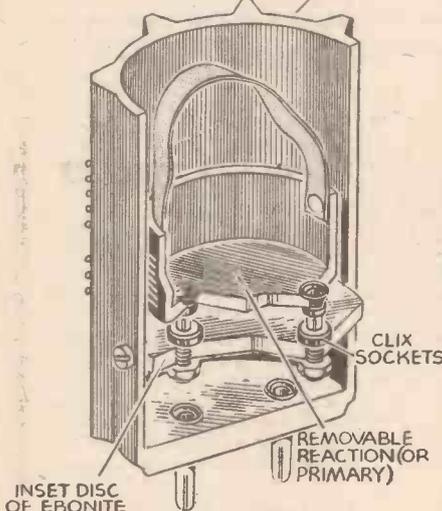


Fig. 1.—Suggestion for making one section of a S.W. coil on a removable former for experimental purposes.

### Plug-in Reaction

Accordingly, a plug-in reaction or "tickler" coil is a valuable feature, especially in an experimental rig-up where circuit modifications may be made from time to time for test purposes. Alternatively, the primary winding on the coil former may be employed for reaction purposes, and the plug-in winding may be employed for coupling purposes. Experiment will show which winding will provide the most useful source of experiment in this respect. A simple way of making such a device is to wind the grid coil (with or without a primary winding) on a small ebonite former provided with pins on the base in the usual way. Inside this former a small disc or block of ebonite should be inserted and this should be provided with two sockets of the Clix parallel type. A small former is then obtained upon which a reaction winding may be placed and the lower end of this former is provided with

two Clix plugs, so that the former may be inserted inside the normal coil. A small loop of leather attached to the former will enable it to be withdrawn when desired and will facilitate changes. As an alternative idea the standard four-pin short-wave coil former (1 1/4 in. in diameter) may be used for the reaction winding, and two of the pins may be removed. The grid coil may then be placed upon a length of the standard 6-ribbed ebonite former of sufficient inside diameter to accommodate the smaller former, and a base and plugs may be fitted in the usual manner.

### Dipole Coupling Coil

Another type of coil which may easily be made is that intended for use with a dipole or other aerial where a twin feeder is used. It will often be found that the coupling between the feeder and grid coil may best be carried out by winding a single turn round the grid coil, but the actual position of this coupling coil will be found to affect results. One scheme which is very useful is to wind it with an electrostatic screen between the two coils. To do this, the grid coil is wound in the usual way, and over this two or three lengths of ebonite are placed to act as spacers. The distance apart, or thickness of the spacers will again offer scope for experiment. Round these spacers a piece of aluminium or copper foil is placed, and this should be of such a size that the ends do not quite meet. A gap of about 1/8 in. to 1/4 in. should be left. A layer of thick brown paper, insulation tape or other material of a like nature should then be wrapped round this screen, and one or two turns of thick wire placed round this, the ends being joined to the ends of the twin feeder. A wire is soldered to the metal foil and is connected to earth.

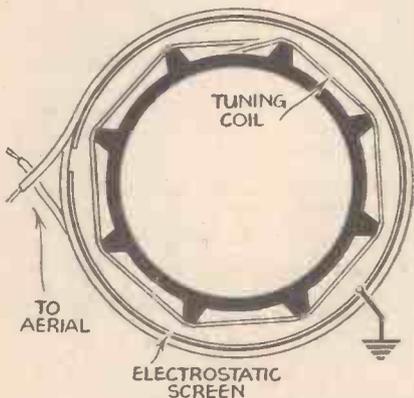
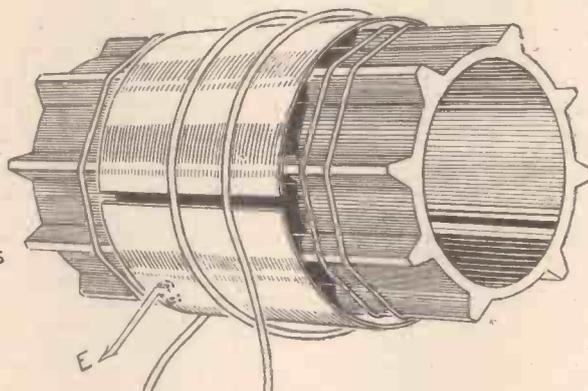


Fig. 2.—A form of aerial coupling which has some very useful applications. In the upper illustration the screen has not been covered in order to make the arrangement quite clear.

many circuits used in short-wave reception where coils of a different type may be employed, or are essential, and these will now be described. The commonest difficulty met with by the beginner is the reaction circuit design, and when making a simple coil the reaction winding is often placed at one end of the grid coil or is interwound with it. This means that some experimental work has to be carried out whilst the coil is being made in order to find the most satisfactory size of reaction winding. When the detector valve is changed, or other circuit alterations are made, this particular winding may not be found so satisfactory. The reaction condenser only provides a certain adjustment, and the actual number of turns and their relation to the grid winding are of considerable importance.

The feeder (or the end of the small coupling coil) must not be joined to earth, but where it is desired to use an ordinary aerial system, with the coupling coil functioning as an aperiodic aerial coil, one end may be earthed. Such an arrangement would, of course, only be employed for experimental purposes in view of the weakness of the coupling which is provided. Such a coil may be used in arranging a Collin's Coupler for a transmitter, with suitable fixed condensers in series with the ends of the coil to avoid the high voltage on the tank coil from reaching the aerial, and several variations are possible.

# Directional Aerials

## Directional Aerials

**R**ESULTS on the short waves, both from the point of view of transmission and reception, are considerably improved when a directional type of aerial is employed. As it is necessary to change the direction in order to give the widest range of reception, this means that the aerial array must be capable of movement, and in this respect various difficulties arise. The simplest scheme is to build a dipole (with a thin copper rod rather than wire) and to arrange for the dipole to give maximum response on the band in general use. A reflector should be arranged, half a wavelength behind this dipole, and the two may conveniently be mounted on a wooden framework erected on the roof. Means must be provided inside the house for rotating the aerial array, and preferably the movement should not be continuous, but stops should be inserted so that it can only be turned through 360 degrees. This will avoid difficulties due to the feeder wires becoming entangled, and will greatly facilitate the erection of the structure.

A framework may be made from deal scantlings, say 1 in or 1½ in. square section, screwed at the corners and well creosoted. An inner framework to suit the overall length of the dipole should then be constructed and a length of timber placed in

the centre with inserts of metal to form pivots. They must be well greased to avoid sticking due to the effects of rain, and at the lower end a large diameter pulley (obtainable from shops which sell the well-known constructional toy) may be fitted. This will enable the frame to be rotated from any distance, but if desired, the central pivot could be taken down straight through the roof.

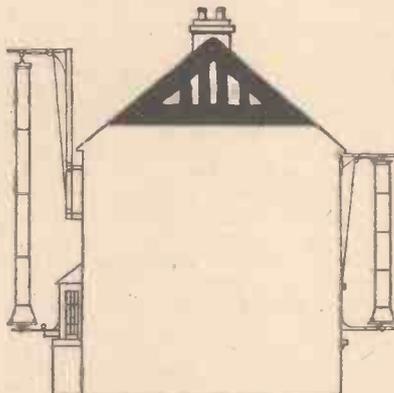


Diagram showing two methods of using the directional variable aerial system.

## Multi-reflectors

Experiments may be made with more than one reflector, and the distance may also be varied in relation to the aerial proper. If more than three reflectors are employed they should be arranged in the form of a parabola, and naturally a more rigid structure will have to be constructed to accommodate the added weight. It will be found, especially on the television wavelengths at long distances from the London station, that a multi-reflector of this type will prove very valuable in giving increased signal strength with diminution of interference.

## The Variable Directional Aerial

A variable aerial equipment may be obtained from the manufacturers at 62, Costa Street, Middlesbrough, Yorks. This consists of all of the essential parts with brackets, wire, etc. It is complete with a blueprint and assembly, and will be found to offer a very useful method of overcoming interference and giving improved results. A leaflet is supplied showing methods of using it, and the accompanying illustration shows two suggestions. A special tuner unit is obtainable for use with a receiver employing ordinary 4-pin or similar plug-in coils, and the design is such that it will operate efficiently right down to 10 metres, although arrangements are being made, and tests are being carried out, to lower the minimum still further. The price varies from 19s. 6d., according to the particular kit supplied.

## Budapest's New Schedule

**O**N April 3rd last a new schedule of broadcasts was brought into operation for Hungary's two short-wave transmitters. HAS3 working on 19.52 m. (15.37 mc/s) is now on the air every Sunday from B.S.T. 15.00-16.00, and HAT4, on 32.88 m. (9.125 mc/s) every Monday, Thursday and Saturday from B.S.T. 01.00-02.00. Reports should be addressed to Radiolabor, Gyali-Ut, 22, Budapest (Hungary).

## Short-wave Station in Curaçao

The first short-wave station to be installed in the Netherlands West Indies has been opened at Wilhelmstad, the capital of Curaçao. It operates on 31.67 m. (9.475 mc/s) daily; the call-letters are PCJ-1.

## Madagascar on Three Wavelengths

With a view to ascertaining the most favourable frequency for its broadcasts, the French colonial station FIQA at Antananarivo (Madagascar) simultaneously transmits on every weekday between B.S.T. 19.30-20.30 on 25.40 m. (11.810 mc/s); 31.5 m. (9.523 mc/s) and 49.96 m. (6.005 mc/s). All announcements are made in the French language, the call being: *Ici station Française de radiodiffusion coloniale et équatoriale—Ici Tananarive*. Reports which are greatly desired by the organisers should be addressed to Direction des P.T.T., Hotel des Postes, Place Colbert, Tananarive, Madagascar.

## An Enterprising Ultra-short-waver

W6XKG, Los Angeles (California), the experimental station of the Don Lee Broadcasting System, according to its announcements, is now on the ether

# Leaves from a Short-wave Log

twenty-four hours daily. The frequency is 25.95 mc/s (11.56 m.). Many of its broadcasts have been clearly picked up on the other side of the North American continent even during the brightest hours of the day. Reception reports should be addressed to Station W6XKG, 1076, West Seventh Street, Los Angeles, Cal., U.S.A. British correspondents say that the transmissions from W9XAZ, Milwaukee (Wis.), on 26.4 mc/s (11.36 m.) are regularly heard in the United Kingdom. The difference in the frequency used is not a big one and therefore a search for the Los Angeles transmitter is warranted, and should meet with success.

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## Japan Goes Ahead

The Japanese Broadcasting Corporation has received so many letters of appreciation from European listeners in respect to the special programmes transmitted through JVM, 27.93 m. (10.74 mc/s), and JZJ, 25.42 m. (11.8 mc/s), that it has decided to give all announcements in foreign languages to make the broadcasts perfectly clear to a larger number of foreigners.

English is now heard in all transmissions; German is added on Mondays, Wednesdays and Fridays; and French on Tuesdays and Saturdays. Following the broadcasts for U.S.A. and Europe, which close down nightly at B.S.T. 21.30, the stations reopen with an exclusively Japanese programme at B.S.T. 22.00.

## Another Mystery Solved

During the past month or so listeners have been puzzled by the reception of a French broadcast on 33.48 m. (8.96 mc/s) and 24.75 m. (12.12 mc/s). These transmissions do not, as was hitherto believed, emanate from Paris Radio-Colonial, but from FVA, Algiers (Eucalyptus), of which the main duty is a public radio-telephony service with France. The station has been carrying out tests with the rebroadcast of the Radio Algiers medium-wave programme occasionally on 33.48 m., and at other times on the lower wavelength between B.S.T. 19.30-22.00.

## Have You Logged Chile?

Listeners report having heard broadcasts from CEB, Santiago (Chile), on 24.32 m. (12.381 mc/s) between B.S.T. 22.30 and midnight. The interval signal would appear to be a bugle call, and the announcement in Spanish includes the words: *Transmision del Radio Santiago de Chile*.



# 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).

### An Amateur's Results

SIR,—I have never yet read in your columns of anyone claiming a large number of stations logged over a period of years, so I hope the following details will interest other readers.

During the last eight years I have logged 10,024 different stations in 130 countries. This total consists of:—

- 8,898 amateurs in 112 countries.
- 833 ships and commercial stations.
- 293 broadcasters.

I have 600 QSL cards from Hams in 78 countries, and have heard hundreds of Hams on 28 mc. in 40 countries.

Of course, the largest country is U.S.A., which totals about 4,700.

I hold the H.B.E. (Heard British Empire) Certificate, and first, second and third Certificates for R.S.G.B. reception contests in 1933-4-5.

My receiver is 0-v-2, battery valves, home-made coils, covering 8 metres to 2,000 metres.

Perhaps some PRACTICAL AND AMATEUR WIRELESS reader can better this, so what about it?

I have been a PRACTICAL AND AMATEUR WIRELESS reader since No. 1, and think it is as good now as No. 1 (or even better).—  
CECIL A. BRADBURY (Burton-on-Trent).

### Quality Receivers

SIR,—I am writing to you in the hope that I shall receive the same consideration as reputed "multi-year" readers. I have been a follower of PRACTICAL AND AMATEUR WIRELESS for a little over six months now, during which time I have obtained an appreciable amount of information from its pages.

To get down to brass tacks, I had a quality set built for me by a "local expert" some twelve to eighteen months ago. In justice to the builder, or designer (if he designed it himself), the set does give reasonably good quality. The main components are also of the best, comprising two H.F. pentodes, double-diode-triode detector, and a Ferranti transformer coupled Mazda PP5/400 output valve, Colvern and Polar four-gang coils and condensers.

I almost forgot to mention; the set is for A.C. mains.

However, I am of the opinion that it does not compare with a properly designed set with correctly matched components. The only two quality sets shown in your blue-print list are the A.C. Hall-Mark and Universal ditto, both of which are—as you must admit—too old to compare with the present-day standard of fidelity reproduction. Therefore, I am asking that a hundred per cent. quality set—or receiver with amplifier separate—be designed. I feel sure this must be the cry of hosts of other PRACTICAL AND AMATEUR WIRELESS readers. After all, your readers are not confined to batteries and short waves, the material for which has occupied PRACTICAL

AND AMATEUR WIRELESS pages for the last six months.—A. N. DOWNES (Brooklands, Cheshire).

[We do not admit that the receivers referred to are too old to compare with present-day standards. The circuits employed in these receivers are quite straightforward and, when properly operated, will give as good quality as can be desired under modern conditions. However, probably one of the circuits included in the article on Quality in this issue will be of use to you.—ED.]

### Practical Home Recording

SIR,—With reference to the article on this subject in your issue dated March 20th, 1937, I wish to point out that the "Simplat" blank consists of a glass base, with a surface coating of a gelatinous composition, and is neither "bakelite" nor "wax."

It is true, as Mr. Delaney suggests, that a worn steel play-back needle can be used for cutting, but this practice is not advisable, as it will result in badly-shaped grooves and undue surface-noise. A sapphire stylus for cutting should always be employed.

In the penultimate paragraph (page 16)

CUT THIS OUT EACH WEEK.

## Do you know

—THAT screened leads should be employed with care as the screening adds to the stray capacities in tuned circuits.

—THAT in obstinate cases of mains hum it often pays to ignore the centre-tap in the heater transformer winding and provide an artificial centre-tap by means of a hum-dinger or similar component.

—THAT when using a battery variable-mu valve the grid bias battery must be disconnected from the potentiometer when the receiver is not in use, or it will discharge itself through that component.

—THAT the above arrangement may easily be carried out by using a three-point on/off switch.

—THAT in obstinate cases of interference from static, a buried aerial (or the use of the earth as an aerial) will often avoid the trouble.

—THAT an indirectly-heated mains valve cannot be used successfully as an anode-bend rectifier with automatic bias unless special precautions and circuit arrangements are adopted.

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.

of the article "B.G.N." needles are mentioned; these should, of course, be "B.C.N.," i.e., Burmese Colour Needles.—D. ALDOUS, Technical Consultant, Messrs. V. G. Manufacturing Co., Ltd. (Park Royal).

### Selenium

SIR,—Re the statement regarding selenium, in "Do you know," of April 10th, I should like to quote the following extract from an advanced "Text-Book of Inorganic Chemistry," by Partington:—

"Metallic Selenium which has been heated for some time at 210°C. has the remarkable property of possessing an electrical resistance which varies on exposure to light. . . ."

Also "Metallic selenium is formed when ordinary selenium is heated to 200-220°C.

. . . It is insoluble in carbon disulphide, but is soluble in chloroform."—J. GLICKMAN (Eastbourne).

### A Problem Solved?

SIR,—In "Queries and Answers" in your issue of April 10th, G. R., from Penge, asks about a station beginning I or CL. You say you cannot find a prefix CL. Might I suggest that CL is short for a station like I(No.)CL. Amateurs in England and France call one another like this; e.g., "G6KZ" might be called "6KZ" or "KZ." So this station could be something like I4CL or I5CL.—R. TRIEFUS (N.W.3.)

### Scottish Broadcasting Stations

SIR,—Some time ago you published my report on short-wave reception in the Highlands. Now, I would like to submit my report on medium and long-wave reception here, and also, to raise some questions about the service provided.

Droitwich, on 1,500 metres, for a 150 kW station is very poor indeed, and is always subject to a bad heterodyne whistle. On this station fading is bad, and this, together with local electrical interference, makes the programme value at almost all times worthless.

Scottish National, 50 kW, on 285.7 metres, is subject to bad fading, and is most unreliable, as are the low power (20 kW) Nationals on 261.1 metres. Thus, as can be seen, a reliable National programme is not provided in the Highlands.

The new station at Burghead gives superb service. Thus the Regional programme is excellent.

The question I should like to raise is this: Why should a new 5-kW station be built at Nigg, Aberdeenshire, to radiate the Regional programme, when the National service is so deficient? Surely Burghead, 60 kW, can supply Aberdeen, only 65 miles distant, with a Regional programme.

My second question is: Why cannot a National transmitter be built at Burghead and synchronised with the Scottish National on 285.7 metres to supply the North of Scotland with an efficient National programme?—A. H. MILLER (Strathpeffer, Ross-shire).

[We invite the B.B.C. to reply to these criticisms.—Ed.]

### Correspondent Wanted

SIR,—I have become greatly interested in "Short Wave" work. I have built the "Prefect 3" and am surprised by its performance and would be pleased to receive correspondence from any reader who has constructed this excellent receiver.—A. A. D. CASTELL (11, Calderon Road, Leytonstone, E.11).

**QUALITY**

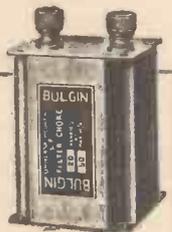
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**Facts and Figures**

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**Hivac Midget Valves**

IN a recent issue we gave base connections and other data relative to various valve types and mentioned that the Hivac midget valves were available in three types only. It has been pointed out that this may lead to the supposition that there are only three midget valves, whereas there are actually five such valves. One of these is an S.G., one an output pentode and the other three are triodes, thus dividing the valves into three types or classes, as mentioned in the article in question. For the benefit of those readers who are anxious to utilise these valves in portable receivers we give below the main characteristics.

Type XSG: Anode volts 120 max.  
Screen volts 60 max.

Amplification factor 375.  
Impedance 500,000 ohms.

Type XD: Anode volts 100 max.  
Amplification factor 16.

Impedance 23,000 ohms.

Type XL: Anode volts 100 max.  
Amplification factor 12.

Impedance 14,000 ohms.

Type XP: Anode volts 100.  
Amplification factor 5.

Impedance 5,000 ohms.

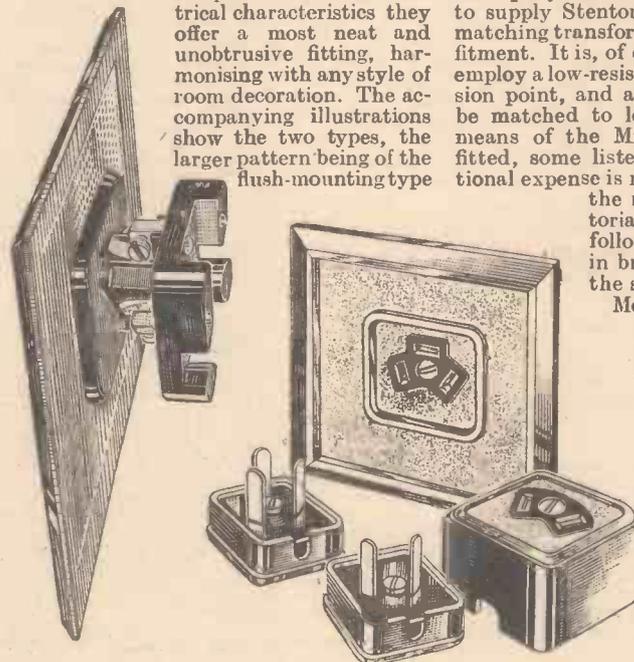
Type XY: Anode volts 100 max.  
Screen volts 100 max.

Optimum load 25,000 ohms.

With the exception of the output pentode (type XY), the filament rating is 2 volts at .066 amps, but the pentode takes .14 amps. The prices are as follows: Type XD and XL, 10s. 6d.; Type XP, 12s. 6d.; Types XSG and XY, 15s. 6d.

**Belling-Lee Flat Pin Plugs**

FOR use at extension speaker points, the new Belling-Lee flat-pin plugs and sockets will be found of great utility, as apart from their electrical characteristics they offer a most neat and unobtrusive fitting, harmonising with any style of room decoration. The accompanying illustrations show the two types, the larger pattern being of the flush-mounting type



similar to an ordinary electric-light switch, and is finished in brown bakelite. The rear projection, with contact points, may be let into the ordinary box such as is used for flush-mounting light switches, and the speaker leads may be let into the wall material. The smaller model is intended for use where the wall cannot be recessed, and the overall projection is less than two inches. Both models may be obtained with either two or three pins and the prices are 2s. 4d. and 2s. 8d., respectively. If desired in cream finish, an extra charge of 10d. is made. The contact is positive and self-cleaning and the utilisation of flat pins and sockets prevents apparatus from being inadvertently inserted into ordinary lighting or mains sockets. These components are ideal for extension speakers, microphones and other similar apparatus.

**Ridco "Ranger"**

THE popular short-wave unit which was recently reviewed by us is now available in a pattern suitable for use on universal (A.C. or D.C.) mains. This has been carried out by fitting a valve rectifier and the usual smoothing equipment. The unit is enclosed in an attractive black cellulosed metal cabinet, measuring only 6in. by 5in. by 6in. As mentioned in our previous review, the chassis has been dispensed with in this unit by mounting components direct to the valveholder, which is suspended by means of rods from the top panel. The intermediate-frequency adopted in this unit is 545.4 kc/s, thus permitting it to be used with American and other single-waveband receivers. The price of this model is 52s. 6d., including two valves.

**W.B. Speaker**

THE Whiteley Electrical Radio Company announce that they are now able to supply Stentorians without the special matching transformer which is the standard fitment. It is, of course, often necessary to employ a low-resistance speaker at an extension point, and although Stentorians may be matched to low-resistance circuits by means of the Microlode device which is fitted, some listeners feel that the additional expense is not justified. Accordingly the makers will supply Stentorians in four ranges at the following prices. The figure in brackets gives the price of the standard cabinet model.

Model 37 SX	—52/6	(63/-)
" 37 JX	—42/-	(49/6)
" 37 CX	—35/-	(39/6)
" 37 BX	—24/6	(29/6)

Rear view of the flush-mounting wall plate, and, on the right, views of the remaining Belling-Lee plugs and sockets.

# RADIO CLUBS AND SOCIETIES

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

## Oxford Short-wave Radio Club

THE Oxford Short-wave Club is arranging a number of field experiments on 5 metres during the summer months commencing on Sunday, June 6th. Co-operation from other amateurs will be welcomed and any experimenter desirous of taking part should communicate with the hon. sec., Mr. E. G. Arthurs (2BHP), at 13, Walton Well Rd., when details will be forwarded from time to time as available.

## Newbury and District S.W. Club

WE have recently held a competition open to all members for the neatest and most efficient short-wave set.

A radio representative from Messrs. Edwards and Goddings, Ltd., Newbury, judged the sets, and had to spend quite a time before he could decide on the best, as they were all very much alike as far as results were concerned.

One of the prizes was given by an anonymous person signing himself as "A Ham," and the other was given by Messrs. Edwards and Goddings, Ltd.

Hon. Sec.: L. Harden, 11, Highfield Avenue, Newbury, Berks.

## Kidderminster and District Radio Club

READERS in Kidderminster and district will be interested to know that a newly-formed Radio Club has started under the heading of "Kidderminster and District Radio Club." Will all those interested in Kidderminster and District please get in touch by either writing or calling as soon as possible to Hon. Sec.: Harold A. Brown, Kidderminster and District Radio Club, 12, Stourport Rd., Kidderminster.

## Swindon and District Short-wave Society (2CLY)

A MEETING was held on April 15th. Much interest in logging stations was shown by the junior members. Members are endeavouring to speed up their morse ready for a full licence. A QSL competition is in progress, and will continue for a month. A.A. transmitting members are busy, too. Mr. E. W. Mortimer (2BMM) is now crystal controlled on 160 metres. W. G. Ford (SBVR) is doing splendid work with PAs. W. C. Barnes (2BWR) and P. Bailey (2CGN) are developing speech amplifiers. D. T. Boffin (BRS1469) has applied for A.A. licence, also Mr. Rose.

Hon. Sec.: W. C. Barnes (2BWR), 7, Surrey Rd., Swindon.

## Portsmouth and District Wireless and Television Society

AT a meeting of the above society at 1A, Hudson Road, an interesting demonstration was given by Mr. Batt of a high-quality amplifier.

Mr. Batt gave blackboard circuits of the amplifier and a special tone control he had constructed.

A new W.B. 37S chassis loudspeaker, kindly lent by Messrs. Whiteley Electrical Radio Co., was put on test and members were delighted with the excellent reproduction. Several members gave in their names to borrow and test this speaker on their own sets. Thanks were given to Mr. Batt and Mr. F. Jordan for assisting, also

to Mr. Bull for gifts of a table and magazines for the library.

Harold Leigh, Chairman, 20, King St., Southsea.

## The Croydon Radio Society

THE Croydon Radio Society's session concluded on Tuesday, April 13th, in St. Peter's Hall, Ledbury Road, S. Croydon. Mr. W. J. Bird presided. The occasion was quite informal, as the hon secretary, Mr. H. G. Salter, presented one of his popular musical programmes on records. Being Coronation year, no better choice as the first item could have been selected than Eric Coates's "London Suite," including "Westminster" and "Covent Garden." In these days of jazz and tunes of doubtful melodic power, a record of Drury Lane Memories was much appreciated, young members as well as old thoroughly enjoying the tunes. Nor was

more serious music neglected, and the Vienna Philharmonic Orchestra's performance of Beethoven's Eighth Symphony was a great success. Similarly was Elisabeth Schumann's singing of "Standchen." Comedy is never forgotten in these programmes, and the mere fact that Tommy Handley and Jean Allistone appeared showed that the standard here was good. Incidentally, Mr. Salter took one bold step—he refused to play one single jazz item, but its absence was not regretted. As far as the Croydon Radio Society is concerned, crooners can become extinct. The new session begins on the first Tuesday in October, and in the meantime the society will be very interested to hear from PRACTICAL AND AMATEUR WIRELESS readers with a view to acquainting them of forthcoming good things.

Hon. Pub. Sec.: E. L. Cumbers, Maycourt, Campden Rd., S. Croydon.

# MORE SHORT WAVE BARGAINS!

**Amazing Offer of Permanent Magnet Moving-coil CABINET SPEAKERS LIST PRICE 39/6 BARGAIN**



Wonderful Opportunity! Only a few of these magnificent cabinet model speakers are available at this amazing reduction. Secure yours to-day!

**21/-**

● Large Permanent Magnet Moving - Coil Speaker - fitted

**2/6**

dust-proof cover and tapped for Power, Super Power or Pentode ● Walnut veneered and inlaid hand-trench-polished cabinet, size 12" high x 12" wide x 6 1/2" deep, rigidly built and lined with special non resonating fibrous boards to prevent vibration and boom ● Woven silk-covered speaker opening. 2/6 down secures; balance in 8 monthly payments 2/6.

## B.T.S. ADABAND

★AMAZING BARGAINS★

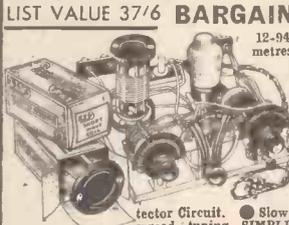
List Price **£6. 12. 6**  
**BARGAIN**  
**£4. 19. 6**



● Your Set rests on top of the ADABAND ● BRINGS AMERICA to your present set! Simply stands beneath and plugs into your existing receiver, of almost any kind. Walnut veneered cabinet. Single tuning control... long, medium or short-wave reception on one switch without disconnecting. Wavering 13-74 metres. A.C./D.C. MAINS MODEL. List Price £6/12/6. Bargain £4/19/6. Cash or C.O.D. Carriage Paid or 5/- down and 11 monthly payments of 9/6. BATTERY MODEL. List Price £5/5/0. Bargain £3/19/6, or 5/- down and 11 monthly payments of 7/6.

**5/-**  
**DOWN**

**Something Entirely NEW! "3-in-1" SHORT-WAVE KIT Adaptor-Converter-Receiver LIST VALUE 37/6 BARGAIN**

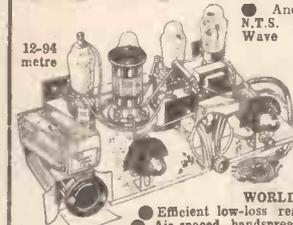


**25/-**

● Adapts or converts your battery set for short-wave reception, or may be used as an efficient 1-valve Short-Wave Receiver. ● Reacting Detector Circuit. ● Slow-motion hand-spread tuning SIMPLIFIES WORLD RECEPTION! ● Low-loss reaction circuit. ● Air-spaced bandspread and tank condensers. ● SPECIAL ANTI-BLIND-SPOT CONDENSER. ● 3 scales calibrated in degrees and tenths. The N.T.S. "3-in-1" Short-Wave Kit is entirely unique in short-wave technique. This amazing combined Adaptor-Converter-Receiver is offered you for the first time... at an astonishingly low price! KIT "1" comprises every part for assembly, including 3 4-pin coils, wiring and assembly instructions, less valve only. Cash or C.O.D. Carr. Pd. 25/-. or 2/6 down and 10 monthly payments 2/6. KIT "2" with British valve, £1/8/8, or 2/6 down and 11 monthly payments 2/6. If N.T.S. headphones required, add 7/6 to Cash Price, or 8d. to deposit and each monthly payment.

**2/6**  
**DOWN**

**New 4-valve BANDSPREAD \* SHORT WAVE KIT \* LIST VALUE 69/6 BARGAIN**



**42/-**

● Another wonderful N.T.S. Bargain Short-Wave Receiver Kit! ● Aperiodic detector, 1 resistance and 1 transformer L.F. Stages. Pentode Output. ● Slow-motion hand-spread tuning SIMPLIFIES WORLD RECEPTION! ● Efficient low-loss reaction condenser. ● Air-spaced bandspread and tank condensers. ● 3 scales calibrated in degrees and tenths. Secure this new design short-wave with the wonderful performance right now! Assembled in an evening, it will bring you the programmes of the world clearly, powerfully, tuned-in with the greatest simplicity. A marvellous Kit at an astonishingly low price! KIT "1" comprises every part for assembly, including 3 6-pin coils, wiring and assembly instructions, less valves only. Cash or C.O.D. Carr. Pd. 42/-. or 2/6 down and 11 monthly payments 4/-. KIT "2" with 4 British valves, £25/9/6, or 5/- down and 11 monthly payments 6/8. If N.T.S. headphones required, add 7/6 to Cash Prices, or 8d. to deposit and each monthly payment.

**2/6**  
**DOWN**

**5 valve ALL-WAVE A.C./D.C. SUPERHET CHASSIS LIST Price £8 : 10**



● with 5 British Valves and Field-Energised M.-C. Speaker. **BARGAIN £5.19.6**

● For A.C. or D.C. Mains, 200-250 volts. ● Octode Frequency Changer circuit employing 5 Valves. ● Automatic Volume Control. ● Illuminated airplane dial. ● Wavering 17-2,000 metres. This wonderful triple-range set is as simple to operate and as economical to run as an ordinary 2-band receiver, and covers all three wavebands, long, medium, short, bringing you music and entertainment from every part of the world in addition to the usual English and Continental broadcasts. 7/6 down secures; balance in 11 monthly payments 13/6.

**7/6**  
**DOWN**

**FREE!** Write today for free Booklet describing in full, with actual photographs, 5 entirely new N.T.S. Bargain Short-Wave Kits, and range of Bargain Short-Wave Components, including the "3-in-1" and 4u. Bandspread Receiver Kits offered above.

All P.O.'s should be crossed and made payable to New Times Sales Co. All currency must be registered.

EST. 1924.

**NEW TIMES SALES CO.,** 56 (Pr.W.17), Ludgate Hill, London, E.C.4.

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS.		
	Date of Issue.	No. of Blueprint.
<b>CRYSTAL SETS.</b>		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
<b>STRAIGHT SETS. Battery Operated.</b>		
One-valve: Blueprint, 1s.		
All-wave Unipon (Pentode)	—	PW31A
Two-valve: Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
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, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	—	PW35
Sunmit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF, Pen, D (Pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow)	—	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)	17.8.35	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)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
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))	5.12.36	PW72
<b>Four-valve: Blueprints, 1s. each.</b>		
Sonotone Four	1.5.37	P.W.4
Fury Four (2 SG, D, Pen)	—	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), L.F., 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 "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	7.10.33	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)	7.4.34	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)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	6.12.30	PW70
Four-valve: Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
<b>SUPERHETS.</b>		
Battery Sets: Blueprints, 1s. each.		
£5 Superhet (Three valve)	—	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
Two-valve	—	PW58
F. J. Camm's £4 Superhet	—	PW53
F. J. Camm's "Vitesse" All-Wave (5-valver)	27.2.37	PW75
Mains Sets: Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)	—	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	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualltone" Universal Four	10.1.37	PW73
<b>SHORT-WAVE SETS.</b>		
Two-valve: Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	15.9.34	PW38A

Three-valve: Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandsread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
<b>PORTABLES.</b>		
Three-valve: Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	10.5.36	PW65
Four-valve: Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12
<b>MISCELLANEOUS.</b>		
S.W. Converter-Adapter (1 valve)	—	PW48A
<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
<b>CRYSTAL SETS.</b>		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
<b>STRAIGHT SETS. Battery Operated.</b>		
One-valve: Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker	—	AW440
One-valver (Class B)	—	AW440
Two-valve: Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	July '36	WM409
Three-valve: Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cosor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
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
Iron-core Band-pass Three (SG, D, QP 21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	June '35	WM398
Certainty Three (SG, D, Pen)	Sept. '35	WM393
Minutube Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	—	Dec. '35
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
65a. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
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, 2LF)	Feb. '35	WM381
The H.K. Four (SG, SG, D, Pen)	Mar. '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	April '36	WM404
<b>Five-valve: Blueprints, 1s. 6d. each.</b>		
Super-quality Five (2 HF, D, RC, Trans)	May '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	Dec. '33	WM344
New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	Sept. '35	WM394

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 PW refers to PRACTICAL WIRELESS, AW to Amateur Wireless, PM to Practical Mechanics, WM 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., Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Three-valve: Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	28.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386
<b>SUPERHETS.</b>		
Battery Sets: Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	Oct. '35	WM395
The Request All-Wave	June '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
<b>Mains Sets: Blueprints, 1s. 6d. each.</b>		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	Apr. '35	WM385
<b>PORTABLES.</b>		
Four-valve: Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW417
TWO H.F. Portable (2 SG, D, QP21)	June '34	WM369
Tyros Portable (SG, D, 2 Trans)	—	WM367
<b>SHORT-WAVE SETS—Battery Operated.</b>		
One-valve: Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valver for America	23.1.37	AW429
Boine 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-wave (SG, D, Pen)	Jan. 10, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve: Blueprints, 1s. 6d. each.		
A.W. Short-Wave World-Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383
Superhet: Blueprint, 1s. 6d.	—	Nov. '35
Simplified Short-waver Super	—	WM397
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve: 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
<b>MISCELLANEOUS.</b>		
Enthusiast's Power Amplifier (1/0)	June, '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)	Sept. '35	WM392
Radio Unit (2v.) for WM392	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New Style Short-Waver Adapter (1/-)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter (1/-)	Dec. 1, '34	AW456
Superhet Converter (1/-)	Dec. 1, '34	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/-)	July '36	WM408



# QUERIES and ENQUIRIES

was used in the single-valve all-waver described in your issue dated March 6th last?"—J. G. (Aldenharn).

## A.C. Gramophone Amplifier

"Have you a blueprint of a gramophone amplifier to work off A.C. mains 250 volts? Can you give me particulars?"—R. K. (Whitstable).

THE only amplifier of the type mentioned is the Listener's 5-watt A.C. amplifier, blueprint WM.392. This particular print costs 1s. 6d., and the issue of the *Wireless Magazine* in which the constructional details were given is dated September, 1935. This may be obtained for 1s. 3d. by post from this office.

## Frame Aerial

"I am building a small 3-valve portable set, but am not quite certain how to wind the aerial. The frame will be 10in. by 10in., and I would like to know the number of turns and the gauge of wire I should use."—E. J. R. (Pengam).

IF you wish to cover medium and long waves, you will have to wind the frame continuously, but if reaction is being employed the medium and long-wave sections should be separated by a short space, and the reaction winding placed between the two sections. Use 75ft. of 24 D.C.C. wire for the medium-wave winding and about 135ft. of 30 D.C.C. wire in series for the loading coil. The reaction winding may consist of about 35ft. of 30 D.C.C. and its position may have to be found by experiment so that it offers the desired control on both wavebands. For wave-change switching a simple on/off switch across the long-wave loading coil will be required.

## Twenty-station One-valver

"I have obtained the blueprint for this receiver, and should like to know what make of dual-range coil would be suitable. Also, will any make of Class B output transformer do, or do you recommend any special make?"—E. L. D. (Snaresbrook, E.).

THE coil specified for this receiver may be obtained from Formo Products, of Mason's Hill, Bromley. It is Type A1. The valve is obtainable only from the Hivac Company, and is Type DB.240. It is a combined Class B and Driver valve, costing 15s. 6d. Any good standard Class B input and output transformers may be used, those specified no longer being on the market.

## Single-valve All-waver

"Could you let me know what type the .0003 mfd. variable condenser is which

THE component in question is a differential reaction condenser and any well-known make may be used in this particular set. The two short lines on the theoretical symbol indicate the two sets of fixed plates and the long line indicates the moving plates of this particular component.

## Transmission

"I would like to know the price of a plan in detail of a transmitter. I would like it

### 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.

Please note also, that queries must be limited to two per reader, and 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 different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. 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.

to be as simple as possible, as I am only a beginner. I want it to have as low a voltage as possible, and to transmit for a distance of about 200 yards or less. I have a pal about that distance away who would receive on an ordinary 2-valve set. I want it for Morse only."—D. E. P. (Royston).

WE would remind you that the transmitting licence is not issued to enable you to communicate with a friend, but is supplied only for genuine research purposes. When applying for a licence you have to state the lines of experiment or research which you wish to undertake, and from your letter we would imagine that you would be unable to supply the necessary details. Full particulars concerning the licence may be obtained from the G.P.O. Radio Section at Armour House, London, E.C., and no experiments may be undertaken until the licence is issued. There are heavy penalties for an infringement of this law.

## 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. C. (Ulverston). We have several more up-to-date receivers, but cannot recommend any to build from the parts of your present set. We suggest you look through the Blueprint Service list and select a suitable set.

B. L. (Tamworth). The lighting switch may be faulty, due to the springs having weakened and arcing taking place in the "on" position. We suggest that you check this point and if found in order the set should be examined by a service agent of the makers.

L. S. (E.1). We have no book on the subject, but suggest that you follow the details given in our issue dated January 9th last.

J. N. (Wembley). If you cut out the motor and the noise ceases it will indicate some fault in that component. We are not familiar with the servicing details of individual commercial receivers and regret that we have no details of the set mentioned.

G. W. L. (Sidcup). The arrangement should work, but we have no diagram which would assist you and cannot recommend modifications of our published circuits.

T. W. H. (Hednesford). All of the issues are in print and cost 4d. each by post.

J. E. H. (Ilford). We regret that we cannot trace the receiver as one of our designs. Can you give any further details?

G. C. (Edinburgh). You do not state whether the receiver is battery or mains operated. In the latter case the bias resistance may have burnt out due to the short circuit, or in the former case the H.T. battery may have been seriously damaged and this would account for the effects mentioned.

S. A. (S.W.9). We cannot state for certain, but suggest you ask the makers of your receiver whether a standard converter will function satisfactorily. If so, the blueprint may be recommended.

M. A. K. (Stoke). We regret that we have no blueprint of a suitable mains unit.

P. S. (Peterborough). The valve in question is obtainable from the G.E.C., price 50s.

G. J. B. (Bexley Heath). We regret that we have no details of the set referred to and therefore cannot advise you. The coils referred to were employed in the £5 Superhet.

B. S. S. (Itchen). We will bear your request in mind, but there are no gift books of the type mentioned so far in our series.

L. K. (Westcliff-on-Sea). We regret that we cannot insert a request as mentioned, but suggest that you write to Messrs. Foyle's, of Charing Cross Road, who may have a secondhand copy.

T. C. G. (N.17). The hum is more likely to be due to the circuit wiring or receiver design, and not to the tuning pack. Perhaps you could let us have some details of the receiver, when we may be able to suggest the cause of the trouble.

H. W. (No address). From your remarks we suspect the multi-contact switch. Make certain that the flexible fingers are not bent and that they contact evenly with both sides of the contacts on the discs.

No Name (Coventry). The trouble is undoubtedly L.F. instability. Try the effect of reversing the connections to the secondary of the L.F. transformer.

A. A. (Longford). A test in Morse will certainly have to be passed, and you should apply for full particulars to the Engineer-in-Chief, Radio Section, G.P.O., Armour House, London, E.C.

J. C. (Bristol 5). We regret that we are not familiar with the servicing difficulties of individual commercial receivers, and suggest you communicate with the makers or their nearest local service agent.

D. H. G. (West Brompton). We regret that we have no receiver of the type referred to in our blueprint list. We have not described a receiver of this type and think that it would be rather difficult to arrange for all-wave reception in a midget portable.

T. W. M. (S. Croydon). We regret that the issues in question are no longer obtainable, but the makers are still in business at Gt. West Road, Brentford.

F. G. G. (Lincoln). The address of the Performing Right Society is 33, Margaret Street, London, W.1.

The coupon on Cover iii must be attached to every query.

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

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**R**EPAIRS to Moving Coil Speakers, Cones and Coils fitted or 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.

**S**HORT WAVE on a crystal set. Full building instruction and crystal 1/2 post paid.—Radiomail, Tanworth-in-Arden, Warwickshire.

**V**AUXHALL.—Polar Midget 3-gang condensers, straight or superhet, 3/9; Polar full vision, horizontal or Arcuate dial and drive, 5/-.

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**V**AUXHALL.—Polar station named scales, for horizontal dials, latest settings; 1/9 each.

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**V**AUXHALL.—T.C.C. condensers, tubular, non-inductive, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 mfd., 50v. working, 1/6; 50 mfd., 12v., 1/3; 0.05, 6d.; 0.002, 0.0002, 0.001, 0.0001, 4d. each.

**V**AUXHALL.—T.C.C. mica 0.002, 2,000 volt test, 1/-; 0.0001, 4d.; 0.001, 0.01, 1/-; 1 mfd. Mansbridge, 1/3; 2 mfd., 1/8.

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**V**AUXHALL.—Pushback wire, four colours, 6 yds., 6d. 6BA screws or nuts, 4d. doz.

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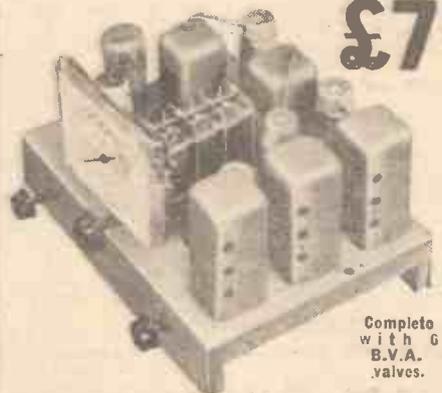
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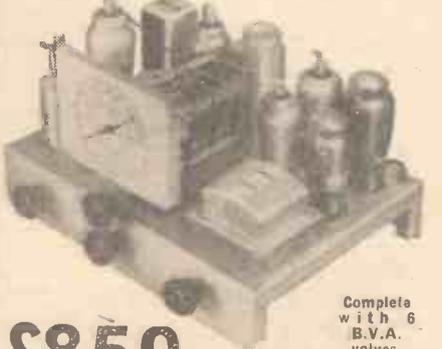
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**MAINS WORKING ON SHORT WAVES**—See Page 182

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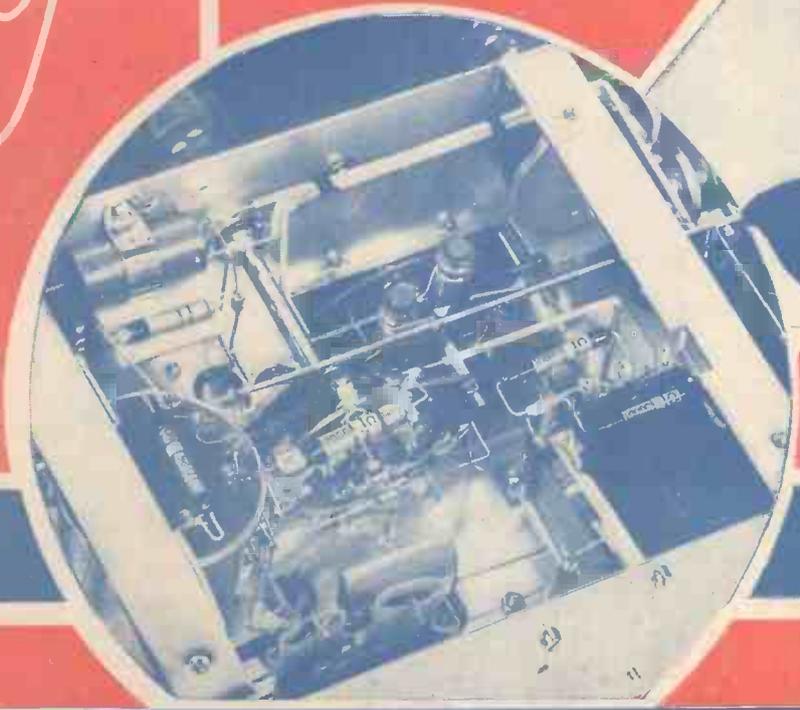
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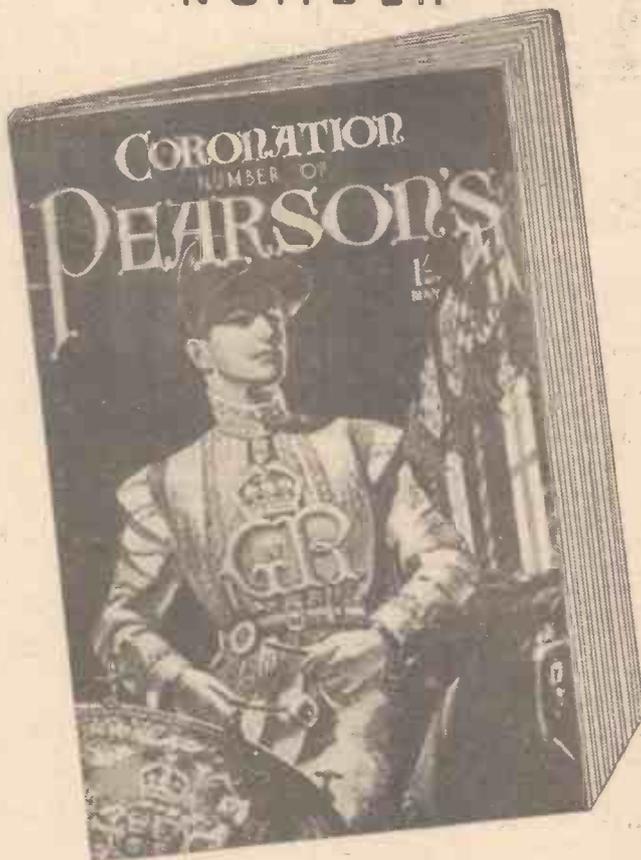
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# THE VALVE AS RECTIFIER See page 171.



## 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. X. No. 242. May 8th, 1937.

## ROUND *the* WORLD of WIRELESS

### Fault Finding

THE first step in locating a fault in a receiver is to measure the current or voltage at various points in the circuit, but, as every service man knows, it is often very difficult to locate some types of fault by this means. Such difficulties as broken tuning-coil windings, short-circuited transformer windings and so on, are not revealed by preliminary tests as above described, and there are other faults which will not be revealed at all by a meter of the usual kind. Short-circuited turns in such components as transformers are revealed by special types of apparatus which the average experimenter does not possess, and there are other faults which will only be located when a systematic substitution of components is carried out. In this issue we deal with such details, and even if you have not at the moment experienced such troubles you should study this article in order to be prepared against the time when one of these unforeseen difficulties arises.

### Brighton Television Pioneer

THE range of reception of the Alexandra Palace transmitter has been the subject of much controversy, and it is now stated that no definite limit can be placed upon the range. Rumours that listeners on the Continent have picked up the vision transmission and that even American experimenters can get some sort of signal, show that we do not yet know all that is to be known of the peculiarities of the ultra-short-wave transmissions. Mr. S. R. Burbidge, a well-known television pioneer of Brighton, was recently televised from the B.B.C. television transmitter in a talk on how he regularly receives the programmes at Brighton, a distance of 50 miles.

### Loudspeaker Traffic Control

THE General Electric Company has received an order for a loudspeaker announcing system for installation on Kincardine-on-Forth Bridge, for the purposes of traffic control. It is hoped by this means to direct traffic by loudspeakers at either end of the swing span, and thus greatly reduce delays caused by congestion. The engineer will have a microphone at his control desk, which is situated at the crown of the swing bridge, and he thus has maximum visibility. The amplifier is rated at 50 watts.

### Empire Day Broadcast

THE B.B.C. announces that on Empire Day (May 24th) listeners will hear broadcast on the National wavelength for half an hour a programme from India, with a contribution from Ceylon. Devised by All-India Radio, the programme continues the policy of fostering radio exchanges between various units of the British Empire. The series of this type of Empire Day broadcast began in 1933, when the programme, "News of Home," was provided by the United Kingdom. In the following years,

### A Coronation Lesson

BENDIGEIDVRAN, in the Mabinogion, making his body into a bridge so that his men could cross over a river, is reputed to have said: "A fo ben did bont," which, translated into English means: "Who would be foremost, let him serve." A special Coronation lesson on this subject will be given to Schools in the Welsh programme by Alun Oldfield Davies, on May 10th.

### Summer Programmes

THIS year it is proposed to provide alternative programmes during the summer months, instead of a single programme as in previous years. During July, August and September, these alternatives will be radiated on the National and Regional wavelengths between 6.30 p.m. and 8 p.m. It is emphasised that this arrangement is experimental, and its resumption in future years is likely to depend largely on its welcome by the public.

### Coronation Route in Music

THE B.B.C. announces that three days before the Coronation a description in music of the route that the Royal procession will take to and from Westminster Abbey will be broadcast by the B.B.C. Variety Orchestra, directed by Charles Shadwell. The programme will be heard on the National wavelength during the afternoon of Sunday, May 9th. Modern composers have written many famous and popular works around "the sights of London" and most of the important thoroughfares in the metropolis have been portrayed in music.

The programme will thus be able to cover all the important parts of the route, and it will include a Coronation march, "Royal Cavalcade," specially written by Albert Ketelbey; two movements from Eric Coates' London Suite, "Westminster" and "Oxford Street," and "Massed Bands of the Guards," by Michael North.

### "Scotland Calling"

GOVAN BURGH BAND, conducted by Gregor J. Grant, will broadcast on May 6th. The programme will include the March Medley "Steps of Glory," Selection from "Oberon," and a Fantasia, "Scotland Calling."

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the principal broadcasting organisations of the Empire have collaborated with the B.B.C. in the provision of a special programme on May 24th; in 1934 Australia, in 1935 Canada, and last year South Africa.

### Television Lectures

A SPECIAL course of four lectures on Television is to be given at the London Polytechnic, Regent Street, commencing on May 31st next. These lectures, delivered by Mr. H. J. Barton Chapple, will commence at 7.30 p.m., and will last for one hour and a half. Demonstrations of high-definition television, including the reception of the B.B.C. programmes, will be given at each lecture.

# ROUND the WORLD of WIRELESS (Continued)

## A Coronation Musical Acrostic

WE are informed that Reginald Foort's contribution, at the B.B.C. Theatre Organ, to the programmes of Coronation Week will include a novel arrangement of songs, entitled "A Musical Acrostic in Melody and Rhythm."

He will be accompanied again by Phil Park and Ivor Dennis at two pianos, Styx Gibling, of the B.B.C. Variety Orchestra,



Tuning-in a Coronation week broadcast on the new Cossor mains receiver Model 348.

at the drums, and by Esther Coleman and Bert Yarlett.

He has so arranged the programme, which will be broadcast on the Regional wavelength on May 14th, that the initial letters of the titles of the songs will, together, form an appropriate acrostic.

## All British Variety

THE Empire Theatre, Belfast, has arranged a brilliant programme of All-British Variety to celebrate Coronation Week, and on May 14th a broadcast from this Theatre will be included in the Northern Ireland programme. The popular comedians, Hazell and Day, who broadcast from Belfast during the special week after the opening of the Lisnagarvey transmitter in March, 1936, are returning to Belfast, and among the other artists at the Empire will be Alex Findlay and Lou Redford with his xylophone. This should prove an outstanding variety programme, and it will be compared, as usual, by Raymond Glendenning.

## Salisbury Cathedral Organ Recital

ON May 10th, in the Western programme, Sir Walter Alcock will give an organ recital from Salisbury Cathedral. He has been organist of the Cathedral since 1916.

## INTERESTING and TOPICAL NEWS and NOTES

### Variety from Bristol

A VARIETY programme will be broadcast from the Prince's Theatre, Bristol, on May 14th, the artists including Stainless Stephen, Nora Williams (the Piccolo Pete Girl) and Frank Wilson in a musical comedy act.

### "Geisha" Broadcast for Soviet Listeners

THE "Comintern" radio station has recently given the first broadcast of the popular English operetta "The Geisha," composed in 1897 by Sydney Jones. A new text for the operetta was written by the Soviet poet J. Galitsky. George Martin Fuchs conducted.

### Coronation Party of Radio Favourites

ON May 12th, listeners to the National programme will hear "Coronation Party," which will represent radio's contribution to the day's celebrations. The producer, Charles Brewer, has included on his invitation list the names of famous broadcasting acts. There will be Elsie and Doris Waters ("Gert and Daisy"), Jeanne de Casalis ("Mrs. Feather"), Clapham and Dwyer, The Two Leslies, Leonard Henry, Davy Burnaby, Michael North and Wynne Ajello, in addition to the Revue Chorus and the Theatre Orchestra.

Brian Lawrance, Jan van der Gucht, Raymond Newell and Stuart Robertson, four vocalists well known to

listeners, will also feature in the Party. As a quartet, they will "put over" humorous part-songs.

## SOLVE THIS!

### PROBLEM No. 242

Robertson's set suddenly stopped functioning, but when the low-impedance extension speaker was plugged into the extra L.S. sockets of the receiver satisfactory results were obtained. Where was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions 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. 242 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, May 10th, 1937.

### Solution to Problem No. 241

The hum and high readings were due to shorted turns on the field winding of the energised speaker. The following three readers successfully solved Problem No. 240, and books are accordingly being forwarded to them: J. M. Robertson, 16, Bank Street, Aberfeldy, Perthshire; D. A. Castle, 45, High Street, Winchester, Hants.; R. Le Grove, 128, Halley Road, Forest Gate, London, E.7.

In addition, Ashley Sterne, the well-known writer, who has already created much delightful microphone humour, has been engaged to provide some topical material for the show, which will run for seventy-five minutes, in the National programme.

### Coronation Music in Braille

FOR the guidance of blind musicians during the Coronation period, the National Institute for the Blind has issued a list of fifty appropriate musical compositions—vocal and instrumental—that are available in Braille notation. Only five of these works are by non-British composers.

### British Light Overtures

FOR the National programme at the lunch-hour on May 11th the B.B.C. Midland Orchestra, conducted by Reginald Burston, will play works by five British composers—Sir Arthur Sullivan, Roger Quilter, Leigh, Eric Coates, and Ansell.

### Concert from Torquay

ANOTHER popular concert by the Torquay Municipal Orchestra will be broadcast in the Western programme on



At a recent Charity Press Ball in Cambridge, a Pye T.20 A.C. Portable was offered as a special prize. Tommy Fields, the famous comedian, is here seen presenting the set to the lucky winner.

May 11th. Stanley Pope (baritone) will be the vocalist.

### Light Entertainment from the Midlands

THREE Midland theatres will be visited by the microphone on May 14th to obtain an example of the light entertainment provided during the week of popular celebrations. These are all independent theatres, namely, the Theatre Royal, Hanley, where Arthur White and his Road Show will be the chief attraction; the New Theatre, Northampton; and the Coventry Hippodrome. All three contribute regularly to the broadcasts of theatre variety. The commentators will be David Gretton, who is charge of Midland Outside Broadcasts; Cedric Johnson, and Kenneth Harvey.

# The Valve as Rectifier

This Article, which Explains the Functions of Valve Rectifiers, is Specially Written for Beginners By RADIO ENGINEER

**B**EFORE one can consider using alternating current supplies for the purpose of providing the necessary high-tension for a receiver or transmitter, it is essential to arrange some means whereby the alternating current can be "rectified" so that a steady current, flowing in one direction only—*direct current*—is obtained.

The process is known as "rectification," and in this article it refers to alternating currents of low frequency—the standard frequency of commercial supplies in this country being 50 cycles per second—and not, as in the case of rectification or detection in a wireless receiver, to alternating currents of radio or high frequency.

When dealing with batteries or D.C. supplies, the potential can be considered to be steady, while the polarity is always constant, one side of the circuit being negative and the other side positive. With A.C., however, the state of affairs is very different, as the polarity alternates between a positive and negative maximum value.

It is possible to represent the difference between the two supplies graphically, and "x," Fig. 1, indicates the wave form of a direct current, while "y" shows that produced by an alternating supply, the change

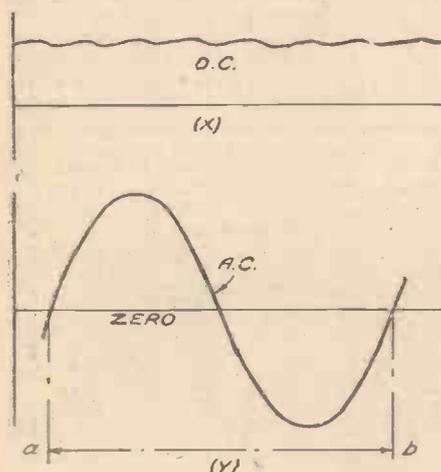


Fig. 1.—Graphical representation of a D.C. and A.C. supply.

in polarity being clearly indicated. The distance between the two points "a" and "b" represents a complete cycle, during which the current passes from zero to positive maximum, back to zero and on to negative maximum, finally completing the cycle by returning to zero. This cycle is repeated very frequently, and it is the number of times per second that it takes place which determines the periodicity or frequency of the current.

If the two curves are given a little consideration, it will be appreciated that to obtain the required results the alternating current has to be stopped from flowing in alternate directions, i.e., above and below the zero line; therefore, various methods have been devised to do this, but in this article we are only concerned with the thermionic valve as a rectifier.

## The Valve Rectifier

The original thermionic valve (Fleming) employed two electrodes only (diode valve), a filament and an anode, as indicated in Fig. 2. For its operation it depended on the filament, when heated, emitting electrons which passed across the intervening space to the anode, providing

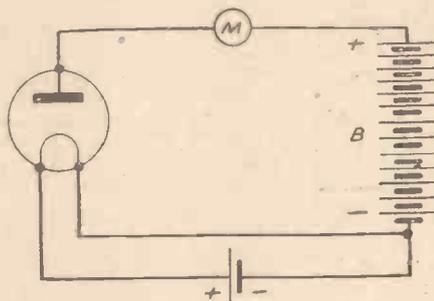


Fig. 2.—Simple or basic rectifying circuit.

the anode was maintained at a positive potential, with respect to the filament. The flow of electrons constitutes an electric current, and the milliammeter M will indicate its presence when the required operating conditions are in force.

The rectifying valve of to-day is fundamentally the same, though, of course, vast improvements have been made as regards design, construction and efficiency.

The modern rectifying valve can be of the directly or indirectly heated type; it can be fitted with one or two anodes for half or full-wave rectification, while larger electrodes are employed to allow the necessary output and life to be obtained.

One of the main considerations in design is the reduction of voltage drop across the valve, perfect insulation, and a filament which is capable of giving a generous emission without excessive loss of life. The placing of the anode in relation to the filament is very important, as the distance between them has a direct bearing on the voltage drop.

## Operation

Referring again to Fig. 2. If the battery "B" is replaced with a source of alternating current, it follows that the anode will be alternately positive and negative; therefore, in view of the previous remarks concerning the Fleming valve, it also follows that current will flow only during the positive half-cycle, i.e., when the anode is positive. During the negative half-cycle, no current flow will take place, so what really happens is: a *unidirectional* current is set up, but it is of a *pulsating* nature due to the time between successive positive half-waves.

This can best be understood by examining Fig. 3, in which curve "A" shows the wave form of the rectified output, and it will be appreciated—by comparison with "x," Fig. 1—that the D.C. thus produced is still far from perfect.

The system described deals with only half of the A.C. wave, it being the most simple method possible, and it is usually known as half-wave rectification.

## Full-wave Rectification

If two half-wave rectifiers are connected as shown in Fig. 4 it will be possible to utilise the complete A.C. cycle and obtain a greatly improved output wave form.

The source of alternating current is obtained from the mains via the transformer "T," which can be so designed that the voltage output of the secondary windings is greater or less than the actual mains supply.

The secondary "S" is provided with a tapping at its dead electrical centre, and it is essential that the voltage across "s" and "s.l." is equal to twice the voltage required by the anode of each rectifier, thus giving between "c.t." and "s" and "c.t." and "s.l." a voltage equal to that required by each valve.

When the secondary is positive at "s," current will flow through the rectifier "R," but "R1" will be inoperative. As soon, however, as the polarity of the secondary changes, "s.l." will become positive and the current flow will be through rectifier "R1," while "R" will cease, as that end of the winding is then negative.

By adopting this method, and it is the one most widely used, both half-cycles of the A.C. wave are rectified, and the resultant output is considerably smoother or, in other words, the big gaps between the pulses "A," Fig. 3, have been filled in, as shown by "B" of the same diagram, by the rectification of the additional half-wave.

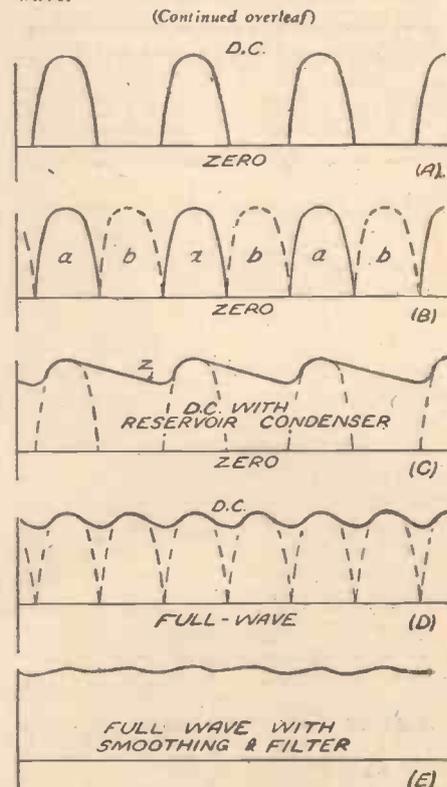


Fig. 3.—Graphical representation of the effects of rectification and smoothing of an A.C. supply.

**THE VALVE AS RECTIFIER.**

*(Continued from previous page)*

It is not usual, for average amateur work, to use two separate half-wave rectifying valves to obtain full-wave rectification, as full-wave rectifying valves, containing two sets of electrodes within one bulb, are standard products of the various valve manufacturers.

**Smoothing**

It has been agreed that the outputs obtained so far are still far from perfect

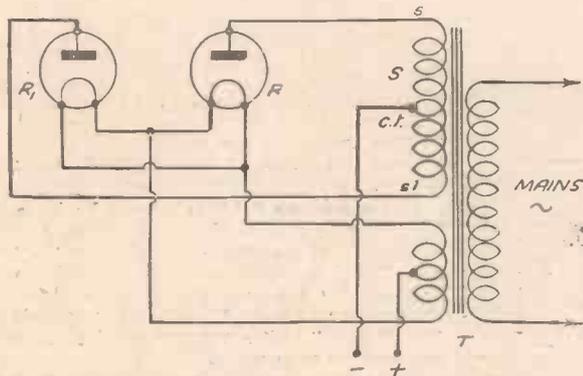
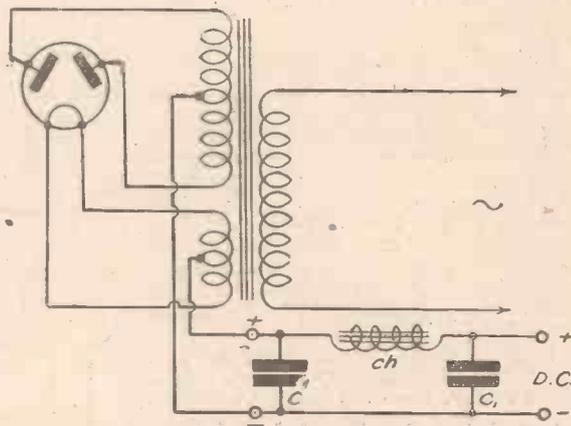


Fig. 4 (left).— Method of using two half-wave rectifiers to obtain an improved output waveform, and Fig. 5 (right).— Full-wave valve rectifier circuit.



and quite unsuitable to feed the anodes of the valves in a receiver or transmitter, therefore some smoothing arrangements must be employed.

For simplicity's sake, consider the half-wave output first. Quite a high degree of smoothing can be obtained by simply connecting a suitable fixed condenser across the output. In fact, such an arrangement also has a marked effect on the output voltage, tending to raise the value; therefore, although the capacity is not exactly critical, it is advisable to follow the rectifier makers specification. If the condenser has too high a value, damage can be caused

to the rectifier by excessive charging currents, while, on the other hand, if the capacity is too small, the condenser will discharge its load too quickly or too much before it receives the next charge, thus producing a pronounced ripple.

If the curve "C" (Fig. 3) is examined, the general effect of the condenser can be seen. During the positive half-cycles the condenser receives a charge which is discharged, or partially so, during the following

has to be embodied to remove all traces of them. A good L.F. choke and another fixed condenser are all that is necessary, at least, in the majority of cases, and they are introduced into the circuit as shown in Fig. 5, which shows the complete full-wave rectifier arrangement.

With the output of the full-wave circuit, the condenser smoothing has an even greater effect than in the previous case, the resultant curve being shown as "D"

negative half-cycles, thus, as the curve shows, filling in, so to speak, the gaps between the pulses or peaks, the part "z" being condensed voltage.

For the average amateur working voltages a capacity of 4mfd. is quite satisfactory, but it will be found that half-wave rectification requires more smoothing than full-wave.

The unevenness of curve "C" is due, to a great extent, to the presence of "ripple" voltages superimposed on the direct current, and if such are allowed to remain it is highly probable that pronounced "hum" will be experienced, so a simple filter circuit

(Fig. 3), where it will be seen that the output is no longer a series of heavy pulses, but a fairly steady supply.

The filter circuit is still, however, essential, and its effect can be seen by examining the curve "E" (Fig. 3), which represents a reasonably good D.C. supply.

The choke "Ch," Fig 5, should have an inductance of at least 20 to 25 henries when carrying the maximum current output of the rectifier concerned, while "C.1" should be 4 mfd. to 6 mfd., and, for safety's sake, it is advisable to see that it is made for a "working" voltage of, say, 50 per cent. higher than the rectified output.

**SOUTHAMPTON'S WIRELESS COLLEGE**

THE increasing interest which is being taken in radio and television technique has led to an increased demand for training centres. The Wireless College at Colwyn Bay has specialised in radio training for many years, and on April 14th a branch was opened at Calmore, Southampton. The opening ceremony was performed by Sir Ambrose Fleming, M.A., D.Sc., F.R.S., who was presented with a gold key for the purpose by Miss Pamela Whale, aged three years. A tablet is mounted in the Hall to commemorate the occasion and an address was given to the guests by a representative of the Marconi Company. A tour of inspection of the college, its grounds and equipment was made, and the proceedings terminated in the evening with a concert given in the College Theatre by the students. Full details of the training provided at the college

may be obtained on application to the Principal, Gordon S. Whale,

A.M.I.R.E., M.A.A.A.S., at Calmore, Southampton.



Sir Ambrose Fleming, with the principal of the Wireless College, Mr. Gordon S. Whale, reading a tablet he unveiled at the opening of the college recently.

# Practical Television

May 8th, 1937 Vol. 3. No. 49.

## TELEVISION IN CORONATION WEEK

The B.B.C. Announces the following Plans for Television Programmes During Coronation Week

THE outstanding event will, of course, be the televising of the Coronation procession at Apsley Gate, Hyde Park Corner, on the return journey from Westminster Abbey. The broadcast, which is expected to last one hour, will open at 2 p.m. with views of the Park and crowd scenes between Stanhope Gate and Hyde Park Corner. Telephoto lenses will pick out the head of the procession a quarter-of-an-hour later as it approaches down the East Carriage Drive, and from then until the last horsemen have passed through Wellington Arch to Constitution Hill the whole of the two-mile procession will be shown on the television screen. A descriptive commentary will be given by Frederick H. Grisewood, who will be stationed at a microphone beside the cameras at Apsley Gate.

As mentioned in a recent issue, three Emitron cameras will be used. Two will be mounted on a special platform at Apsley Gate and will be fitted with telephoto lenses for obtaining distant and mid-shots of the procession and the crowds to the north and south of the gate. A third camera, installed on the pavement to the north of the gate, will give close-range views of the Royal Coach and other important parts of the procession passing through the gate.

The cameras will be connected by some fifty yards of cable to the new mobile television unit behind the park-keeper's lodge, whence the sound and vision signals will be conveyed by cable to Broadcasting House and Alexandra Palace. The mobile television unit comprises three vans; one contains the control apparatus and scanning equipment, one the power plant, and the third an ultra-short-wave radio-link transmitter of 1 kilowatt power, which on May 12th will be used as a stand-by for conveying signals to the television station.

### The Week's Programmes

Outstanding among the studio programmes in Coronation Week will be the appearance of Alicia Markova and Anton Dolin on Tuesday, May 11th, with members of their company in a Pas de Quatre and Tchaikowsky's "Blue Bird" suite. Special Coronation editions of "Picture Page," television's topical "magazine," will be presented in the afternoon and evening, and it is expected that many of the visitors will have been directly concerned with the Coronation preparations. On the same day, Gerald Cock, Director of Television, will give an illustrated account, both in the afternoon and evening, of the arrangements for televising the Coronation Procession. Films and photographs will be used and, through the co-operation of Scotland Yard, special plans will show how London traffic will be controlled on Coronation Day.

A "Music-hall Cavalcade," which will be the main feature in the evening television programme on Coronation Day, will be presented in a novel manner. An elderly couple who recall the grand old days of

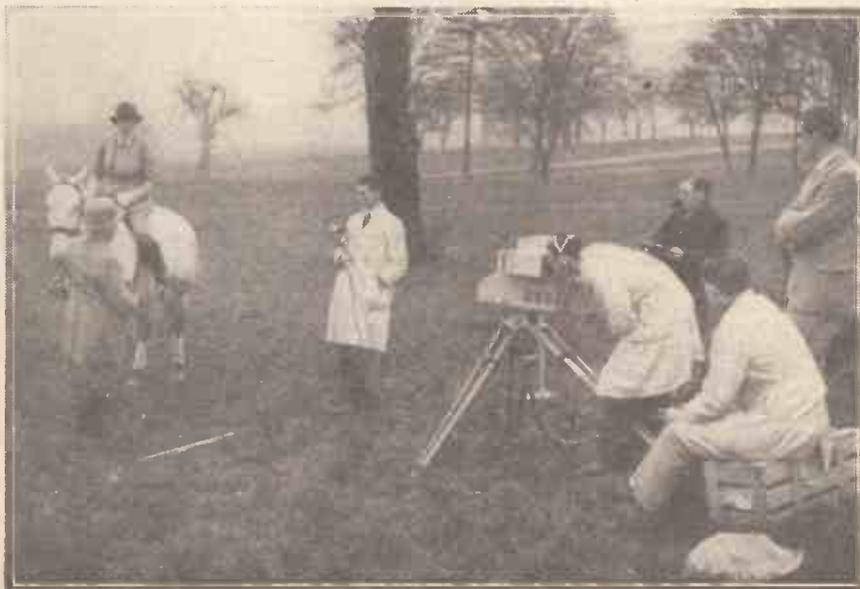
Victorian and Edwardian music-hall will see their reminiscences take form and substance as the favourites of yesterday and to-day reappear on the television screen. The artists will include Albert Whelan, entertainer at the piano; Ada Cerito, singing her celebrated "widow" song; Tom Costello, singing "At Trinity Church I met my Doom"; Marie Lloyd, junior, who will be heard in her mother's great number, "One of the Ruins that Cromwell Knocked Abaht a Bit"; and Ida Barr, singing "Oh, you Great Big Beautiful Doll." The studio will be decked out as an old-time music-hall and the traditional chairman and the sellers of bath buns and sweetmeats will be very much in evidence.

Harry Roy's Band will be televised, with Princess Pearl, in the afternoon programme on May 13th. In the evening transmission Clapham and Dwyer will be featured in

evening programmes will be devoted to a tour of the London Television Station. The guide will be Leslie Mitchell, television announcer, and the visitor none other than George Robey, who will accompany the roving camera to the reception hall, to rehearsal, the sound and vision transmitters, the make-up and dressing-rooms, production shop, film projection room, control room and studios. During the "tour" viewers will meet C. H. Middleton, the gardening expert, and the Television Orchestra.

### Another Historical Film

PRIOR to the official opening of the Alexandra Palace station the B.B.C. staff prepared a film entitled "Television comes to London" and televised it several times in the initial programmes. It traced some of the early history of television but dealt more specifically with the building and installation of the television equipment, together with the very considerable structural alterations in the Palace building itself. It is now learned that a more ambitious effort is to be made, for plans are already well in hand for an elaborate production which aims at portraying the historical development of television from the earliest work of the pioneers right up to the advanced equipment now in daily use. Not only will this serve as a record for posterity but it will be employed for propaganda purposes by being radiated in television signal form in the new hourly morning sessions which are being planned. These additional daily periods from 11 a.m. to noon are for the benefit of dealers so that



This illustration shows the camera in action televising a horse-riding demonstration for a recent Alexandra Palace broadcast.

"Starlight." The first performance of a new modern rhapsody by Ord Hamilton, "Rhythm in the Dawn," will be given by the Television Orchestra in the same programme.

On Friday, May 14th, Jack Hylton will bring his band to the television studio. The instrumentalists and vocalists number nearly forty—the largest musical combination yet televised, and as was the case on the Band's previous appearance, a special rearrangement of the studio will be necessary.

Television will televise itself on Saturday, May 15th, when both afternoon and

they can demonstrate sets to prospective purchasers, and to enable manufacturers to test their new models and designs under strict service conditions before going into big production. Both the production and direction of the film will be in the hands of the B.B.C. television producer, Dallas Bower, while the late chief cameraman of Baird Television, Ltd.—Allan Lawson—will be in charge of the photographic side. This move on the part of the B.B.C. is an admirable one, and serves as additional evidence of the determination of the television staff to put its service right on the map at a very favourable period.

# THE TELEVISION O.B. VAN

Advance Details of the Special Mobile Control Room Which will be Used when Televising the Coronation Procession

FOR the purpose of televising the Coronation procession, the B.B.C. have purchased from the Marconi-E.M.I. Television Company a special mobile control room in which the various incidental pieces of machinery are housed. The complete installation is incorporated in a large motor vehicle about the size of a Green Line coach, and this will be parked on the grass on the west side of Apsley Gate, behind the park-keeper's lodge. The apparatus itself is mounted on two rows of racks along the sides of the vehicle, with a small central aisle along which the operators can walk when inspecting and operating the equipment. The racks, of which there are six on each side, measure 7ft. 6in. in height and 19½in. in width, and the total weight of the vehicle is 8½ tons. A monitoring receiver is fitted in a compartment over the driver's head, and thus the operators can see the televised picture and make the necessary adjustments by means of the controls provided for the purpose.

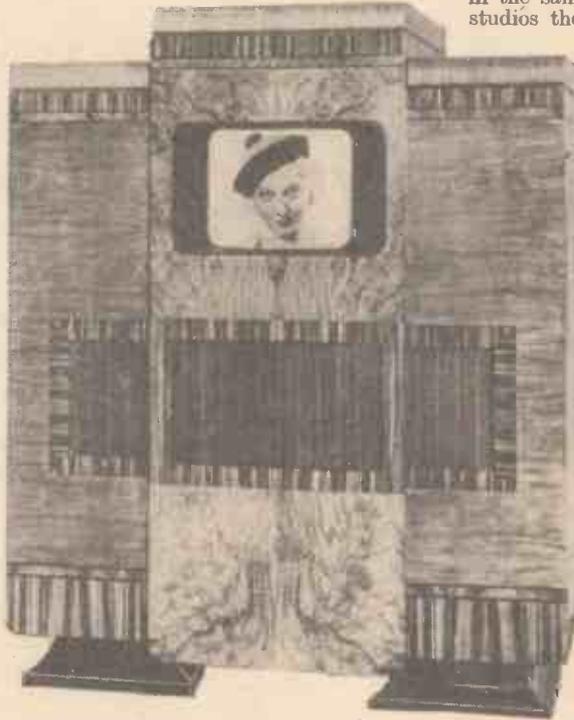
## Sound Control Room

In addition to this section, there is a small sound control room incorporated in the vehicle, with all the necessary faders and amplifiers to deal with four microphones which will pick up the voice of a commentator and local sounds associated with the scene being televised. Three special multiple cables will run from the vehicle to the top of Apsley Gate, across which they will pass, concealed, to drop down behind a pillar at the point where the three television cameras are mounted. These cables are about 1½in. in diameter, and contain 27 insulated conductors, two of which are of a special low-capacity type designed to

carry the very high-frequencies involved in a television picture transmission.

## A Stand-by Transmitter

A special stand-by transmitter vehicle will be parked alongside the main van, and



this will radiate the vision signal from a small highly-directional aerial which is mounted on two low wooden masts close to the scene of operations. This aerial is arranged to provide the maximum signal, in the direction of the Alexandra Palace, where another special receiving aerial will be arranged to intercept the signal from Hyde Park. This receiving aerial is being mounted on top of the main transmitting mast at the Alexandra Palace, and a special shielded high-frequency feeder is to be carried down to a special receiver in the transmitting room, where the signal will be fed into the standard television transmitter in the same way as with signals from the studios there. To avoid any troubles from breakdowns, duplicate circuits are being arranged and special care has been taken to avoid interference from cars and other electrical equipment, which may be in the vicinity of the cameras and vans. No doubt the experience

*The H.M.V. Television Auto-radiogram, a de-luxe television plus all-world radio receiver, incorporating an automatic record changer, playing eight 10in. or 12in. records. The radio controls are beneath the right-hand lid, the television controls beneath the left-hand lid, and the automatic record changing mechanism is in the centre section. The price of this elaborate receiver is 120 guineas, which includes the necessary television aerial, free installation and maintenance for one year.*

gained with this particular equipment at the Coronation procession will provide valuable data for subsequent television broadcasts of important events which take place from time to time.

## Spare Equipment

IN an effort to prevent the breakdowns in the television service from Alexandra Palace the B.B.C. is taking steps to install duplicate equipment. The system of oscillators, correctors, modulation amplifiers, and so on, now in operation is very complicated, and even the failure of a small component is capable of wrecking the whole chain. No doubt the Baird radio transmitter could be adapted to suit the B.B.C. picture standard, and this would then provide an admirable standby in case of a transmitter fault. It would be very serious for the popularity of the service if picture failures occurred when many of the proposed ambitious outside broadcasts were scheduled to take place, for it is known that many receiver purchases have been made for these events alone.

## A Similar Characteristic

REGARDING cathode-ray tubes, it is possible that many readers have failed to realise that one of the characteristic curves resembles very much that of the familiar family of characteristic curves about which so much was said in the earlier days of radio. If a graph is made showing the relation between the negative voltage bias applied to the control electrode of the C.R. tube (horizontal ordinate), and the brightness (beam current) of the spot observed as fluorescence on the screen, it will be identical in shape and nature to a

# TELEVISION NOTES

valve curve plotting anode current against grid bias for a steady anode voltage condition. The beam current will be zero for a certain negative potential on the modulator anode (similar to the valve grid)—some value between 50 and 90 volts—and after a sharp curve will rise steadily with reduced negative bias until a certain maximum value is reached corresponding to the saturation anode current condition of a valve. The shorter the bias range between black (zero beam current) and white (maximum beam current), the greater the sensitivity of the tube, but this characteristic has to be designed to match in with all the other features and operational data of the tube to ensure that good pictures materialise. If the picture is too bright a well modulated signal will extend the voltage beyond the zero bias condition, rendering the modulator electrode positive and spoiling the picture. The static bias condition must be comfortably within the normal signal voltage range if the full black to white brightness variation is to show correctly.

## American Receiver Design

SOME of the objections levelled against American television receivers included the small size of the picture—it seldom was greater than 10in. wide and more frequently

was less—its colour, since the designers showed a marked preference for green, and the total number of valves employed, generally in excess of thirty. Apparently these have been taken to heart, for in the later designs now being prepared by some of the more important companies the total number of valves is about two dozen, while there is a diminution in the number of external controls which the user can handle. Steps are being taken to increase picture size and improvements made in both the estimated life and performance of the cathode-ray tube which still features as the prime picture reproducer. Few, if any, of the companies show any partiality towards mechanical reproducers. On the programme side a close watch is being kept on the efforts of the B.B.C., a very unusual factor as far as anything connected with American radio is concerned. As in this country controversies still rage between the cinema and television interests, but signs of a spirit of co-operation seem to be emerging and this is a favourable factor. The two industries must be interdependent for some time to come and a merging of ideas will operate for the benefit of both sides.

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# Constructional Details of "Practical Wireless" Receivers—3

FOR good long-distance reception, two H.F. stages are essential, and many amateurs prefer a "straight" receiver of this type to one of the superhet designs. There are, of course, the advantages of absence of whistles and the avoidance of tricky ganging and trimming adjustments, and in the Fury Four receiver greater simplification is introduced by utilising separate tuning condensers. The two H.F. stages are tuned by means of a two-gang condenser, the flatness of tuning of the aerial coil rendering it unnecessary to make use of any panel trimming device. The detector tuning coil is then tuned by a separate tuning condenser, and the only disadvantage of such a scheme is that it is possible to find two adjustments for certain powerful stations. However, if the trimmers mounted on the condensers are adjusted carefully, and the series aerial condenser also set to a certain position, it may be found in most cases that the dial readings of the two tuning controls will coincide, thus facilitating the tuning process.

### Modifications

To bring this particular receiver up to date, modern iron-core coils are recommended in place of the original air-core variety, and the Varley combination will be found ideal. A set of three type BP.50 coils should be obtained, and the attached diagram shows the wiring to the coil unit, the majority of the wires in this diagram being placed in the same position as on the blueprint, which may be obtained for this receiver. For tuning purposes, we now recommend the J.B. "Nugang" type condensers, the make originally specified no longer being on the market. To keep in line with the original design, the J.B. drive Type A should be specified when ordering these condensers. Of the remaining components in the original specification, the aerial-series condenser, output choke, and volume control are now unobtainable, and for these, substitutes are given in the list of components which is attached.

One of Our Most Popular Early Receivers Was the Fury Four, and This Article Gives the Main Constructional Details and the Modifications Necessary to Bring It Up to Date

### Construction

The receiver is assembled on a baseboard 16in. by 10in. with 2in. runners along two sides, and a panel 16in. by 8in. carries the controls and tuning dial escutcheons. Although not essential, the baseboard could be covered with a sheet of metal foil, either copper or aluminium. The former would enable various earth return leads to be connected to it by soldering. In wiring a receiver of this type it is preferable to do as much of the work as possible before the condensers and coils are mounted as by this

means the weight of the receiver is kept to a minimum, and it may be more easily handled.

It will be noticed that certain slight alterations now have to be carried out to the under-chassis wiring in order to enable the new coils to be used correctly. These are provided with a special change-over tapping on the coils, joined to terminal No. 3 on each coil unit. Therefore, the present connections from the grid line of each of valves V2 and V3 to the H.F. circuit of the preceding stages must be broken in order to enable this to be done. Condenser C5 (.0003 mfd.) is now joined to the grid of V2 and through hole No. 4 to the anode of V1. This lead must be left intact, but the lead which goes from the grid of V2, through hole No. 5, to the tuning condenser must not come into contact with the .0003 mfd. fixed condenser. The tag shown joined to this line should be connected to terminal No. 3 on the centre coil, another hole being drilled in the chassis to enable this lead to pass from one side to the other. The other condenser, C10, is joined in the blueprint to a lead running from hole No. 10 in the chassis, and accordingly it is necessary to

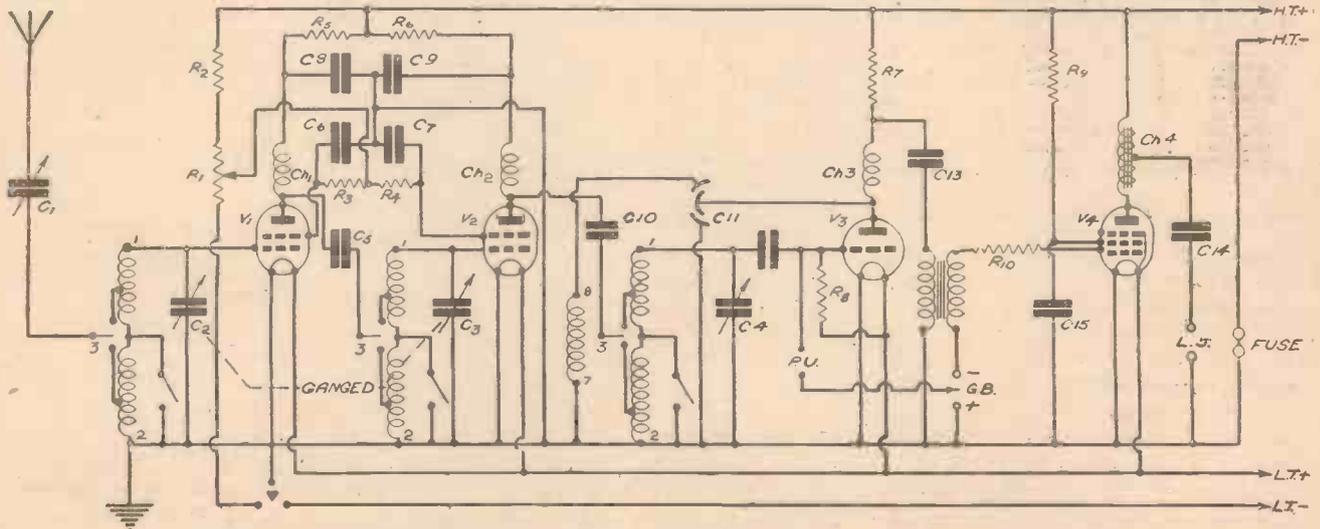
(Continued on page 184)

## THE FURY FOUR

(Blueprint No. P W 11)

### LIST OF COMPONENTS

- One three-gang coil assembly (B.P.50) (Varley).
- One two-gang "Nugang" condenser with type A drive (J. B.).
- One single gang "Nugang" condenser, with type A drive (J. B.).
- One Formodenser, type J (Formo Products).
- One Wearite S.G. choke, type H.F.P.A. (Wright and Weaire)
- One S.G. choke, type H.F.4 (Bulgin).
- One screened H.F. choke (B.T.S.).
- One L.F. transformer, ratio 3 to 1 (B.T.S.).
- One Pentode output choke, type D.P.9 (Varley).
- Three 1 mfd. fixed condensers, type B.B. (Dubilier).
- Two .0003 mfd. fixed condensers, type 665 (Dubilier).
- One .0002 mfd. fixed condenser, type 665 (Dubilier).
- Two .1 + .1 C mfd. fixed condenser, type BE.31 (Dubilier).
- Four Clix chassis mounting valveholders, three 4-pin and one 5-pin (Clix).
- Four 1,000 ohm 1-watt type Resistors (Erie).
- One 100,000 ohm 1 watt type Resistor (Erie).
- One 5,000 ohm 1-watt type Resistor (Erie).
- One 2 meg. grid leak with wire ends (Erie).
- Three terminal mounting blocks (Belling-Lee).
- One 4-way battery cord (Belling-Lee).
- Six terminals: A, E, Pick-up (2) and L.S. (2) (Belling-Lee).
- One fuse-holder, type F5 with fuse (Bulgin).
- One 50,000 ohm potentiometer, type VG.47 (Bulgin).
- One .0003 mfd. differential reaction condenser (B.T.S.).
- One three-point switch, type GWC (Wright and Weaire).
- One ebonite panel, 16in. by 8in. (Peto-Scott).
- One chassis, 16in. by 10in., with 2in. runners (Peto-Scott).
- Four valves: Type 220 S.G., 220 S.G., 210 H.F., and 220 PT (Cossor).



Complete theoretical circuit diagram of the Fury Four showing the terminal connecting points for the new coils.



# On Your Wavelength

By THERMION

## A Jam in the Studio

THE B.B.C. we must admit is bright and breezy and up-to-date in its outlook. Further evidence of this was provided by the recent jam session in which a room full of highly-paid musicians extracted from the leading bands in London were invited to broadcast themes on certain popular tunes without previous rehearsal. The result was better imagined than listened to—it was certainly easier imagined than described. I was left speechless, tongued, and my usually prolific vocabulary with its rich store of appellations, execrations, objurgations, and expletives, entirely broke down in my effort to find suitable words with which to describe it. I can only tamely say that it was the greatest insult to the ear that the B.B.C. had yet broadcast. Or is it? After all, why shouldn't the B.B.C. do what the

chaos which has been created by Hore-Belisha. When they arrive at the office their nerves must be frayed to tatters, and on the grounds that after the night before you want the hair of a dog that has bitten you to effect a cure, they plan this cacophony to assuage their trembling nerves and bodily torments. The world is a mad place nowadays anyway, where rules of decorum and the proprieties are relegated to the limbo of bustles, harpsichords, antimacassars, and the cult of dirt in which it was considered unclean to wash every day. A world which can tolerate jazz and crooners can tolerate anything. Therefore, I congratulate the B.B.C. on having created the Big Din, and thereby set an example to America. The interlarded remarks such as "Yeah, Sir," "Swing it, Boys," "Gee, that's meller," or "Atta Baby, that's a hot one," add to the lunacy.

## New Use for Crooners

I LEARN that the General Electric Company are installing a speech amplifying system on the Kincardine-on-Forth Bridge which is to be used for controlling traffic. The Control Engineer will be able to speak into a microphone from his cabin situated at the crown of the swing span, and when he wants the traffic to stop I suggest that he puts on a record of a crooner when the motorists will just fade away.

## Good News for Norfolk?

I HAVE had a number of letters from readers in Norfolk and district who have bemoaned their lot for years. It appears that reception conditions there are very bad, and even the experts who have visited Norwich and its surroundings have been unable to say just why conditions should be so bad. On the long waves signals are received fairly well, but on the medium band even London does not provide a good signal. Apparently

the complaints have also been sent to the powers that be, for it is now announced that a station is to be built at Norwich by the B.B.C. So perhaps now the residents in that part of the country will rest content—or will they? I forgot to mention that the station will not be in operation until 1939!

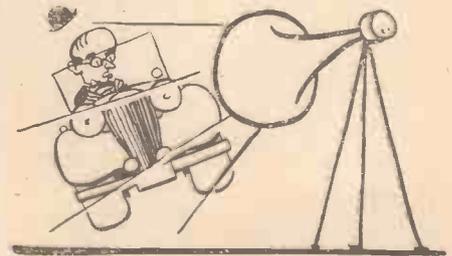
## Songs You've Never Heard!

Some time ago the B.B.C. had another bright idea—namely, to broadcast songs that had not been accepted by various music publishers. We were told that these songs had been submitted to the publishers who had either refused them, or placed them on their shelves as unsuitable for public consumption. What has happened now? I called in at our local bazaar yesterday, and the gramophone on the music counter was blaring out one of the songs in question. When I switched on the radio at home, the band which was playing at the moment was also playing the same tune. During the evening I heard it no less than five times. Does this mean that the song is so popular, or that plugging still takes place? Incidentally, the question of adver-



Money for jam.

Minister of Transport is allowed to do and is paid to do? I expect many members of the B.B.C. arrive at Portland Place by means of their Rolls-Royces—a vehicle, I understand, which even the most lowly paid luminary employed in that ugly building is wont to use. They must always be on the alert for ideas for new programmes. In travelling through London they must, as I do, become simply frantic at the muddle and the



Loudspeaker traffic control.

tising in this particular series seems to have cropped up again, and although it is stated that no advertising is permitted I have noticed many instances lately where blatant infringements of this rule have taken place—even to an artist being permitted to state the hotel at which he is going to stay when he comes to London.

### Radio Alarms

IN a recent issue some details were given concerning a new automatic call device to be introduced by the American shipping authorities, and these details seem to have raised the ire of a reader who sends the following epistle:—

“Produced in America, a country always regarded as very ‘go-ahead,’ one is led to believe that this device is something new and remarkable. Mr. Pannell, President of the Radiomarine Corporation of America, also seems to think it something to shout about. A considerable portion of my life has been spent at sea as a Marine Operator, and for eight years of that period I have worked on ships fitted with just such a device as is described in your paper. In America, the Safety Device was not recognised, nor would they even consider it as an effective aid in British ships, and, in consequence, they compelled all foreign ships trading on their coasts to carry, in addition to the Wireless Operator, a ‘watcher’; that is, a person capable of receiving the distress call only. Apparently they have now come to appreciate the efficiency of the British instrument they have for so long scorned.

“In closing, I would like to mention that the Marconi Automatic Device is a beautiful piece of work, as delicate as the finest wrist watch, and worthy of more publicity than it has ever received in the past.”

Of course, it should be unnecessary to state that the information was not given to belittle the British product, but merely to acquaint readers with the latest development in this direction. The policy of this paper is to give readers all the information which comes to hand of radio developments, and this particular item was only released in April.

### America Again!

I HAVE called attention before to the way things are done “in the States” and in the latest news-sheet issued by a popular station I find the following: “The announcer was giving a sound-demonstration, while the narrator was describing a bombing and gun battle between thugs and police. The sound effects included automobiles, trains, crashing buildings, fires, sirens, etc. No synthetic stuff was employed here, and to simulate the gun battle the announcer was using two revolvers, one in each hand. As he blazed away he suddenly felt a burning sensation in the calf of his left leg, and after the show he found that he had shot himself. At least, the gun had gone off so close to his



## Notes from the Test Bench

### M.B. Contacts

IT has previously been mentioned in these notes that the metallised surface of a wooden baseboard must not be used for conducting heavy currents such as valve filament current. Whilst conducting tests on the ultra-short-wave bands we have also found that the metallised coating of baseboards is not a good conductor of very high-frequency currents. If the metallising is used as a path from tuning coil to tuning condenser it is sometimes found that reaction cannot be obtained, but when heavy gauge connecting wire is used reaction is easily obtainable.

### Limit and Vitesse All-Wavers

SOME readers who have constructed the Limit All-Wave Four have found that reaction cannot be obtained on the lowest short-wave band unless the M.B. bolt is connected direct to the bolt holding the gang condenser chassis to the baseboard. Constructors who are having poor results on the lowest band should therefore try this connection. When a metal chassis is used, as in the Vitesse All-Waver, it should be carefully ascertained that the M.C. bolts are making good contact with the metal. The metal is generally painted and therefore the paint should be carefully scraped off underneath the M.C. bolt in order to ensure good contact.

### Improving Smoothing

CONSTRUCTORS who are troubled with L.F. instability on the short-wave band of their receivers when supplied from A.C. mains units should try the effect of connecting a high-capacity electrolytic condenser across the H.T.+ and H.T.— terminals of the unit—the T.C.C. type 80g condenser is very suitable for this purpose. Its high capacity of 32 mfd. ensures effective smoothing of the H.T. supply voltage from the unit and it has been found that it eliminates L.F. instability in the majority of cases. When using an electrolytic condenser in this manner in receivers supplied from batteries or a D.C. mains unit, great care should be taken to see that the polarity of the supply is not reversed. Polarity reversal will damage the condenser and may consequently cause damage to other components in the D.C. unit.

**NEWNES' TELEVISION AND SHORTWAVE HANDBOOK**  
By F. J. CAMM  
3/6, or 4/- post free from  
George Newnes, Ltd., Tower House,  
Southampton Street, Strand, London, W.C.2.

calf that he was severely burned and had to visit a nearby doctor to have surgical treatment. When he returned to the studio for a repeat of the item in a later programme, he took good care to fire the revolvers farther away from his body.”

### Receiver Developments

I HAVE often wondered what the radio set of the future will look like, and the various interesting cabinet designs which have been produced from time to time have given no indication of the ultimate trend. But a receiver is shortly to be put on the English market which may well be a welcome indication of the set which will eventually grace our homes—assuming that television takes on some new principle. This new receiver is built as a mantel clock and is, in fact, very little larger than the standard marble timepiece which our forebears used. It is, at any rate, sufficiently narrow to enable it to be stood comfortably upon the modern narrow fire surround. The entire front of the cabinet is in the form of a clock face, the centre portion acting as a speaker grille and the hands and chapters being arranged round the rectangular opening. Three controls are fitted just below this, and the receiver is an all-mains model with a novel built-in aerial and tuning system. Thus, where a power point is fitted by the builders in the centre of the mantel, this particular receiver may be placed in position and no wires of any description can be seen. The clock is mains operated and the makers guarantee 50 to 60 stations at full entertainment value.

### Retaliation

AN interesting Court case in Denmark recently gave me quite an amusing five minutes. The owner of a stationery shop was charged with an offence against the Danish Broadcasting Act by using a receiver without a licence. He pleaded justification, and when asked for his reasons stated that the Post Office authorities were guilty of infringing another section of the same Act which forbids broadcast advertisements. He said that the Post Office, by continually using the radio to advertise their special “greetings” telegram, were undermining his business in birthday and similar cards, and as a protest he refused to take out a wireless licence. The magistrate was sufficiently impressed to inflict a relatively small penalty, and gave him permission to appeal to a higher court.

A PAGE OF PRACTICAL HINTS

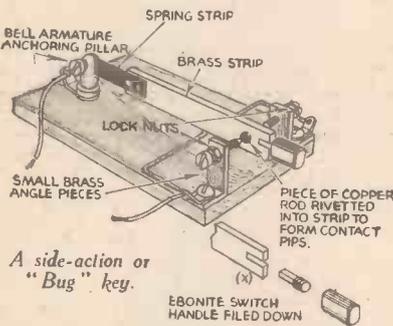
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Novel "Bug" Key

THE accompanying illustration shows a method I have adopted for making a simple but efficient "Bug" type key. The movement is light and definite, and

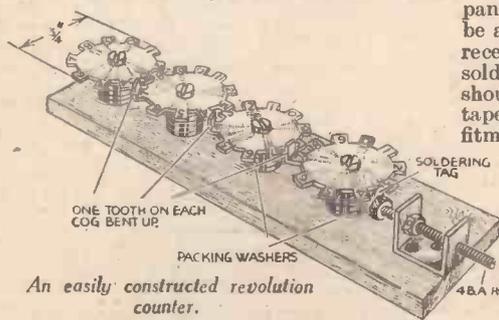


A side-action or "Bug" key.

although some experimenters prefer the ordinary type of sender, speed may be improved since the length of the dots and dashes is more fully calculated, and consequently, when going back to the old key, more care is exercised when sending. Contact movement is adjusted by two screws with lock nuts, and correct air gaps must be maintained, otherwise impulses will vary. A piece of brass rod is filed down and made to fit the recess in the brass strip (X) after which soldering should complete the fitment. The ebonite finger control handle was procured from an old key switch, but numerous ways will suggest themselves to suit the conditions of operation.—L. R. MORRIS (Leicester).

A Simple Counter

THE easily constructed counter shown in the sketch can be made from odds and ends in a very short time. When



An easily constructed revolution counter.

winding coils or transformers it saves much wearisome counting and ensures accurate results. The four cogs are best cut from sheet brass or stout tin-plate with a pair of snips, and then filed up in the vice together. Note that one tooth on each is longer than the others, and should be bent up as shown. The cogs are then given a coat of white enamel and mounted on a piece of wood with a screw through the centres. Washers are placed underneath to prevent them fouling. The driving spindle is a piece of 4 B.A. studding with

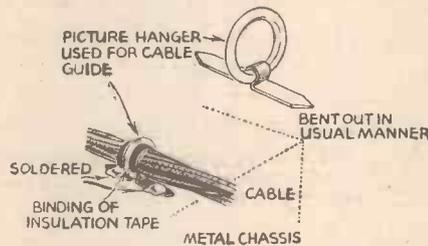
THAT DODGE OF YOURS!

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 Quereic with your wrinkles.

a soldering tag nutted on the end and arranged so as to drive the first cog one tooth per revolution. The numbering of the teeth is best left till last, when it is easier to see the direction of rotations. As shown, the device will count to 9999, but, of course, more or less wheels can be arranged as desired.—D. BESSANT (Mitcham).

Anchoring Multiple Leads

THE anchoring of a number of parallel leads in a receiver may be neatly accomplished by the aid of passe partout picture hangers, as shown in the accom-



A method of anchoring multiple leads.

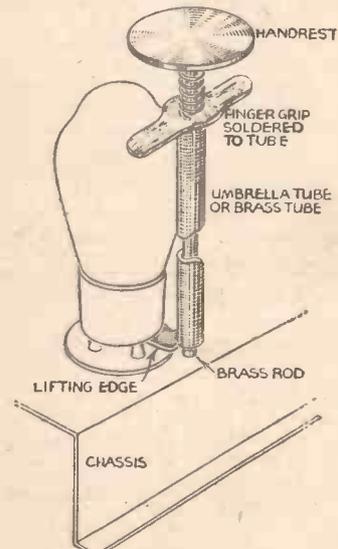
panying sketch. The leads should first be adjusted to the required positions in the receiver and the loops fitted and finally soldered into position. The cable or leads should be bound when possible by insulation tape to prevent wear, and also to make the fitment more secure, thus obviating any tendency towards slipping.—J. R. OLIVER (Taunton).

A Valve-lifting Device

AFTER loosening several valves from their bases when pulling them out of their holders, I made the simple lifter shown in the accompanying sketch, which is self-explanatory. In operation, the valve is shifted slightly to allow the lifting edge of the device to fit under the valve base, and pressure is applied to the hand-rest and below the finger grip. By this means the valve pins are easily withdrawn from their sockets without the possibility of loosening the valve bulb.—L. HENSLAW (Ilkeston).

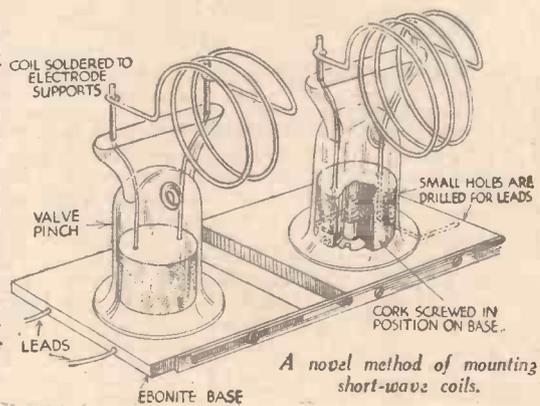
Mounting S.W. Coils

I HAVE found that losses in efficiency of S.W. Coils can be minimised by mounting them on the glass pinch of an old valve, which in its turn is mounted on a cork screwed to a baseboard. The pinch is pushed over the cork and mounted on a small ebonite square. The whole assembly looks very attractive. A slider can be fitted to the side of the ebonite to vary the coupling, and small holes are made through the ebonite for the connecting leads, as shown in the sketch.—A. T. WARD (Edgware).



A simple valve-lifting device.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA  
 By F. J. CAMM 4th 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.



A novel method of mounting short-wave coils.

THE return of the warmer weather and longer hours of daylight leads to a diminution of the hours of listening in the case of many listeners, but there is no reason why this should be so. Apart from the fact that it is possible to make use of any receiver out of doors just as easily as in the house, the B.B.C. have this year decided to cut out their original arrangements regarding the provision of summertime programmes. In previous years the hours from 6 p.m. to 8 p.m. have been utilised to radiate only one programme from both National and Regional transmitters, but they have now realised that listeners require to make use of these hours just as much as at other times, and accordingly will this year provide the usual alternative programmes, thus giving to those who have not previously taken advantage of outdoor radio, an added incentive to do so. In many cases one requires to listen in the garden, and in this case there are two alternative schemes. Either the receiver may be left in its original position in the house and an extension loudspeaker connected for use in the garden, or the receiver may be taken out of doors. There are advantages and disadvantages in both cases. In the former, one has to return to the house in order to make adjustments of volume or tuning, and in the latter the aerial and power supply leads may introduce some difficulty. It must, of course, be emphasised that when making use of the radio in the garden it is essential to keep the volume down to such a level that it is not audible in the next garden, otherwise, apart from the annoyance this may cause, you may be breaking a local by-law concerning the use of loudspeakers in such a manner that they cause a nuisance to other residents.

**Separate Speaker or Set**

When adjustments have to be made at the house end, it may be necessary for one listener to go into the garden and indicate to the operator in the house just when a suitable volume is reached. If the adjust-



A range of Portables described in past issues of "Practical and Amateur Wireless."

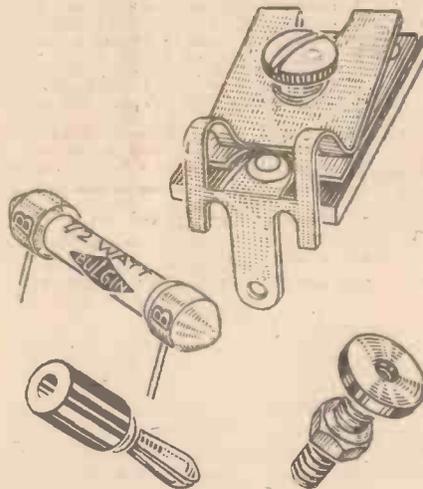
ment is carried out without assistance it may easily be made so that the next house also can hear the signal. In most cases, therefore, it will be preferable to take the receiver into the garden, running an extension lead from the aerial lead-in, or erecting a temporary one along the fence, for instance. In many cases this will not lead to much difficulty other than the problem of transport where the domestic receiver is of large dimensions. Many

# OUTDOOR R

How to Make the Best of Radio in the Open Air, Reference to Suitable Receivers - - - - By V

modern extension speakers are provided with a volume control and this will, of course, remove one of the drawbacks to an extension listening point in the garden. There still remains, however, the problem of changing from one station to another, and

low-tension accumulator used for the car lighting is employed to deliver the various voltages required for the radio receiver, the usual scheme being to employ a special type of rectifier which changes the accumulator supply to A.C. It is then stepped up by means of a transformer and rectified. This device can also be employed to build a small H.T. unit to operate a multi-valve set in the garden, or even when on a hike, provided that the separate sections are included in individual cabinets or cases for portability. A good 6-volt accumulator will be found lighter than a combined 2-volt battery and 120-volt H.T. battery and thus will enable much better results to be obtained from a receiver with only a very small aerial. A further important point is that the majority of modern receivers now include a short-wave band which will provide more alternative programmes, and a very small aerial will be found adequate for good reception of short-wave stations—providing the right time of day or night is chosen when selecting the stations.



Midget components such as these may be used in constructing lightweight portables for outdoor use.

thus a small portable will be found the ideal solution to this particular form of listening.

**Car Radio and Hikers**

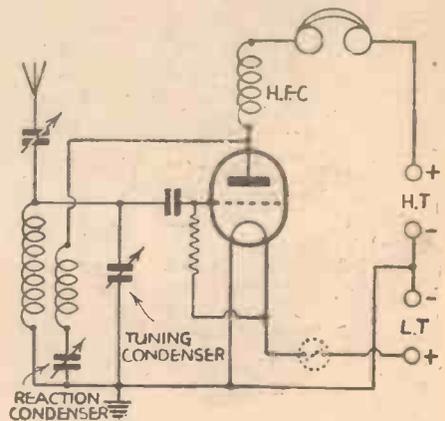
The user of a car already has facilities for radio when making journeys into the country, and the cyclist and hiker can build a very neat type of receiver which will provide entertainment with the crudest aerial system. It is, therefore, obvious that a good portable is an investment which returns one hundred per cent., as it may be utilised under so many different conditions. In our blueprint list will be found various types of receiver of the portable variety, from the smallest midget suitable for a hiker to the larger multi-valve receiver which includes a frame aerial and will provide many alternative programmes.

**Overcoming H.T. Problems**

For the car, one can also make use of receivers of this type, although as will be seen from the many car advertisements in these days a car radio fitment is now included in most good makes of car. The

**Aerials and Earths**

The all-important aerial may take many forms in the open air, and it is important to remember that it is unnecessary in many cases to erect any form of mast. A length of good flex may be thrown over the branch of a tree (using a stone tied to the end to act as a weight when casting the aerial, and which will enable the end to drop within reach when the aerial has to be taken down). Alternatively a wire fence will often be productive of splendid results. In certain parts of the country wire fences will be found in which three or four wires are supported on wood or wood and concrete posts, and if these are very dry it may be found that the lowest wire may be connected to the earth terminal of a receiver and the top wire to the aerial terminal in order to give much better results than are obtained when a proper earth connection is employed. Normally this latter connection may most easily be



The simplest circuit for a small portable—ideally suited for the hiker.

# RADIO

with Particular  
V. J. DELANEY

made by sticking a meat skewer or other metal object into the earth, pressing a piece of bare copper wire in with it, and attaching the other end of the wire to the earth terminal. If a small brook or stream



is adjacent to the place where you decide to camp or picnic, then the earth wire may simply be dropped into the water. If the weather is at all stormy and atmospheres are bad (due to the sensitivity control having to be turned up in order to reach out sufficiently far to obtain a strong signal), it will often be found desirable to ignore the customary earth and to use a wire stuck into the earth and connected to the aerial terminal. A few feet of flex coiled round a 1 in. diameter tube of some insulating material and then enclosed in an ordinary cocoa tin or some similar object, and the tin pressed into the earth by the mere process of treading on it, will often provide a splendid anti-static aerial connection, the wire being insulated where it passes through the lid and connected to the aerial terminal without any connection to the earth terminal. Where it is desired to obtain really long distance reception

with a small receiver and the best possible aerial is required, remember that a kite forms an admirable method of elevating the wire. Attach it to the bridle on the kite at the point where the normal kite string is attached and let the kite rise as high as desired, tuning the signal whilst the kite is rising, and making use of the desired amount of aerial. For this purpose again, ordinary thin flex will be found simplest to use, as it may be coiled round a suitable reel and will not easily break. It also has the added advantage of lightness.

### H.T. Generator

If the special H.T. generator previously mentioned is to be built in order to dispense with the H.T. battery, the correct type of unit should be obtained, and this, together with the associated transformer, should be built into a metal box to

avoid hum or induction with the wiring or other components in the receiver. It will be found that the entire unit may be made very compact indeed and up to 250 volts may be obtained. This, of course, overcomes one of the great difficulties of the portable receiver, where in many cases a very small H.T. battery is employed in order to reduce weight. Another method of avoiding the weight difficulty is to build the receiver from midget parts, and to use the Hivac Midget valves. Not only does this reduce the weight of the receiver itself, but a much smaller H.T. battery and L.T. accumulator may be used to operate it.

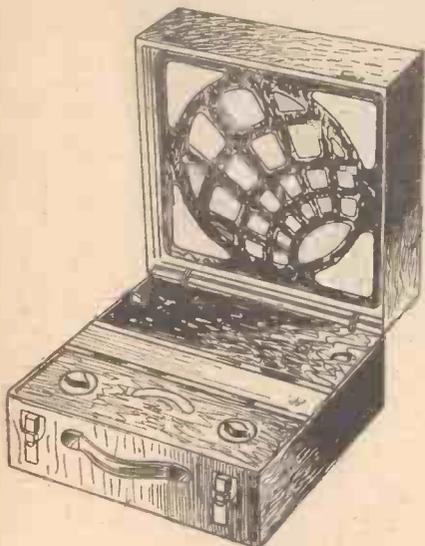
### Additional Details

The above remarks cover the general principles of outdoor listening, and there

remain only the incidental details which will, of course, vary in each individual case. The majority of commercial receivers now provide an extension loud-speaker panel or socket strip and this may be employed to supply a speaker used in the garden, for instance. If a switch is fitted in the receiver to silence the built-in speaker this should be operated in order to keep within the desired volume range necessary to avoid disturbing neighbours. If no extension arrangement of this type is fitted, the simple filter circuit consisting of a 2 mfd. or 4 mfd. fixed condenser joined to the anode may be added. In this case the built-in speaker acts as an L.F. choke, and if the speaker is then to be silenced a switch of the ordinary on/off type must be inserted in one of the leads to the speech coil. If it is not thought desirable to modify the speaker in this way, then a good output choke should be obtained in order to replace the speaker transformer. If a pentode output valve is employed a pentode type choke should be obtained in order to provide the correct matching impedance. The special Clix loudspeaker switching panel will prove of great value if a permanent line into the garden is to be used, and to avoid difficulties due to dampness, such a line should be of the lead-covered type such as is now used for ordinary electric light wiring. The cab-tyre (rubber) cable is also suitable, and may be tacked along a fence, or run just beneath the soil. If a plug-in point is fitted at the distant end of such a lead (in a garden shelter, for instance) some type of damp-proof cover should be arranged to prevent corrosion of the sockets, and a good tip is to obtain a spare plug, well smear with vaseline and insert this into the sockets when the speaker is not in use. Remember that a single lead will suffice for an extension lead of this type, with the return path via earth—for which purpose a short wire from the plug point inserted in the ground will prove adequate.

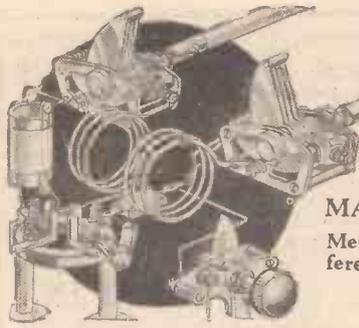


Here is our Cameo receiver chassis, showing how a neat receiver may be constructed for portable use.



A typical portable of the attaché case type. This has the advantage that controls are hidden when the set is not in use.

When using a car-radio at a picnic it may often be found that the car has to be parked on the roadway or in a cart-track some distance from the point where you desire to picnic, and again the extension speaker arrangement may be brought into use, following the above details. Obviously, however, as weight is of minor importance when using a car for transport, a good portable will prove of great utility as it will avoid journeys to the car to change from one station to another, to switch off or to control the volume. If an extension speaker such as the W.B., provided with the built-in control, is employed, the question of controlling volume will be avoided.



# Short Wave Section

## MAINS WORKING ON SHORT WAVES

Methods of Avoiding Mains Hum and Induced Interference : Precautions Which Should Be Taken : Extra Decoupling : Mains Filters.

**A**LTHOUGH it is by now no means unusual to build mains-operated short-wave receivers, there are several points which should be watched when designing such a set. One reason for this is that electrical interference and mains hum are far more likely to be troublesome than is the case with a normal broadcast set fed from the mains. That such trouble can be entirely overcome is well proved by the receivers which have previously been described in these pages, and also by the

—not power—type will give an excellent degree of amplification, and an output which is generally sufficient for operating a loudspeaker at modest volume.

### Four-valve Superhet

Should it be desired to construct a four-valve superhet which will be simple to build and operate, a circuit similar to that shown in Fig. 2 will often suit. Here, again, there is an untuned aerial circuit, followed by a pentagrid frequency-changer

by replacing the triode output valve by a pentode. The latter method is satisfactory if reasonable precautions are taken to decouple the screening grid by means of a 2,000-ohm resistor and a 2 mfd. fixed condenser. The same advice applies when using a pentode in a "straight" circuit, but a good deal of care must then be taken with regard to the layout.

### The Aerial Circuit

When designing any kind of set with tuned aerial circuit for mains operation, it is found worth while to employ an inductively coupled aerial winding, for this tends to minimize mains interference picked up by the aerial system. It is better still, of course, to employ a dipole aerial system, the two aerial wires being connected to the ends of the inductively-coupled winding. With this arrangement, any interference picked up by the aerial lead-in (which might run comparatively near to mains leads in the walls of the house) tends to be cancelled out due to the capacity existing between the two twisted leads. For the benefit of those readers who are not conversant with the dipole aerial system it might be mentioned that an article on this subject appeared in the issue of PRACTICAL AND AMATEUR WIRELESS dated September 19th, 1936.

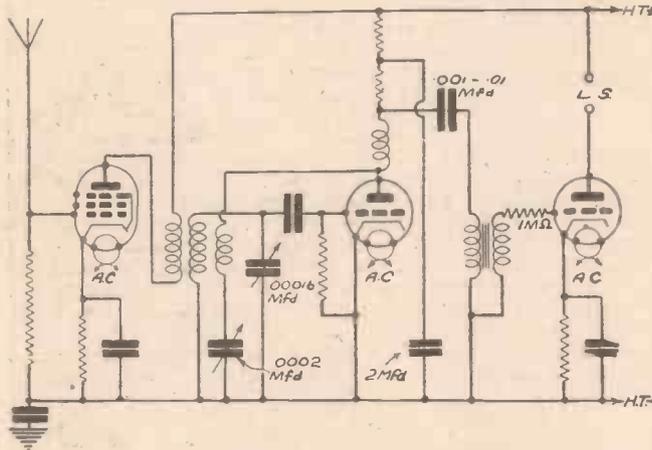


Fig. 1.—Skeleton circuit of a three-valve H.F. short-waver for A.C. operation, with an untuned aerial circuit.

### Heater Connections

In the case of an A.C.-operated receiver a good deal of potential interference from the mains can be eliminated by connecting a fixed condenser between each heater terminal of the detector valve-holder and the earth-line, as shown in Fig. 3. The condensers may each have a capacity of about .002 mfd., and they should be placed as near as possible to the valve-holder. It is sometimes worth while to repeat this arrangement with the L.F. valve, using condensers of about .005 mfd. capacity. These condensers balance out the A.C. potential developed across the heater winding.

many commercial sets which are designed for all-wave working.

### Valves and Circuit

When the constructor proposes to make a receiver other than a complete, published design, however, he must be prepared for difficulties which might possibly be encountered. With regard to the general form of the circuit, it is generally found that immunity from hum is most easily ensured by using a fair number of valves, each working well within its capacity. If maximum sensitivity is demanded from every valve in the set there is far more likelihood of interference troubles presenting themselves. Some readers may feel inclined to disagree with the statement that a well-designed superhet, even of very simple pattern, is more likely to be free from "mains" troubles than is a Det.-Pen. two-valver.

If the constructor does not feel disposed to go to the expense of a superhet, he would be well advised to include an H.F. stage—even if this is untuned. A circuit on the lines of that shown in skeleton form in Fig. 1 nearly always proves very satisfactory. It will be seen that there is an H.F. pentode, which follows an aperiodic aerial circuit, followed by a tuned-transformer type of inter-valve coupling, a triode detector and a triode output valve. Increased output can be obtained by using a pentode in the output stage, but this is more prone to give trouble in the way of mains interference. A triode of the L.F.

I.F. stage, triode second detector and triode output valve. Tuning is carried out by means of the single .00016 mfd. condenser. An intermediate-frequency of 465 kc/s should be used for preference, and the "oscillator" coil might be one of the normal type designed for aerial tuning, the reaction winding being included in the anode circuit of the oscillator portion.

If greater output were required it could be obtained by using two L.F. stages or

With the same object, it is often better to disregard the centre tapping on the 4-volt A.C. winding, used to supply the heater current, and to fit a "humdinger" or 30-ohm pre-set potentiometer, so that the exact "electrical" centre can be found by experiment. The idea is illustrated in Fig. 4.

When the set is of the A.C./D.C. type it is usually wise to arrange the heater connections so that the detector heater is

(Continued overleaf)

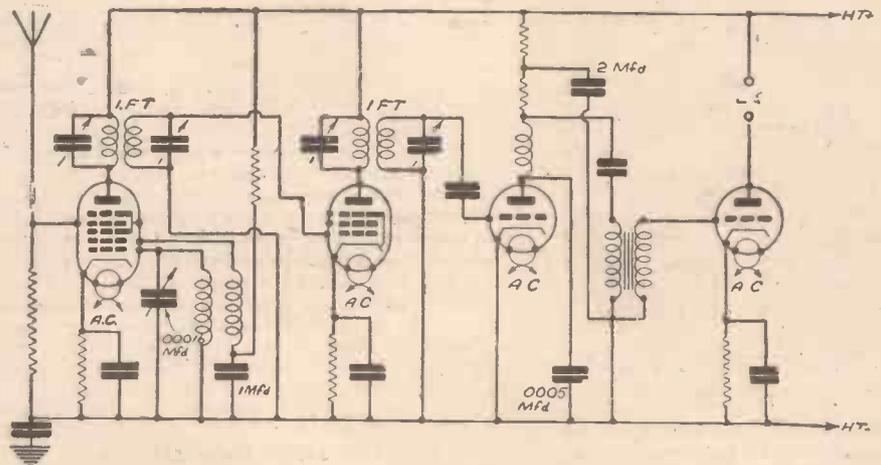


Fig. 2.—This skeleton circuit refers to a simple and effective type of A.C. superhet with single tuning circuit.

**SHORT WAVE SECTION**

(Continued from previous page)

returned to the earth-line, as in Fig. 5. If the detector heater is not at earth potential it frequently happens that pronounced hum is noticed, and that this cannot be eliminated by the usual means. Modulation hum, in particular, is likely to be troublesome. This manifests itself in the form of a pronounced, and often comparatively high-pitched, hum which is present only when the receiver is tuned to a fairly powerful signal. In many cases it has been found that a re-arrangement of the heater circuit has cured troublesome hum which could not otherwise be obviated.

**Adequate Screening**

Screening is always important in a sensitive receiver, but it is more than usually so in a mains-operated short-waver. In many instances it is found that it is insufficient simply to use screened coils and chokes, and to isolate the mains-supply portion of the set. Apparently-trivial things like unscreened anode connectors can cause a considerable amount of trouble. To guard against this it is worth while to

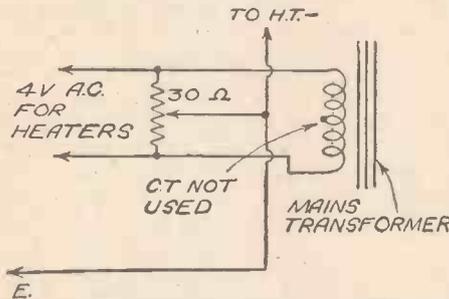


Fig. 4.—It is sometimes better not to use the centre tap on the heater winding, but to obtain the exact "electrical" centre by means of a 30-ohm pre-set potentiometer.

use valve anode connectors for H.F.-type valves which are provided with a small copper or aluminium cap designed to enclose both the connector and the portion of the valve which is not metal-coated.

Although decoupling is not usually considered in connection with mains hum, it does play an important part in this respect. Thus, if the detector valve is inadequately decoupled, interference is likely to be far more pronounced. Moreover, when reaction is employed, any tendency to instability and interference is increased. In most cases it is sufficient simply to include a decoupling resistance of between 25,000

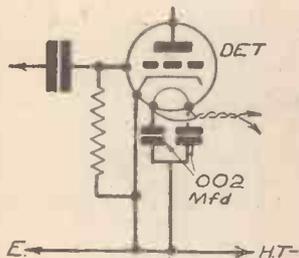


Fig. 3.—Hum can often be obviated by connecting a pair of fixed condensers as shown here.

and 50,000 ohms, along with a 1 to 2-mfd. fixed condenser, but in exceptional cases it is better to have two decoupling resistances in series, connecting a fixed condenser between each and earth. This double-decoupling also provides additional smoothing for the detector valve, which is most susceptible to the effects of mains irregularities.

**Impaired Low-note Response**

Another "trick" which has often been found useful is to reduce the efficiency of the L.F. amplifier at very low frequencies. This does not introduce any undesirable effects in most cases, because the quality of reproduction is rarely so good that the difference in tone can be recognised. One method of doing this when using R.C. or parallel-fed transformer coupling is to reduce the capacity of the coupling condenser to about .001 mfd. It might even prove worth while to experiment with a few different condenser capacities. Another method is to connect a condenser of between .0003 mfd. and .001 mfd. between the grid of the L.F. valve and earth.

With regard to the component lay-out, one of the most important points to watch is that the aerial and/or grid leads do not run close to the output valve or to the heater connections. Similarly, the speaker leads should be isolated from the mains and H.T. leads. Again, if the components are placed fairly close together, it is generally desirable to use twin, screened connecting wires for the 4-volt A.C. (heater) supply. The metal-braid covering should be earthed at a number of points, care being taken that the earthing wires are well soldered to the braid.

**H.F. Pick-up**

It might appear unimportant, but it is not so, that the wires from the rectifier to the various H.T. points should not be any longer than necessary. These have a tendency to act as a miniature "aerial," and so to pick up high-frequency currents, with the result that the set shows signs of instability. If the leads must be long it might be well to "break" them at intervals by inserting 250-ohm resistances, taking care that a good by-pass condenser is placed between the "set" end of these and earth.

Should hum be troublesome after taking the above-mentioned precautions it might be necessary to include a filter in the supply leads from the mains. Generally, a double

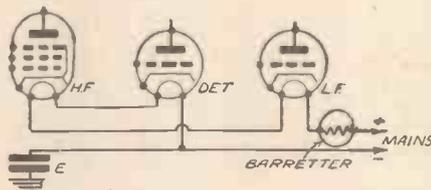


Fig. 5.—The detector heater should be connected to the earth line in an A.C./D.C. set.

.01 mfd. fixed condenser is sufficient. The centre tapping of this should be connected to earth, the other two ends being joined to the mains leads. In particularly troublesome cases it will also be necessary to include mains filter chokes—large H.F. chokes of high current-carrying capacity—between the mains leads and the set; the double condenser should be used in addition.

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## LEAVES FROM A SHORT-WAVE LOG

### Radio Servicio Santiago

THE broadcasts from CEB, Santiago (Chile) on 24.23 m. (12.381 mc/s), recently reported in these columns, are now very well heard in the United Kingdom. The call given out at frequent intervals in both Spanish and English makes the identification an easy one. The studio, as an interval signal, appears to be using four chimes.

### An Unpleasant Interference

During the past few days the W2XAF, Schenectady, transmissions have been marred occasionally by a background of a South American broadcast. It is stated that the trouble is due to the change made by HJ4ABH, Armenia (Colombia), which moving from 31.51 m. or 10 kc/s above G.S.B. to 31.47 m. (9.532 mc/s) is now inconveniently wedged between W2XAF, Schenectady, and JZI, Tokio. The Colombian may be identified not only by its call-sign, but by its 5-chime signal sometimes alternating with 2 strokes on a gong,

and the fact that at G.M.T. 0245 it closes down with the playing of the Indian Love Call from "Rose Marie."

### Another French Colonial Broadcaster

At Fort de France, in the island of Martinique, the French colonial authorities have installed a 250-watt transmitter for the broadcast of wireless entertainments; the wavelength is 32.05 m. (9.36 mc/s). The daily schedule is: G.M.T. 1630-1730; 2315-0015 and from 0100-0200; on Thursdays the intermediate broadcast is devoted to a Children's Hour. All announcements are made in the French language.

### Messages to the Far North

If you care to tune in to W8XK, relaying the KDKA, Pittsburgh (Pa.), broadcasts on 48.86 m. (6.14 mc/s) on any Sunday morning at B.S.T. 06.00, you may eavesdrop on the private messages which are transmitted to trappers and settlers dwelling in the North-West provinces of Canada, Alaska and the Polar circle. It is the only practical means by which these temporary exiles are given the opportunity of hearing from their relatives and acquaintances. On most occasions a special programme of music and news bulletins is also compiled for their benefit.

### CONSTRUCTIONAL DETAILS OF "PRACTICAL WIRELESS" RECEIVERS.

(Continued from page 176)

disconnect this condenser from that lead. Thus the condenser will still be joined to the lead passing through hole No. 11 and the other end of this condenser must be joined to terminal No. 3 on the coil farthest from the panel—again another hole being drilled for the purpose. An examination of the blueprint, in conjunction with the coil wiring diagram reproduced herewith will enable these points to be clearly seen and no difficulty should be found in building this receiver from the modern components specified.

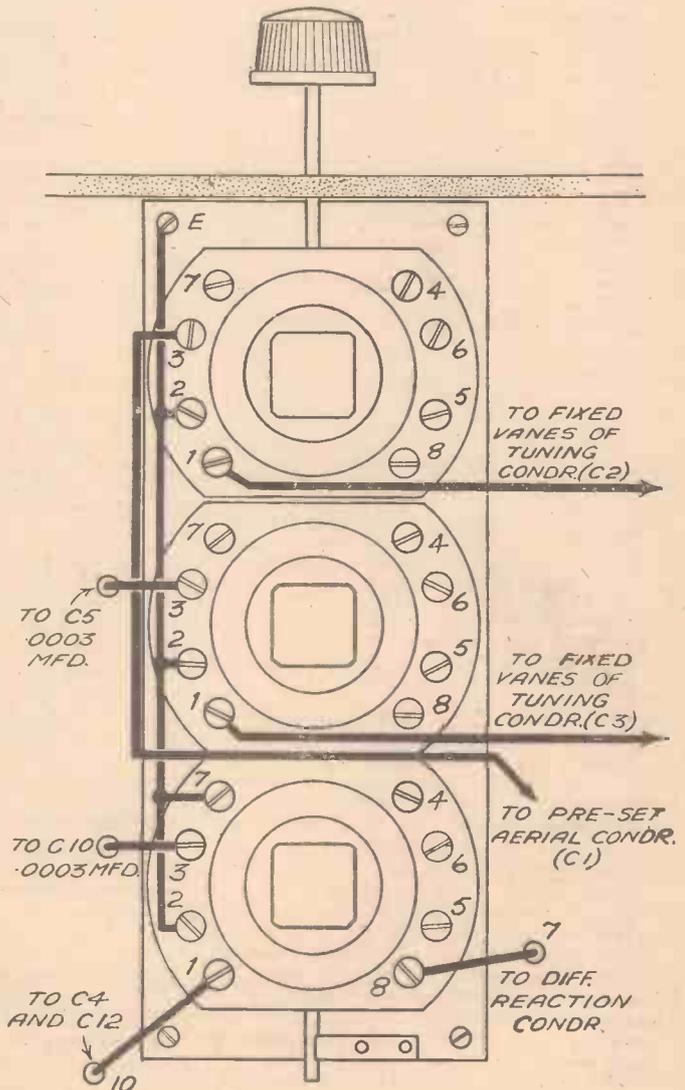


Diagram of connections for the new coils required for the Fury Four.

# UNSUSPECTED CAUSES OF TROUBLE

A Few Unusual Defects Described and Explained : Aerial Faults :  
 Damaged Coil : Condenser Drive : Speaker Distortion : Pick-up  
 Trouble : No Reaction - - - - - By FRANK PRESTON

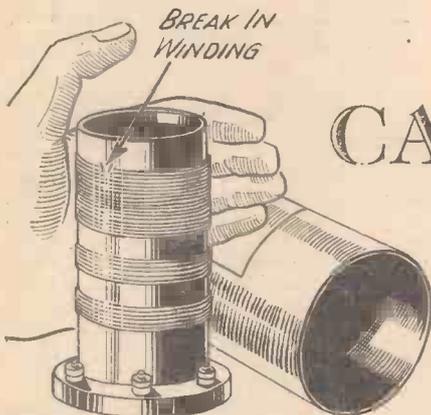


Fig. 1.—Signals could be received only when a hand was held near the coil—because of a break in the winding.

THE experienced constructor generally adopts a systematic method of tracing faults in a receiver, and by using suitable meters it is rarely difficult to locate the source of trouble. This does not always follow, however, whilst the constructor who does not possess very much equipment must rely on more "rule-of-thumb" tests.

But whether test gear is available or not, there are various forms of trouble which are very difficult to trace, due to the fact that the fault is of an obscure nature, and is one which a meter would not normally reveal. One such case was revealed a short time ago, when an amateur found that at some periods the signals of even the local transmitters became abnormally weak, whilst those from more distant stations could scarcely be heard at all.

### Erratic Operation

The wiring was carefully checked, battery leads were tested, measurements of anode and L.F. current revealed no faults, and there were found to be good connections between valve pins and sockets. It was found that the periods of weak signals did not occur at regular intervals, nor at any particular time of day. It was only by accident that it was discovered eventually that the rubber-covered lead-in wire was fractured inside the insulated covering. Sometimes the contact was fairly sound, and at others it was broken, so that only the lead from the window to the set could serve as a source of pick-up. As this lead was fairly long, it provided quite a respectable "aerial."

Cutting off the end of the lead-in wire and re-making the connection immediately set matters right. In the majority of cases a fault such as this would have resulted in crackling noises being heard, but there was no such clue in the instance mentioned.

### Wave-change Switching

In another case it was noticed that, although tuning was sufficiently sharp on long waves, it was so flat on the medium-waveband that a considerable amount of interference was in evidence. The receiver in use was of the H.F.-Det.-Pen. type, tuned-anode coupling being used between the H.F. and detector stages. It had operated perfectly well for several months after construction, and the fault developed suddenly. The wave-change switches for the two coils were of the Q.M.B. type, and were mounted on the panel. There was no doubt that these were operating, and the leads to them were making good contact with the coil terminals.

The owner went so far as to test the coils with a meter, and it was found that the

D.C. resistance of each was similar on both wavebands. There was no fault with the tuning condensers, and different valves did not make any difference. Despite these tests it was discovered that one of the wave-change switches was not making proper contact in the "on," or medium-wave position, and thus one coil was not being set for the lower waveband.

This seems impossible from the details given above, but it transpired that the contact was sufficiently good when a current was being passed through the switch, although insufficient to short-circuit the coil when only the H.F. signal currents were being handled. The D.C. test was insufficient chiefly due to the fact that it was made by using a battery of too high a voltage in conjunction with an ammeter. If a milliammeter had been used, in series with a resistance and 1½-volt cell, the fault would probably have been revealed.

### "Listening Back"

Another example of a tuning fault was amusingly (and rather amazingly) described by a new constructor. He said that he could not receive the programmes from the local station when the tuning condenser was suitably adjusted; in fact, the set normally appeared to be completely "dead." But if the coil screen was removed from the aerial coil, and the windings grasped firmly,

### Receiver Service

A reader sent in his receiver to the PRACTICAL AND AMATEUR WIRELESS laboratories. The set had been made to a design published in these pages, and was a super-het. A screened gang tuning condenser was employed, and although there was a very slight background noise no signals could be heard on medium waves, and only a very faint background of music on long waves. Furthermore, the faint signals which could be heard were at equal strength over the whole of the tuning scale.

The sender of this set was rather indignant, because he explained that he had followed the published design implicitly, had checked all the components, and had had the set in the hands of a "reliable" service engineer; the latter gentleman had been unable to find any fault, or to obtain any reception.

Would you believe it? The condenser drive had not been properly tightened on the condenser spindle, with the result that the condenser vanes did not move a fraction of an inch, despite the repeated turning of the knob on the tuning control. The matter was made more difficult of solution due to the fact that the spindle of the slow-motion drive was rubbing against the panel, so that there was a normal amount of resistance to turning; additionally, the rotor of the tuning condenser was fairly stiff, due to the end adjuster being tighter than usual. Anyhow, the application of a small screwdriver to two small grub screws immediately put the receiver into very satisfactory working order.

A rather similar kind of fault was experienced by a constructor who had been less careful in following the published

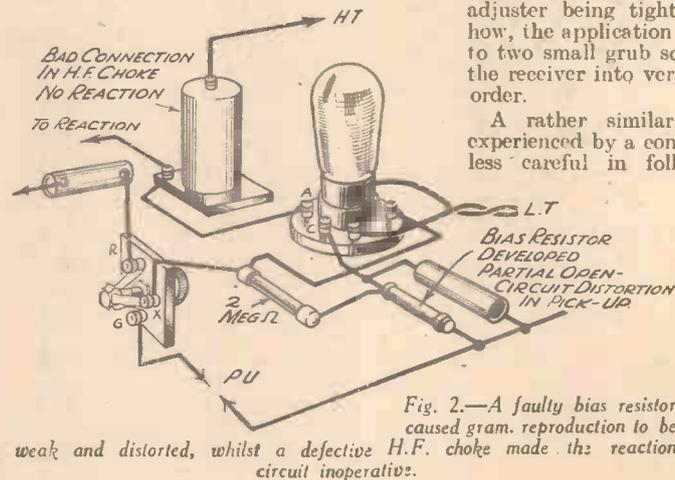


Fig. 2.—A faulty bias resistor caused gram. reproduction to be weak and distorted, whilst a defective H.F. choke made the reaction circuit inoperative.

yesterday's programme could be heard at fair strength. "Impossible," you will say. But the fact remained that signals could be received if the hand were held close to the coil, when reception was out of the question otherwise. A break in the winding of the coil explained the matter. The break was near to the "aerial" end, and gave the same result as if the aerial were disconnected. By holding the hand near to the coil, the pick-up of the body was employed, and this, quite by accident, had the effect of bringing in the Regional transmission when the set was tuned to the National.

design. A metalised baseboard was specified, but this constructor has used a plain plywood chassis. In the original design the frame of the tuning condenser was automatically earthed through the metallising, but when using a wooden chassis no such connection was obtained or

provided for. In consequence, the condenser might just as well have been omitted.

### Earth-lead Peculiarity

Another fault which frequently puzzles readers is indicated by the fact that signal strength is greater when the earth lead is not connected to the set. This can be due to the occurrence of a slight amount of instability, resulting in "automatic reaction" when the earth lead is removed. In that event, a certain amount of distortion

(Continued on next page)

## UN SUSPECTED CAUSES OF TROUBLE

*(Continued from previous page)*

is generally present when the earth lead is not used. The proper remedy is to pay more attention to screening, and perhaps to re-arrange a few of the components in the H.F. circuits. On the other hand, the fault can be caused by a slight leakage between the aerial lead-in and earth. This in turn can be because a bared portion of the lead-in wire touches the window frame or masonry.

## Distortion

A case of distortion, especially on loud signals, recently gave a fair amount of trouble. Grid-bias voltages, anode currents and anode voltages were tested and found correct; the output valve was tried in another receiver; another output valve was tried in the set which gave trouble; tuning was checked and found to be normally sharp. Not until another speaker was tried did it become evident that the fault was in this component. Even then it was not due to incorrect matching, a faulty transformer or a defect in the magnetic system, but to the speech coil touching the magnets when a strong signal was applied to it. In order to overcome the trouble it was necessary only to slacken the nut in the centre of the spider, insert slips of paper at two or three points round the speech-coil former between it and the magnet pole and re-tighten the spider screw. This, of course, centred the speech coil, so that it was prevented from touching the magnets.

Although this particular fault could immediately have been traced by means of proper instruments, it passed undetected for a long time. The four-valve A.C.

superhet operated perfectly satisfactorily on radio, but results on gram. were distinctly disappointing; they had previously been very good. Not only was the record reproduction of low volume level, but it was badly distorted. A new pick-up was tried without there being any change, and then a measurement was taken of the anode current passed by the detector—which was acting as an L.F. amplifier on gram. This showed that the valve was passing only 1 mA, whereas the current should have been almost three times this figure. That gave a clue. The bias resistance was defective, so that the valve was considerably over-biased when the pick-up was in use. On test, the resistance was found to have developed a partial open-circuit, although it was not "dis." Thus, the H.T. was being applied to the valve, although the voltage was a good deal lower than it should have been, whilst the bias voltage was so high that the handling capacity of the valve was considerably reduced.

## A Reaction Fault

A fault of somewhat similar nature was observed in a Det.-L.F. battery set, but in this case there was no provision for gram. Reception of the local station could not be called poor, despite the fact that signal strength was below normal, and the reaction condenser had practically no effect. In this case it was found that there was a poor connection inside the H.F. choke in the detector anode circuit. In consequence, the voltage being applied to the anode was less than 10 volts. The valve was able to rectify in a fairly satisfactory manner, but was incapable of oscillating or providing sufficient feed-back for reaction to be effective.

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Trouble-tracking with the D.C. AvoMinor is fascinatingly simple with the help of the illustrated instruction booklet included with the instrument; and the AvoMinor gives you accurate readings in milliamps, volts and ohms. It enables you to test valves, circuits, components, batteries and power units with the ease and precision of the radio engineer. The AvoMinor is a permanent investment in trouble-free radio. It's time YOU had an AvoMinor in the house.

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**AVOMINOR**  
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This is really 2 maps in one, showing on the first side the Central London Area with the principal thoroughfares and new by-pass and arterial roads, and on the other side the main roads to the country and coast with their suburban connections.

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It incorporates a complete index key with a quick reference explanation and colour guide.

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Tower House, Southampton Street, Strand, W.C.2.

NEWNES : LONDON

## 'THE EMPIRE'S HOMAGE' on CORONATION NIGHT

Mr. Stanley Baldwin, The Viceroy of India, the Prime Ministers of the Dominions and representatives of other units of the Empire will be among those taking part in the Coronation Night broadcast entitled "The Empire's Homage."

For forty minutes, from 7.20 p.m. (British Summer Time), listeners not only in the United Kingdom but throughout the Empire and in other parts of the world will be taken by radio westwards round the world till the Prime Minister of Great Britain in his closing address leads up to a message from King George VI to his peoples:

The King will himself speak into a special microphone at Buckingham Palace, and as his father talked to "my beloved people" in the memorable Christmas Day broadcasts of the past, so will the new monarch speak to his Empire.

It will be a unique and historic occasion; the first on which a king, by the power of broadcasting, has ever spoken to his subjects in all parts of the world only a few hours after his Coronation.

It will be the first time, too, that the Dominion Prime Ministers have taken part in such a programme.

Mr. W. L. Mackenzie King, Prime Minister of Canada; Mr. J. A. Lyons, Prime Minister of Australia; Mr. M. J. Savage, Prime Minister of New Zealand; and General J. B. M. Hertzog, Prime Minister of South Africa, all of whom will be present at the Coronation as representatives of their Dominions, will speak from London. Southern Rhodesia will be represented by its Prime Minister, Dr. G. M. Huggins, and Newfoundland by a member of its Commission of Government, Mr. W. R. Howley, both speaking from London.

The Viceroy will broadcast from India.

With its impressive list of names, the roll of members of the Colonial Empire will be called, and this part of the Empire will also have its direct representation in a message to be broadcast from Bermuda by Lieutenant-General Sir Reginald Hildyard, Governor of the Colony.

The programme will also embody some of the features which have become customary in the Christmas Day broadcasts. For instance, in addition to the official greetings, representative citizens will be heard speaking from Canada, New Zealand, Australia, and South Africa, as well as spokesmen for the King's people in England, Scotland, Wales and Northern Ireland.

From beginning to end, the programme, in which the B.B.C. has the co-operation of the British Post Office and the various broadcasting authorities overseas, will be recorded, so that afterwards it may be repeated from Daventry and so be made available to any parts of the Empire where it has not been possible to hear the original broadcast.

### LOCAL STATION QUALITY SETS

(Concluded from last week's issue)

A HIGH impedance detector valve has been chosen with values for the grid leak and condenser to give a good compromise between sensitivity, selectivity and quality. The leak is connected to the cathode which is returned to earth via a biasing resistance shunted by a 50 mfd. electrolytic condenser. The biasing arrangements provide the necessary grid bias when the valve is used as an amplifier for gramophone work.

With regard to the coil a suitable one would be the Bulgín type C7.

Why certain values have been given the various components will be apparent from the points discussed last week. In practice such a receiver will give exceptionally good quality from the local station and, with careful handling, should receive one or two of the more powerful foreigners, although, of course, it is not intended for the latter.

From our discussion of a quality receiver, it is apparent that a large set is necessary for faithful reproduction, but this does not necessarily mean that a battery user, or a constructor with A.C. mains at his disposal, cannot obtain quality above the average without being very ambitious. Perfect quality means a set similar to that given in Fig. 1, but the two-valve mains receiver, shown in Fig. 2, will suit all but the most fastidious of quality enthusiasts. Its fidelity curve would be equal to that of the larger set but, of course, it would not have the power-handling capacity, and would not be able to reproduce transmissions at the same strength as they would appear to a listener were he in the actual concert hall. It must, therefore, fall short of our ideal, but it would certainly give a quality of reproduction which could not be approached by any set with a selective H.F. stage.

### A Set for Battery Users

Battery set users are limited at the outset by the H.T. supply necessary for valves capable of giving a reasonable undistorted output. In Fig. 3, however, is shown a receiver suitable for use from H.T. accumulators, a Milnes Unit or an eliminator. Dry battery operation is not permissible, but one of the new Bulgín Electronic H.T. Vibrator Generator Rectifiers would enable the set to be worked entirely from a six-volt accumulator, and dispense with H.T. batteries, in which case it would be greatly advantageous to use Cossor six-volt valves in the output stage—either the type 610XP or the 625P. This would give a greater undistorted output and would allow the set to have greater power-handling capacity. For anyone limited to battery operation, and who is in search of real quality, the circuit can be confidently recommended.

No doubt many readers using batteries will say immediately that they are able to get good quality and plenty of volume with a Class B or Q.P.P. output stage, but there is no doubt, at least from the author's experience, that both these systems contain a large percentage of harmonic distortion in their output. This distortion is, of course, strongly emphasised with a good loud-speaker, and directly the H.T. volts drop below 120, the distortion is so pronounced as to render reproduction, to anyone at all musically inclined, unbearable. Such systems cannot, therefore, be recommended for a quality battery receiver.

One thing stands out from the above remarks—and that is that quality of reproduction must be paid for.

## IMPORTANT BROADCASTS OF THE WEEK

### NATIONAL

Wednesday, May 5th.—Running commentaries on the Chester Cup, from the Roodey Racecourse, Chester.

Thursday, May 6th.—Variety programme, from the Union Cinema, Kingston.

Friday, May 7th.—Scrapbook for 1902, presented by Leslie Baily and Charles Brewer.

Saturday, May 8th.—A running commentary on the second half of the Rugby League Cup Final, from the Empire Stadium, Wembley.

### REGIONAL

Wednesday, May 5th.—Empire Exhibition, a talk.

Thursday, May 6th.—Paradise Isle, a musical picture of the South Seas, by Sonny Miller.

Friday, May 7th.—King's Health, feature programme.

Saturday, May 8th.—Scrapbook for 1902, presented by Leslie Baily and Charles Brewer.

### MIDLAND

Wednesday, May 5th.—English Song Writers, Holst: vocal and instrumental programme.

Thursday, May 6th.—Cricket Interval, stories and verse.

Friday, May 7th.—Midland Composers: choral programme.

Saturday, May 8th.—The Roving Reporter, a feature column in sound.

### WESTERN

Wednesday, May 5th.—Opening Ours: Hampshire v. Gloucestershire, a recording of some of the match and an eye-witness account of the day's play.

Thursday, May 6th.—Cider Tasting at Long Ashton, feature programme.

Friday, May 7th.—A Novelty Instrumental programme.

Saturday, May 8th.—Town Tour, Bourne-mouth, a talk.

### NORTHERN

Wednesday, May 5th.—Variety programme, from the Royalty Theatre, Chester.

Thursday, May 6th.—God Save the King, a musical tribute to Coronation Year in which the original development of our National Anthem is portrayed, from the Town Hall, Manchester.

Friday, May 7th.—Farming Fundamentals, a talk.

Saturday, May 8th.—Orchestra! programme.

### SCOTTISH

Wednesday, May 5th.—Robert Burns, a play by Joe Corrie.

Thursday, May 6th.—Band programme.

Friday, May 7th.—Gaelic Concert.

Saturday, May 8th.—Scottish Dance Music.

### NORTHERN IRELAND

Wednesday, May 5th.—Orchestral programme.

Thursday, May 6th.—Pianoforte recital.

Friday, May 7th.—Young Farmers' Debate.

Saturday, May 8th.—Round the Albert, a panoramic view of Belfast Life, written by Ruddick Millar and Harry S. Gibson; music by Gerald Morrison.

## A New 40-Page Booklet—Free



This booklet, which is yours for the asking, gives particulars of the many opportunities open to trained men engaged in the Radio industry. It also gives full information about the specialized instruction offered by the I.C.S.

The industry is progressing with amazing rapidity. Only by knowing the basic principles can pace be kept with it. I.C.S. Instruction includes American broadcasting as well as British wireless practice, and provides ambitious men with a thoroughly sound training.

Here are the I.C.S. Courses:  
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**I.W.T. Associateship and Associate**  
**Membership Exams.**  
**City and Guilds Exams. in Radio Com-**  
**munication.**  
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**graphy.**  
**I.E.E. Graduateship Exam.**

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Efficient Servicing is of first importance to every wireless dealer and his assistants.

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Television will soon be a tremendous branch of the industry. Our Course deals adequately with this subject.

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## RADIO CLUBS AND SOCIETIES

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

### Exeter and District Wireless Society

AT the last meeting of the above society a lecture and demonstration was given by Mr. Mays, consisting of the illustration of various forms of electrical interference as experienced in radio reception. A full selection of gramophone records was given showing the types of interference received from almost every imaginable source, and as each was illustrated the method of cure was explained. Electric vacuum cleaners, Neon signs, and ultra-violet ray apparatus were illustrated. Lectures are held every week at 8 p.m. at No. 3, Dix's Field, Exeter, and intending members should communicate with the Secretary, W. J. Ching, 9, Sivel Place, Heavitree, Exeter.

### Torrington and District Short-wave Club

THIS club, which is now enjoying increased membership, is fortunate in having excellent facilities available which include A.C. Mains Power supply, powerful mains driven amplifier, and efficient testing apparatus, etc. A successful Field Day took place recently on a prominent landmark of the district, the object being the practical application of various Aerial systems. Experiments are being conducted on the application of super-regeneration to ultra-short-wave reception.

Meetings will be held as usual throughout the summer session, and anyone interested will be given a cordial welcome. Particulars may be obtained from the Secretary, Mr. A. E. Cornish, 1, Halsdon Road, Torrington.

### Radio Society of Northern Ireland

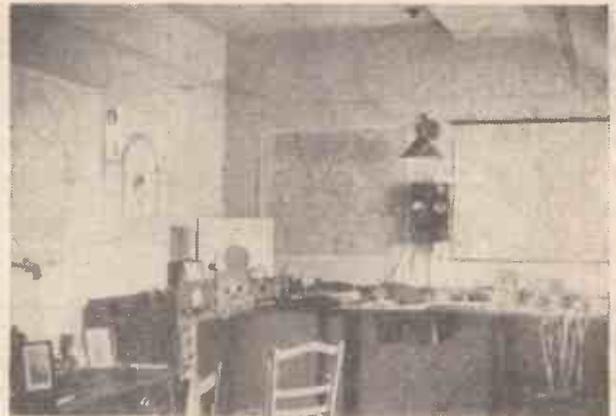
THE above society's new H.Q. are now the City of Belfast Y.M.C.A. Radio Club (GI6YM) and meetings are held on the first Wednesday of the month at 8 p.m., when new members are also welcome. The society held a very successful dance recently, and over 200 members and their friends attended. Two of the club's members have recently obtained their full licences and may be heard on the air with the call-signs GI8LF and GI8MI. Great enthusiasm is shown by the members at the morse class, which is held every Wednesday night in the club room, and the club now possesses 12 operators. Many of the members have also obtained their A.A. licences. Some of the transmitting members hold a QSO party every Saturday night at 24.00 G.M.T., on 20 metres, and the following call-signs may be heard on telephony: GI5QX, GI5JN, GI5OY, GI6TK, GI8GK, and GI8MI; reports on these transmissions will be very much appreciated.

Two of the club's transmitting members have obtained their W.A.C. telephony and await their QSL cards; also, the club's station transmitter will be in operation

within the next few days after being completely overhauled. The R.S.N.I. Leonard Trophy contest is to be held during the week-ends in May, and the club's receiving contest is in full swing. A large entry is expected. New members are gladly welcomed and full particulars may be had from the Hon. Secretary: F. A. Robb (GI6TK), 46, Victoria Avenue, Sydenham, Belfast, N.I.

### Knutsford Amateur Radio Club

MEETINGS of this newly formed club are held at Room 4, The Liberal Club, Brook Street, Knutsford, every Monday at 8 p.m. There is a Morse class, and the G.P.O. have accepted our application for an A.A. Licence. The Hon. Sec. is J.



*Experimental receiving station operated by Mr. M. L. Hunt, treasurer of the Knutsford Amateur Radio Club.*

McDermott (2AHH), Shaw Heath Cottages, Mobberley Road, Knutsford.

### Peterborough and District Short-wave Radio Society

AT a meeting of the above society, held at the "Bird in Hand" on April 20th, the second result of the Boyce Cup DX receiving competition was announced, the winner being W. S. Cornwell (total distance 26,670 miles), with J. W. Parmer, of Whittlesey, (9,650 miles), runner up. Each received replicas given by Mrs. H. Lyon and the donor Mr. C. Boyce.

As the winter session is now drawing to a close the last meeting will be held at 7.30 p.m. on Tuesday, May 4th, when a supper will be given at the "Bird in Hand." Anyone wishing to attend is asked to advise the Hon. Secretary.

During the summer, meetings will be held at the "Bird in Hand" the first Tuesday in the month at 7.30 p.m. and a prize will be given each month for the best QSL received. Results will be judged by the distance divided by the square of the wattage, and this will give all members an equal chance as G stations will be included.

It is expected of members, that when reporting G stations for this competition, that postage is included, and also that the report will be of some use to the station concerned. W. S. Cornwell (2ACP), Jt. Hon. Sec., 80, Elmfield Road, Peterboro.

### The Liverpool S.W. Radio and Transmitting Club

THE first meeting of this club was held recently at the premises of the chairman, Mr. J. E. Crabtree, at 11, Wavertree Road, Liverpool, 7, when various matters relating to the future of the club were

discussed. Any person who is interested should write to the Hon. Secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool.

**The Kingston and District Amateur Radio Society**

A MEETING of the 5-metre group of the above society was held at Ashford, Middlesex, on Tuesday, April 14th. The meeting was very well supported, and after members had presented their individual fortnightly reports, a most instructive talk was given by Mr. J. Stuart Williams (G5JW) on "The Design of 5-metre Receivers." During this talk Mr. Stuart Williams exploded the popular notion that in a super-regenerative receiver a large amount of quench noise is unavoidable.

Hon. Sec: R. K. Shergold, "Reculver," Manor Lane, Sunbury-on-Thames.

**Bideford and District Short-wave Society**

IN view of the interest being shown in amateur transmission, it has recently been decided that alternate meetings of this society, which are held fortnightly, should be devoted to this subject.

A large attendance of members witnessed the first transmitting demonstration by the chairman on April 5th last, when a transportable low-power mains set produced satisfactory contacts with four amateur stations on the 1.7 mc/s band.

Interested prospective members are invited to apply to the Secretary, Mr. E. K. Jensen, 5, Furzebeam Terrace, East-the-Water, Bideford, for particulars. The subscription has been fixed at 1s. per fortnight.

**Clackmannanshire Short-wave Club**

THE annual general meeting was held on Sunday, April 18th, and proved very interesting. The date has now been fixed for the annual field day, which will be held on Sunday, June 13th. The members will be divided into three sections, each one having its particular site, and the contest will be run on a competitive basis, points being allowed at the rate of one per thousand miles. A big membership is predicted when the club opens again on Sunday, October 3rd, and an interesting programme is promised. Prospective members can obtain full particulars from the Hon. Secretary, David McIntosh, 10, Cobblecrook Gardens, Alva, or from the Chairman (GM6TF), 12a, Erskine Street, Alloa.

**The Golders Green and Hendon Radio and Scientific Society.**

MEMBERS of this society recently visited the television demonstration theatre of Messrs. Marconiophone Co.

Six stages of T.R.F. are used having a gain between 40,000/100,000 times, rectified to give a variable voltage between 0/10 volts D.C. Unfortunately the various circuits used were only briefly dealt with, and this rather limited the scope of the discussion.

The meeting closed with a full programme demonstration on three different models all working at the same time. The pictures were remarkably bright, steady, and clear, and it was noted that the apparatus required very little attention, and that local interference was much more noticeable on the sound side than in the pictures. Full details of the society will be sent on application to the Secretary, 60, Pattison Road, N.W.2.

**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.

Y. A. (Mosul). The Radiolab tester would probably suit your requirements. Write to Everett Edgcumbe, Collindale Works, Hendon, N.W.9.

E. H. (Ossett). We regret that we could not insert your request in the paper. You could, if you desired, take a small advertisement in our advertisement columns for the purpose.

I. S. (N.8). We regret that there is no blueprint of a unit of the type mentioned, and the only issues in which these units were described are now out of print.

E. J. R. (Norwich). It is impossible to guarantee reception of the countries mentioned on a two-valver. Under good conditions, it should be possible, but local conditions vary and no guarantee can be given even with a more powerful receiver.

A. G. S. (Edinburgh). In most cases it is only necessary to enclose postage. An International Reply Coupon, obtainable from your local post office, will overcome the difficulty of sending the remittance.

A. P. (S.W.19). As the receiver is a commercial model the reaction arrangements must have been correctly designed in the first case, and therefore we suggest that the trouble is due to some fault. It would be desirable to have the receiver overhauled by a local service agent of the makers.

A. R. (E.15). The issue is still available (5.12.36), and the coil may be obtained from Messrs. Bulgin, price 8s. 9d.

R. A. P. (Southend-on-Sea). The unit should be suitable, but some difficulty may be experienced due to hum. A circuit of your receiver would be desirable to advise definitely.

T. V. B. (Fishponds). Messrs. Electradix Radios, whose advertisement appears in this issue, can supply the granules. The price varies according to the grade.

W. M. (Helensburgh). The chemical mentioned is suitable and is dropped into the vent hole until the desired degree of jellification has taken place.

B. M. C. (Montrose). The trouble is due to the peculiar action of the ultra-short radiation. Reflection and absorption also enter into the problem. The medium waves cannot be used, as the frequency band employed is so wide that the whole of the medium-wave band would be occupied and interference would result.

R. C. S. (Heavitree). The device consists of inductance, resistance and capacity equivalent to an ordinary aerial and is used to provide an artificial load to prevent signals from being radiated during experiments.

J. P. R. (Rugby). We regret that the issue in question is now out of print.

E. M. (Liverpool, 20). We have not described a receiver of the type mentioned by you. The converter would probably be suitable, but we have not tried it with this particular unit, and there may be insufficient current available.

M. S. (Leeds, 7). The S.W. Converter, blueprint P.W.48A, would be suitable for your requirements. It would be desirable to use this as a converter, connected in front of the set, rather than as an adapter in the detector stage, as by that means greater amplification will be obtained.

J. N. (Leeds). The books in question are now out of print.

S. M. (Beckenham). We do not recommend the procedure in view of the difficulty of accurately reproducing the circuit now employed. This will, of course, govern the output and you may find difficulty from hum.

J. L. (E.4). We regret that the issue and the blueprint are no longer available.

D. F. (Llanelli). We regret that we are not familiar with the servicing difficulties of individual commercial receivers and suggest that you have the set examined by the makers.

D. S. (Bromley). The coil in question is no longer on the market, and we suggest you use a Wearite Unigen coil in its place. A diagram of connections will be supplied with the coil.

J. L. (S.E.17). A list of the type you mentioned is to be found in the "Wireless Constructor's Encyclopedia."

S. R. C. (St. Ives). The trouble may be due to a number of things. Reduce the H.T. on the valve, and if this does not stop it, disconnect the reaction winding. If it then ceases you will know that the wiring is too large and turns should be stripped off until normal conditions are obtained.

G. F. W. (Fulham). We believe a condenser of the type referred to may be obtained from Messrs. S. Bird and Son, Cydon Works, Cambridge Arterial Road, Enfield.



You must  
**LOOK UNDER THE SHELL WHEN JUDGING A CONDENSER**

One condenser may look like another, but appearance does not make performance. So look under the shell — investigate what gives the performance, and how.

Strip open any T.C.C. condenser — see the "finish" inside. Take the paper type . . . see the purest linen tissue, that not only stands up to heavy flash tests but lasts a lifetime. See too, the finest foil, so carefully positioned . . . Note the heavy soundly soldered leads that connect the tags . . . fine workmanship all of it. A pity you cannot see the 28 years' specialized research that has led up to the design of these condensers. But you can accept the verdict of the country's leading set makers, they are prepared to take T.C.C. condensers on trust. Why? Because they have never been let down . . . For safety's sake use T.C.C.

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288 Pages and over 200 Illustrations. Now 3/6, or 4/- by post, from George Newnes, Ltd., Tower House, Southampton St., 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).

## Advanced Radio Theory

SIR,—I have been an ardent supporter of your valuable paper since the publication of your 2-valve superhet, at which time I knew absolutely nothing about radio, and consequently your "Beginner's Supplement" was most valuable. I constructed such sets as the "Monitor" and have, during the past five months, designed a self-contained four-valve superhet portable, and have also had five "Wrinkles" published. Surely any average beginner could now do the same, as I am only 16. I think, therefore, that many readers would welcome a section on more advanced work, such things as more complicated formulae, to find inductances of coils, etc., and articles in the latest developments of this very progressive science.

There has been much comment on the delivery of components lately. Actually, I never have any trouble dealing direct with manufacturers. It is the shops which disappoint me. I have to spend at least 9d. on fares to reach Liverpool, where I can obtain out-of-date components, as there are no good firms stocking a good range of modern components. I have a solution which I hope comes to the notice of the R.M.A. If a second-rate shop can produce profit to provide flashing signs, surely a good shop would be capable of doing the same. Such shops could be established by the R.M.A., profits being shared by the manufacturers according to sales. Instead of four or five smooth-tongued, incompetent men, two or three skilled assistants would suffice, with obvious advantage to both constructor and manufacturer.—A. M. WILDING (Wallasey).

[What do other readers think of the suggestion concerning articles of the type mentioned in this reader's letter?—Ed.]

## Back Numbers Wanted

CAN any readers let us have a copy of AMATEUR WIRELESS, dated October 27th, 1934, in which details of the 20 station one-valve receiver were given? We have several requests from readers for this particular issue.

We also have a request for a copy of the *Wireless Magazine*, dated February, 1934.

## Band Spreading

SIR,—Referring to the article in the April 24th issue of PRACTICAL AND AMATEUR WIRELESS on Band Spreading and how a bandspreeder can be made out of a midget .0001 condenser, I would like to state that I made a similar bandspreeder, using two fixed and two moving plates, the spacing being four washers between the moving plates, and likewise for the fixed. Tuning from 0 to 180 degrees on this spreader gives a spread of between 5 to 7 degrees on the setter, which is a .00016. I have had this in use for about a fortnight, obtaining good results.

Further, I enclose a log of stations received, as I have not seen one from this district. My receiver is an 0-v-1, and antenna 45ft. long and 25ft. high.

Incidentally, could you give me the QRA of SV1MK, as there are no SV stations given in my call-book.

Thanking you for the very fine articles, and wishing PRACTICAL AND AMATEUR WIRELESS continued success.—C. DRAKELEY (Mansfield, Notts.).

[We were very interested in your fine log, which, however, was rather too long for publication. SV1MK is a Greek station.—Ed.]

## Logged at Stockport: Correspondent Wanted

SIR,—Having been a reader of PRACTICAL AND AMATEUR WIRELESS from No. 1, and being interested in short-wave reception, I am enclosing the best out of my log for this year as follows: LU2CA, 6KE, 7BK; FT4AL, 4AL, 4AA; K4ENY; VOIT, 4Y, 1P; YV5AA, VP6VR, PY2CK, 2EJ; VE2IT, 2EE, 2AA; CT2AB, and quite a large log of W stations from seven different states. In one of your past issues one of my fellow readers was asking if W2UK QSL'd. I sent him a report about three months ago, enclosing reply coupon, but have not received reply yet. He was also inquiring about VE3CK. I think he must have mistaken the call for VE3ACK,

CUT THIS OUT EACH WEEK.

## Do you know

—THAT English-made valves may now be obtained as replacements for all of the American types.

—THAT it is essential to watch carefully the connection to the top cap of those valves which are provided with this form of top cap.

—THAT the reason for the above precaution is that in some valves the cap is an anode connection and in others a grid connection.

—THAT a dipole aerial for the television signals should be constructed from heavy gauge tubing, and not from ordinary stranded aerial wire.

—THAT if an open type of lightning arrester is employed it should be cleaned periodically to avoid loss of signal strength.

—THAT care should be taken, when making up a multi-cable for use between separate units in a receiver, to avoid wide differences of potential between adjacent leads.

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 Neveles, 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.

who was on the air quite a lot about the same time as W2UK. I have cards from VE1CR, VE2DC, VE2EE, VE2BG, VE3ACK, WIDAY, W2IXY, W3CJA, W4CBY, VO1L, VK3LR, SM5SI, LA1G, F8MM, and HB9T. All stations were received on the 20-metre amateur band. I have only been sending reports out during the last four months, giving a good detailed report, and I have received QSLs from all reports, so far. I have been interested in short-wave work now for two years, and I have done quite a lot of set-building, thanks to PRACTICAL AND AMATEUR WIRELESS. I should be very pleased if you could put me in touch with a fellow reader and S.W.L. in my district through your paper. I have three receivers, one of them being a one-valve detector circuit taken from your journal, coupled to a three-valve amplifier (push-pull), also from your pages. My aerial is an inverted-L type, 60ft. long, 30ft. high, pointing direct north.—A. NEWALL (33, Ladysmith Street, Shaw Heath, Stockport).

## The "Simplest Short-waver"

SIR,—Having made the "Simplest Short-waver," I decided to add another valve. I was astonished at the reception, as my set was really only flung together. No components are of the low-loss type, but the coil unit is just as specified. In addition to sixteen G stations I have also logged EI6J, I2RO, F8MI, TPA3, OLR3E, and DJP. Many other stations are easily received, but being only a "new hand" at short-wave reception, I cannot identify them.

Wishing PRACTICAL AND AMATEUR WIRELESS every success.—H. E. CHAMBERLAIN (Shoreham-by-Sea).

## A Good Log from Cambridge: Back Numbers Available

SIR,—May I add my log to those you have been publishing each week. I started listening on the short waves nearly three years ago with an adapter made from junk parts, and now have a three-valve (0-v-2, R.C.C. and Trans.), which receives below 10 metres.

Since June, 1934, I have received over 2,000 amateurs as well as broadcast stations, all on 'phones, 569 of them W stations on 10, 20, and 80 metres. I have heard 57 countries altogether.

During the last month I have also logged the following stations: CE3DW, CN8MB, CN8AG, CO2KL, CO2MA, CO2WZ, CO60M, CT2AB, CX1CC, FT4AL, HAF8N, HI7I, HK3JA, K4UG, K4ENY, KA1MD, KA1KY, LU7DK, LU6KE, LU4AW, LUIDA, LY1HB, LY1AA, OH2ME, SUIRO, SU5NK, SU8MA, PY2AC, PY2ER, PY2CK, SV1NK, SV1KG, VO2Z, VO4A, VO6L, VP6TR, VP9G, VP9R, LU2AK, YN1NS, YV5AA, YV1AD, YR5AA, and ZP2AC, besides numerous American and Europeans.

I have just received programme sheets from Radio Podebrady for May, and they state that they will send them to anyone for one year on receipt of six international reply coupons or six months for three coupons.

I have all numbers of PRACTICAL AND AMATEUR WIRELESS from No. 60, and will be pleased to send any one the numbers they require if they send a stamp for postage.

Congratulating you on the excellence of your paper, which gets better every week. I hope you will publish more on Amateur Transmitting, but don't cut "Therminion's" space down, as his pages are always interesting and amusing.—B. A. LANSDELL (Clock House, Balsham, Cambridge).



# QUERIES and ENQUIRIES

## The Westector

"Could you please let me know the makers of the Restector Type W6?"—F. N. B. (Brighton 7).

WE presume that you refer to the Westector, which is a high-frequency rectifier manufactured by the Westinghouse Brake and Signal Company, Ltd., of 82, York Road, London, N.1. The type W6 is a half-wave unit suitable for use on frequencies from 100 to 200, and is therefore most applicable to superhets in which an I.F. of 110 kc/s is employed.

### 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.

Please note also, that queries must be limited to two per reader, and 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 different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. 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.

## 2-H.F. Receivers

"Have you in the past described any 2-H.F. receivers for battery operation? I should also like details for winding a Droitwich wave-trap on a 2in. former. I have a 4-gang Radiophone condenser with oscillator section. Does this tune to 110 kc/s or 465 kc/s, and have you a circuit using this particular component?"—J. C. (Nottingham).

THE Fury Four and Fury Super both employed 2 H.F. stages, and you will see from our Blueprint Service list that we have several other receivers employing this arrangement. You can no doubt make a selection from these—they are included in the four and five-valve sections. The Droitwich suppressor may be wound on your former by using 26 D.C.C. wire and winding 100 turns. The condenser referred to employed an I.F. of 110 kc/s so far as we can trace, but you may be in possession of a manufacturer's surplus model in which some other intermediate frequency was employed. In view of this we cannot recommend any of our receivers in which to incorporate the condenser.

## Converting a Battery Set

"Please let me know how I can convert my battery set into a D.C. mains set and thus discard my L.T. and H.T. batteries. What valves must I use if the supply is 230 volts?"—S. T. (Londonderry).

ALTHOUGH you could replace the present valves there may be some difficulty on the score of instability, as the mains type of valve is more efficient than the battery valve. The H.T. could be supplied direct from the mains, using a series resistor to drop the 230 volt supply to 120 or so, according to the previous voltage which you employed. For the heater supply, the valves should be wired in series and a special resistance (obtainable from Messrs. Bulgin) connected between the mains and the heaters. These resistances are supplied according to the current taken by the valves, and these may take .1, .18, .2 or .3 amps.

## A Simple One-valve Set

"I am only a beginner, and in your issue I saw two sets, the All-Wave Unipen, PW 31A and the B.B.C. One-valver, AW387. Which set would be the cheapest and easiest to construct? I have only just commenced taking your paper."—P. I. (East Barnet).

THE first set employs a pentode valve as detector and a special all-wave tuner. The second employs a home-made tuning coil (covering the broadcast wavelengths only) and a simple triode detector valve, and is consequently cheaper to build. The first set has the advantage that the short waves may be tuned in, in addition to the standard broadcast stations. Unfortunately, both the issues describing construction are now out of print.

a blueprint available?"—N. R. (Stockport).

THE current delivered by your mains unit is probably 30 mA at the most. This is .03 amp., and thus you will see that to charge an accumulator you would have to leave the cell on for weeks to replace even the drain of a two-valve set. The average trickle charger delivers .5 amp., and therefore your present unit could not be used for charging purposes. A blueprint for making an A.C. charger may be obtained from this office, price 6d., and the number is AW462. It was fully described in the issue of *Amateur Wireless* dated January 5th, 1935.

## An All-wave One-valver

"In a recent issue you replied in the Briefs column to W. J. A. C. regarding the ranges of a one-valve set. I would like to know the name of this set and in what issue of the paper the constructional details were given. Is it possible to obtain a blueprint for it?"—H. J. W. (Ash Vale).

THE receiver in question was the All-wave Unipen, blueprint number PW31A. It was described in the issue dated October 14th, 1933, but this is now out of print.

## The Westector for A.V.C.

"Referring to a back number of one of your magazines I found an A.V.C. unit which can be built into an ordinary battery set. I wish to incorporate this in a set I am building, but I am puzzled by one thing only, and that is, what component is represented by the box-like figure marked plus and minus. I thought I knew most theoretical signs, and this is a new one on me. Does the potentiometer in the diagram control the volume or the amount of grid bias?"—S. M. (Parkhead, Glasgow).

THE symbol in question is a pictorial representation of the Westector. This is a high-frequency rectifier, sometimes referred to as a cold valve. The theoretical symbol is exactly the same as a standard crystal detector, and therefore the pictorial symbol is often used in preference, to avoid confusion. The polarity must be observed, and that accounts for the plus and minus sign. You will find that the component has red and black end caps to enable this to be done. The potentiometer in question governs the delay voltage, and is, of course, connected across the G.B. battery.

## I.H. and D.H. Valves

"I have a directly-heated pentode which I require to use in conjunction with an indirectly-heated detector in a two-valve straight set. I have a mains transformer which has only two four-volt heater windings, and I wish to use a valve rectifier. I understand that it is possible to run both I.H. and D.H. valves off the same winding and should be glad to know how."—A. C. (Wimbledon).

AS the detector is indirectly heated the cathode will be joined direct to earth, and therefore an automatic bias resistor may be inserted between the centre tap of the heater winding and the H.T. negative line to bias the output valve. Even if the detector is used for pick-up work and has to be biased, the necessary resistor may be inserted in the cathode lead of that valve and no difficulty will therefore arise.

## Repairing a Speaker

"My loudspeaker vibrates on the outer edges, where it is crinkled, when I put my volume on to full strength. This causes a rattling, blurring sound. Could this be stiffened by painting with any solution to stop it, or is there any other means of preventing the trouble? There is also a crackling sound in my set which is very slight on short waves, louder on the broadcast band, and very loud on the long waves. Can you suggest the cause and a remedy, please?"—C. S. M. O'H. (Moascar).

IF the speaker cone is fractured at the corrugated surround it could be repaired by using some cellulose cement. This material is now marketed for loudspeaker repairs, together with a special thinning medium. It may be obtained from Messrs. Holiday and Hemmerding, of Dolefield, Manchester, at 2s. 6d. for the two, or 1s. 6d. for the cement and 1s. for the thinner. The cause of the crackling noises is, in our opinion, something outside of the receiver, and this may be confirmed by removing aerial and earth. If the noise then ceases you will know that the set is not responsible and will probably find some electrical apparatus in the vicinity which is causing the trouble.

## Trickle Charging

"I have in my possession a mains unit which gives an output up to 120 volts. Would it be possible, either by resistance or step-down transformer, to charge a 2-volt accumulator from this? If this is not possible, has there been an A.C. trickle charger described in your paper or is there

The coupon on page 184 must be attached to every query.

## Miscellaneous Advertisements

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

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Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

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**SHORT WAVE** on a crystal set. Full building instruction and crystal 1/2 post paid.—Radiomart, Tanworth-in-Arden, Warwickshire.

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**ALCO ELIMINATORS AND CHARGERS.**—4 H.T. taps, 120v/150v. 20/30 m.a., 13/-. With ½ amp. charger, 25/-. Charger alone, 7/6. ¼ amp., 11/-. Year's guarantee. Details free. P. & D. Radio, 1, Gooding Road, N.7.

**VARIABLE Directional Aerials.** 3 models available. As used at home, India, South Africa, etc. New Semi-variable Modcl. 12s. 6d. P.P. Send 1½d. stamp for Leaflet.—A. W. Mann, 62 Costa Street, Middlesbrough, Yorks.

**SOUTHERN RADIO'S** Wireless Bargains. All lines advertised in previous issues of "Practical and Amateur Wireless" still available.—Southern Radio, 323, Euston Road, London, N.W.1 (near Warren Street Tube). Phone: Euston 3775—and Branches.

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Have you had our **GIANT ILLUSTRATED CATALOGUE AND VALVE LIST?** Send 4d. in STAMPS for THIS BARGAIN LIST.

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**AMERICAN VALVES.** Genuine American HTRON and TRIAD first-grade valves, 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves, all types, 6/6 each. Genuine American DUOTRON Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. OCTOL bases, 9d. each.

**3-WATT A.C. AMPLIFIER,** 2-stage for mike or pick-up. Complete kit of parts with 3 valves, 40/-.  
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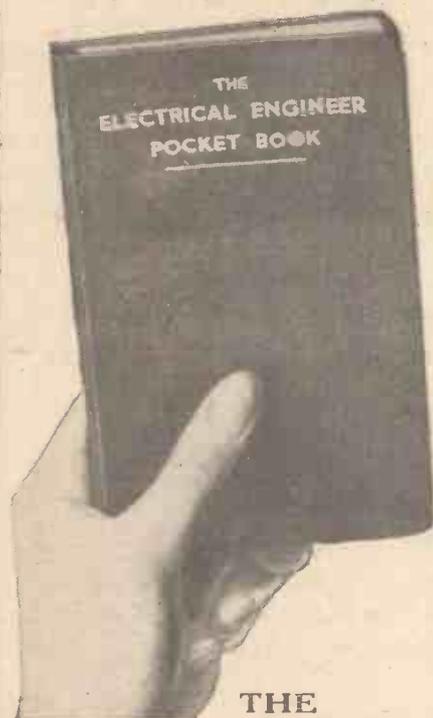


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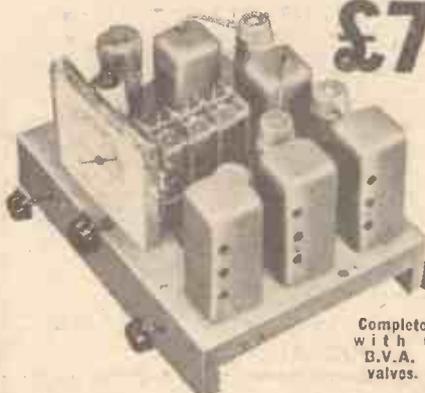
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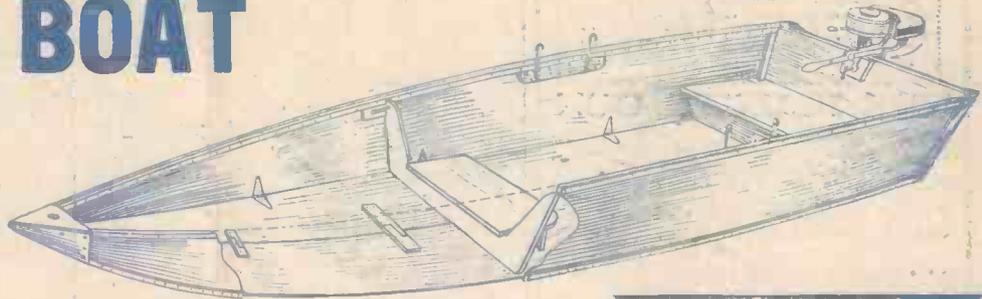
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IN THE MAY

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THE MAGAZINE OF MODERN MARVELS

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Practical and Amateur Wireless, May 15th, 1937.

**AN A.C. MAINS S.W. UNIT—See Page 204.**

# Practical and Amateur Wireless

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WEDNESDAY

Edited by **F.J. CAMM**

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May 15th, 1937.

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# TRANSMITTING TOPICS—See page 195



# Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. X. No. 243. May 15th, 1937.

## ROUND *the* WORLD of WIRELESS

### Fault Tracing

ALTHOUGH the modern radio receiver is an instrument of entertainment, one of the most interesting branches of the hobby is fault finding. Every receiver fails or develops a fault at some time or another, and the expert service man will in most cases be able to identify the cause at once. An inexperienced person might spend days and even then be unable to trace the cause of the trouble, even with good instruments at his disposal. Many radio clubs make a point of introducing competitions in the form of fault-finding, introducing some fault into a receiver and allowing a certain time for so many members to endeavour to trace it. The modern serviceman must be prepared to tackle any type of receiver, and some of the faults which arise are calculated to turn many heads grey unless a sound knowledge of the theory and practice of modern radio apparatus is first obtained. In view of the interest now being taken in service work we are commencing in next week's issue a short series of articles on the subject of fault tracing, designed both for the ordinary amateur and the would-be service engineer, and all of the more important points will be covered in this series.

### Motor-car Interference

THE ordinary electrical equipment of a modern car can give rise to severe interference with broadcast receivers, and it has now been found that even moving parts of a car can generate forms of electrical energy which are radiated over a considerable area and thereby introduce noises into a wireless set. We now understand that in the Federated Malay States the Government recently introduced legislation compelling all cars now on the road, as well as all new cars to be imported, to have adequate interference-suppressing devices incorporated so that broadcast listeners would not experience interference from that source.

### Television in U.S.S.R.

WE understand that the Soviet has ordered some transmitting and receiving television equipment from a well-known English company. Unlike the majority of other countries, however, this apparatus is of the mechanical, as distinct from the electrical, type, and does not utilise the cathode-ray tube.

### Five-studio Broadcast

ON May 16th a special broadcast of "A Midsummer Night's Dream" will be given in which an all-star cast will be featured. To make this even of greater importance, it is proposed to use five studios, and the music (selected from Mendelssohn's score) will be conducted by Clarence Raybould with the B.B.C. Orchestra, Section E, and the B.B.C. Chorus, Section A. Among the artists may be mentioned Fay Compton, Arthur Sinclair, Mary Hinton, Jay Laurier, Ernest Thesiger and Leslie French.

according to the demand and looks of the "fairer" sex. Now that broadcasting has reached the country the price has been changed, and fathers now demand a good radio receiver in place of the oxen. The present rate of exchange is roughly one crystal set for an elderly spinster and a radiogram (all-wave) for an attractive girl in her teens, but as radio receivers are not yet common the would-be husband has to part with many oxen before he can obtain a suitable radio receiver. Actually, therefore, the arrival of broadcasting has put up the market value of wives in Uganda.

### Workers' Choice of Records

WHAT type of gramophone record do you prefer? In a series of broadcasts from the Midland, commencing on May 18th, various workers will broadcast a recital of their choice, and the first speaker and recitalist will be a Birmingham engine-driver. The series is to be broadcast fortnightly.

### Flat as Salesroom

THE increased interest in television has led to the need for a showroom which will enable the television receiver to be demonstrated more nearly as it will be used in the home of the listener. Accordingly, a well-known London dealer has taken a flat near his shop, and this is being furnished by a well-known London store and is to be used as the showroom. Prospective clients will receive special invitations to attend these demonstrations.

### Another Torquay Concert

DOLAN EVANS (mezzo-soprano) will be the vocalist at the concert by the Torquay Municipal Orchestra to be broadcast from the Pavilion, Torquay, on May 18th.

### Variety from Swindon

FLOTSAM and Jetsam, and Haver and Ivor Lee will be among the artists in a variety programme from the stage of the Empire Theatre, Swindon, on May 20th, broadcast in the Western programme.

### Binding Cases and Indexes

BINDING cases and indexes for volume 9 of PRACTICAL AND AMATEUR WIRELESS are now available. The binding case, complete with title page and index, costs 3s. 6d., and the index alone 7d. by post.

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### A Coronation Acrostic

ON May 14th, in the London Regional programme, a novel broadcast will be made by Reginald Foort at the B.B.C. organ, accompanied by Phil Park and Ivor Dennis at two pianos, and Styx Gibling as percussionist. The vocalists will be Esther Coleman and Bert Yartlett. The broadcast will be a series of songs, the initial letters of the titles of which will, together, form an appropriate acrostic.

### Radio for Wife

IN Uganda the natives used to exchange two oxen for a good-looking woman suitable for a wife, and prices varied

# ROUND the WORLD of WIRELESS (Continued)

## Millions of Sets to Tune In for the King's Coronation Speech

IT is estimated that more than 108,000,000 men, women and children in English-speaking countries throughout the world will hear King George VI when he speaks to his subjects shortly after his Coronation on May 12th.

A cable-survey has been conducted by Philco Radio which shows there are more than 36,000,000 wireless sets in those countries. Thousands of additional sets aboard ships at sea, in desert and mountain retreats will reach into the ether to catch the King's historic message.

Figures compiled in Philco's radio receiver census show: 25,000,000 in United States; 8,000,000 in England; 1,500,000 in Canada; 1,000,000 in Australia; 40,000 in British India; 90,000 in South Africa, and 55,000 in Egypt. It is estimated that an average of three persons will be grouped around each of the 36,000,000 wireless sets during this dramatic and unprecedented broadcast. The vast majority of the sets are expected to be turned on most of Coronation Day to receive other programmes of description and commentary relative to the event.

## Victoria Hopper to Play in Coronation "Music Hall"

WE are informed that in John Sharman's 90-minutes Music Hall programme—the last Variety production of Coronation week, to be broadcast on Saturday, May 15th—Victoria Hopper, film star wife of Basil Dean, the producer, playing the part of Elizabeth Sydenham, will take part with Matheson Lang and Irene Vanbrugh in an excerpt from "Drake," (by Louis N. Parker) specially adapted for broadcasting by Julian Frank. Will Fyffe, famous Scottish comedian, ever-popular Bertha Willmott, Florence Desmond, and Elsie Carlisle, have also now been booked to take part in the show.

Other "acts" include Flanagan and Allen, Billy Caryl and Hilda Mundy, and 200 Boy Scouts from "The Gang Shows." Reginald Foort will be at the B.B.C. Theatre Organ, and Charles Shadwell will conduct the B.B.C. Variety Orchestra.

## New Victoria Orchestra

THE Rutland Square and New Victoria Orchestra, directed by Paul Belinfante, will broadcast on May 21st from the New Victoria Cinema, Edinburgh: "Escapada," by Phillips; Selection, "Bala-

## INTERESTING and TOPICAL NEWS and NOTES

laika," by Posford and Grün; "Hungarian Serenade," by Joncières; Foxtrot, "Red, White, and Blue," by Noel Gay; "Andante and Allegro from Sonata in G Minor," by Handel; Selection from



Their Majesties at a "His Master's Voice" recording session.

"The Girl from Paris," by Schwartz; "La Gitana," by Kreisler; "Chinese Rhythm," by Hellier; "Cuban Lament," by Charrosin; Entr'acte, "Willow Pattern," by Lowry; "Arabesque," by Debussy; "On the Banks of the Don," by Ferraris.

## SOLVE THIS!

### PROBLEM No. 243

Ashley's A.C. mains receiver developed a steady popping noise which mutilated the speech and music. When voltage tests were made it was found that the anode voltage fluctuated slightly in unison with the popping noise. What was the defect? Three books will be awarded for the first three correct solutions opened. Address your solutions 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. 243 in the top left-hand corner, and must be posted to reach this office not later than the first post on Tuesday, May 18th, 1937.

### Solution to Problem No. 242

The speech coil on the set speaker had developed an open circuit. The following three readers successfully solved Problem No. 241, and books are accordingly being forwarded to them: J. W. Feast, 12, East Park Street, Chatteris, Cambs.; W. N. Carter, 93, Orme Road, Bangor; R. Cambrook, 103, Carr Road, Walthamstow.

## Whit Monday at Blackpool

THE Whitsun Bank Holiday will no doubt see Lancashire people gathered in their thousands at Blackpool. In the evening Victor Smythe is presenting another broadcast, "Blackpool Night" entertainment, in the Northern programme. This year's tour will be conducted by a new compère, who goes by the name of "Our Albert." He will speak Lancashire verses, written by Frank A. Terry, which will serve to link up the various items. The part of Albert is being taken by Charles Nesbitt, who was one of the old Manchester Station Repertory players, in the early days of broadcasting. Under Albert's guidance, listeners will be able to visit the Tower Ballroom, from which Reginald Dixon, and Norman Newman and the Tower Band will broadcast; the Palace Theatre, where Charlie Kunz is appearing; and the South Pier, to which the Arcadian Follies have returned once more.

## Coronation Broadcast from Birkenhead

IN the Northern programme, on May 14th, an excerpt from the special Coronation bill will be broadcast from the Argyle Theatre, Birkenhead.

## Student Songs

A NUMBER of songs from the Scottish Students' Song Book will be sung by the Male Voices of the B.B.C. Scottish Singers on May 17th. They will be accompanied by the B.B.C. Scottish Orchestra, conducted by Kemlo Stephen.

## Week-End Away

PLYMOUTH is chosen for the "Week-End Away" broadcast series on May 20th from the Western Regional. A motorist, a cyclist and a walker will describe some routes to assist the hundreds of people who leave the scene of their everyday work to explore the surrounding countryside.

## Band Concert from Western Regional

THE City of Bristol Police Band, conducted by Captain F. W. Wood, M.V.O., Director of Music, will broadcast (by permission of the Watch Committee) on May 16th. The soloist will be Marjorie Harper (soprano), who is one of the soloists at a Plymouth City Church.

## "Design for Listening"

AN interesting programme entitled "Design for Listening," which will be broadcast on May 17th from the Western Regional, illustrates the preferences of different types of people, and how they listen to broadcast programmes.

# TRANSMITTING TOPICS

WHILE careful consideration should always be given to the placing, design and erection of an aerial, it is necessary to pay particular attention in the case of transmitters, as losses, unsatisfactory location, and careless design can seriously affect the efficiency of the station.

It is not always possible to select the most suitable aerial system or the best site for greatest radiation at the first attempt,

## A Practical Article Dealing with Various Types of Masts, Their Construction and Erection By L. ORMOND SPARKS

as possible, particular attention paid to all insulation, and, an item which is very important, viz., height. The first of these calls for care in calculating the exact length, according to type of aerial and waveband operated, the selection of good wire of reasonable diameter, and arranging matters so that joints are eliminated. If, however, circumstances force them to be

made, make sure that good soldered connections are used only, and do not use spirit for the soldering flux. The joint should always be bound with electricians' black insulating tape to protect it from the weather.

As regards insulation, too much attention cannot be paid to this item. Be generous with the use of insulators.

The large shell or barrel types are far superior to the very small egg type. Better still, use some of the light corrugated insulators which are specially designed for such work.

If guys are used with the mast, especially if they are of wire, always insert insulators in each one, say, six feet from the mast end. The barrel type are most suited for

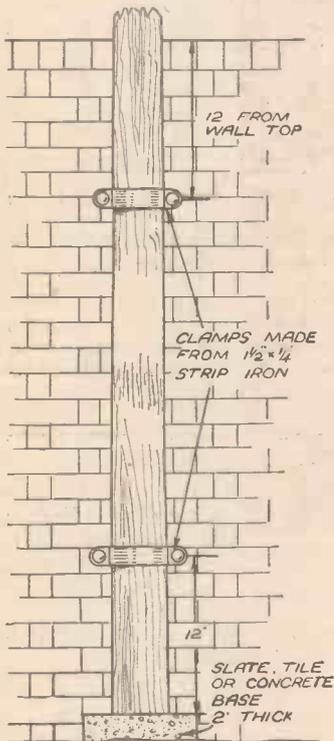


Fig. 1.—Method of bolting an aerial pole to a wall.

so I would repeat the advice I have given previously: "Don't be discouraged by poor reports of your transmission during your initial tests; experiment with the aerial arrangement and, if possible, vary its direction."

### Aerial Suspension

The station owner who possesses a large garden, free from large trees and other earthed objects, is very fortunate, as he is then in the happy position of being able to swing the aerial through many points of the compass and try out systems which the less fortunate owner cannot do through lack of space. A considerable amount of interest and information can be gained through such experiments, even with a low-powered outfit, especially if several wavebands are worked.

While one's activities are often cramped by the lack of ground space, it does not always follow that all parts of the aerial system have to suffer accordingly; for example, the construction and measurement of the electrical path can be made as perfect



A lattice mast built by the author of this article, and which will be described in next week's issue.

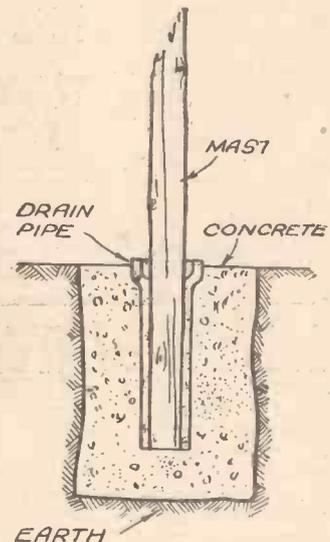


Fig. 2.—When the mast is to be buried in the earth this arrangement will prevent rotting.

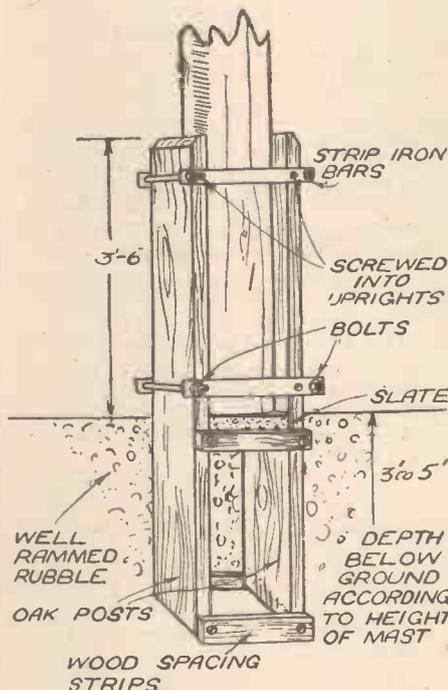


Fig. 3.—To enable the mast to be lowered adopt the scheme shown here.

this, providing, of course, that they are fastened in the proper manner.

### Height of Masts

Metal masts possess the advantages of strength and neatness, but unless space permits the effective portion of the aerial to be well away from the mast, and unless a high-powered outfit is being used, I would suggest that the average amateur cannot do better than use some form of wooden support.

### Scaffold Poles

These provide one of the cheapest forms of support, and, if properly selected and treated, one of the neatest and simplest. The average price, in London, is 3s. 6d. for a 30ft. pole, delivered, but, of course, in its natural state.

When selecting the timber, pick one that is straight with a gentle taper to the top end the diameter depending on its height. For a thirty-foot pole, 13ins. round the base is ample, otherwise it will tend to look very clumsy. After the bark has been removed, smooth off all knots and, if time and weather permit, allow a few days for it to dry out before putting on the first

(Continued overleaf.)

TRANSMITTING TOPICS

(Continued from previous page)

coat of paint. If it is desired to paint it, three coats of good outside paint will be necessary, but if on the other hand a brown colour is not objected to, one cannot do better than apply a good coating of creosote or other wood preservative.

Fixing Methods

The actual method of fixing depends on available conditions and where it is not possible to use a wall, as in Fig. 1, the alternatives, Fig. 2 and Fig. 3, are the most satisfactory. Referring to Fig. 2, it must be remembered that the effective height will be reduced by the amount that is let into the ground; therefore, the arrange-

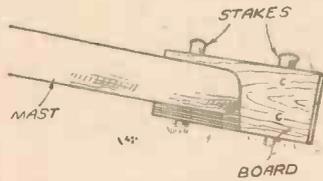


Fig. 4.—An easy way of obtaining the leverage necessary to erect a pole in the garden.

ment shown in Fig. 3 is preferable as it also has the advantage of allowing the mast to be lowered to the ground again easily should it be necessary for repainting or fitting fresh tackle.

With a thirty-footer, guys are not usually required, providing the base fixing is really secure, but for greater heights they are very essential, and care should be taken in placing them and adjusting their tension.

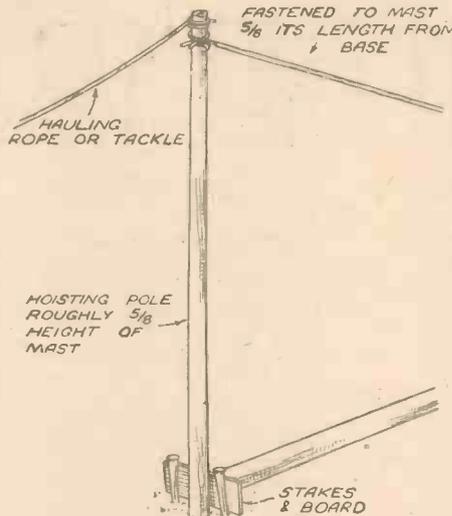


Fig. 5.—An alternative method of putting up the mast where space is restricted.

As it is not always easy to obtain a single pole having a height of 40 to 45 feet, it becomes necessary to join two suitable poles together when such heights are required.

While such procedure is quite satisfactory if the joints are properly made, it should be noted that careless fixing and slap-dash methods can make such an arrangement very dangerous, so it is up to the constructor to pay particular attention to the matter, and satisfy himself that all is well as regards the material used and the method adopted.

If the ideas outlined in Fig. 6 are followed, a safe and neat job will be obtained, producing a mast of 45 to 50 feet according to the length of the individual sections.

All the necessary tackle can be obtained from any ships' chandler, rope merchant, or large ironmongers stores, and it is well worth the slight additional cost to obtain the correct and essential fittings.

When a top mast is used, as in Fig. 6, it is advisable to take guys—three will be sufficient—to the top clamp, and one to the top of the top mast to counteract the pull of the aerial. When deciding on

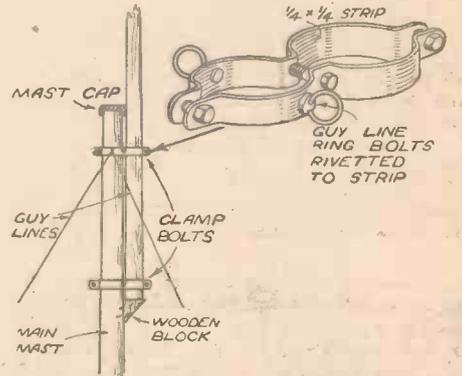


Fig. 6.—To obtain additional height an extension piece may be attached in this manner.

anchoring points for the guys, don't make the angle too acute, and don't forget to see that the anchoring points are really secure, otherwise they are more than useless.

(To be continued)

A NEW PORTABLE "LEVEL" METER

IN repeater stations the indication of power level or voltage in a circuit is now usually performed by means of a direct-reading attenuation measuring set. There are, however, many measurements in the audio-frequency range where an instrument of less precision is perfectly satisfactory, and The General Electric Co., Ltd., of Magnet House, Kingsway, London, W.C.2, has recently developed from the original attenuation set a portable level meter that is direct reading, and is no more difficult to use than an ordinary voltmeter. Such an instrument can be used not only for measuring telephone line attenuation and repeater gain but also by broadcasting organisations, radio manufacturers and gramophone recording companies. It can be operated either from A.C. mains or from battery supplies.

The G.E.C. portable "level" meter, which is manufactured at the Company's Salford Instrument Works, consists essentially of a thermionic amplifier feeding a logscale moving coil voltmeter of the rectifier type. Facilities are provided for maintaining the amplifier gain at the required value and for setting the output of an associated oscillator to any level between +20 and -35 db on 1 milliwatt in 600 ohms. By means of a key, this level can be readily applied to any external circuit, the input of the level measuring circuit being simultaneously switched to a jack plug, from which leads may be taken to other points in the circuit under test.

The instrument covers a frequency range of 100 to 12,000 cycles per second, which is sufficient for all normal requirements of telephone and high-quality amplifier and recording practice. The accuracy over the

range 400 to 12,000 cycles per second is  $\pm 0.25$  db, and, over 80 to 400 cycles per second,  $\pm 0.5$  db. The calibration is independent of fluctuation of battery voltages, and for A.C. mains a neon stabiliser is used. The most suitable generator to use is the G.E.C. beat frequency oscillator.

The standard design is suitable for connection to a 230-volt 50-cycle single phase A.C. supply, or to a 24-volt 0.25 amp. L.T. battery and a 120-volt 5-milliamp. H.T. battery. It can be adapted for L.T. battery supplies down to 16 volts, and a design for operation from any particular A.C. mains supply can be provided.

The various measurements that can be carried out fall into two groups:—

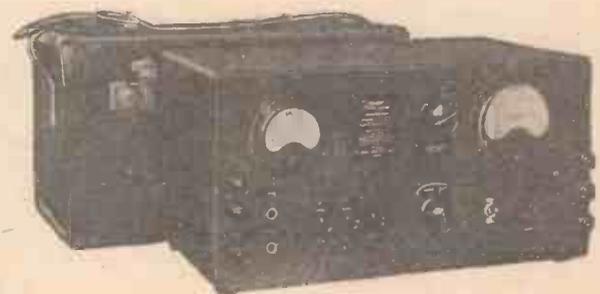
- (a) When a known power level is to be applied to one part of a circuit, and the level at another is to be measured, and;
- (b) When only the power level at a point is required.

Examples of the first group are the measurement of attenuation or amplification for instance, the gain of a repeater or the

loss on a line. The oscillator is adjusted by means of the portable level meter to give the required output level, and this level is then switched to the desired points in the circuit by means of a key. Simultaneously the meter is switched on to a jack plug, the leads from which may be used as voltmeter leads and connected across the circuit as required, giving a reading of the level. Typical applications in this group are the measurement of the frequency characteristics of repeaters or amplifiers or of a filter or other circuit.

Examples of the second group of measurements are monitoring the level of a broadcast programme or a recorded performance. Here the leads from the level meter are used as voltmeter leads and connected in circuit as required. Since the input impedance is high, the addition of the meter to the circuit will, in general, only affect the circuit to a negligible extent. The reading of level is then direct and continuous.

The G.E.C. portable "level" meter is robust and compact, an all-metal construction that is suitable for tropical use being employed. The case is of light sheet steel, finished in ripple black enamel. The whole set measures about 16 x 8 x 8 1/2 ins. and weighs 27lbs.



The new 'G.E.C. portable "level" meter.

# Constructional Details of "Practical Wireless" Receivers—4

**T**HE Featherweight Portable was notable for the fact that the cabinet was designed to overcome the weight difficulty and at the same time to provide adequate strength and rigidity. The circuit was quite orthodox, employing an S.G. H.F. stage, detector, driver and Class B valves, and thus provided a large output. The circuit is given on this page, and it will be noticed that there is no departure from the original design, the only modification now required being the substitution of the tuning coil. The original coil is no longer on the market, but the Bulgín type C.22 coil provides a similar winding and necessitates the same wave-change switching. It is very similar in physical dimen-

An Original Lightweight Portable in a Home-made Cabinet is the Subject of this Article

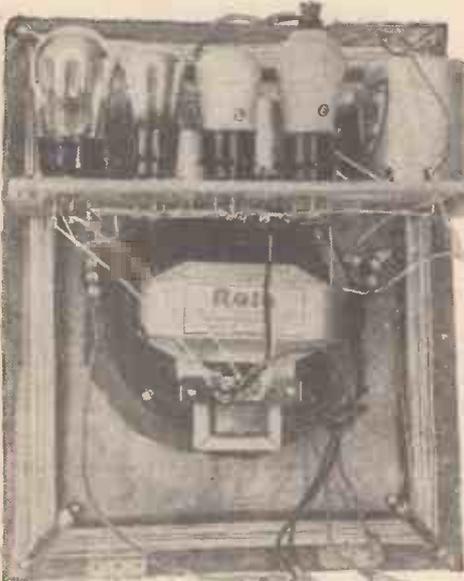
### The Cabinet

The framework of the cabinet is constructed from stripwood 1in. wide by 1/2in. thick and this is screwed together by means of short metal strips found in a well-known constructional toy. The illustrations on page 198 show the method of building it and give all dimensions. The opening or speaker grille is 5 1/2in. in diameter, and is covered on the inside with silk or the special fabric obtainable from any good radio dealer. The cabinet is afterwards covered with leatherette glued in position, and a carrying handle is attached to the cross strips on the upper surface. The front of the cabinet is attached by hinges to the lower edge so that it may be lowered to insert the batteries and make tests or voltage measurements.

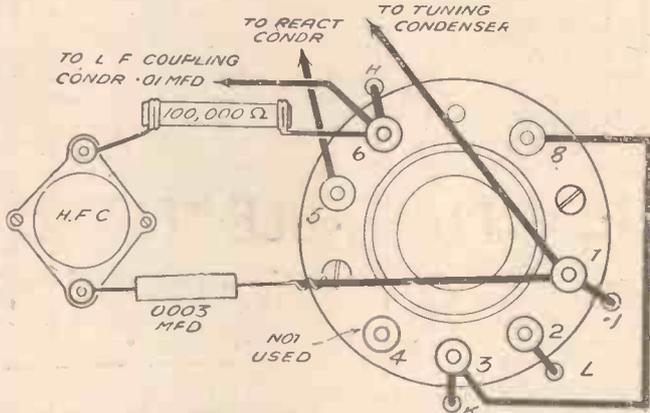
### The Frame Aerial

The frame aerial is wound on the inside of the front, spacing strips of ebonite being screwed diagonally in the four corners. These strips

are no longer on the market but may be made by obtaining a piece of 1/2in. ebonite and cutting strips 1/2in. wide and 2 1/2in. in length. Drill holes at each end so that they may be screwed to the front of the cabinet and then with a hacksaw make eight cross-cuts about 1/4in. deep, followed by two further slots made by making two cuts and breaking out the intervening piece of ebonite so that these two slots are nearly 1/2in. in width. All of the slots should be cut at an angle so that when the wire is wound in it will be prevented from falling out. One end of the 24-gauge wire is soldered to the upper right-hand contact of the tuning condenser and the wire is then passed across to the upper slot of the nearest spacer. Run the wire across to the left, through the upper slot on the left-hand spacer and down to the lower spacer, across the lower edge, and so continue to the slot where you commenced. Carry the wire through this slot again, and make a further turn, repeating the process so that there are three turns in the first slot. Pass to the second slot, and wind three turns in this, after which two turns only are wound in each remaining slot until eight slots have been used. There now remains the two wide slots. The end of the 24-gauge wire must be cut, and it should be soldered, together with the beginning of the 34-gauge wire to the upper terminal of the three-point switch. The long-wave winding con-



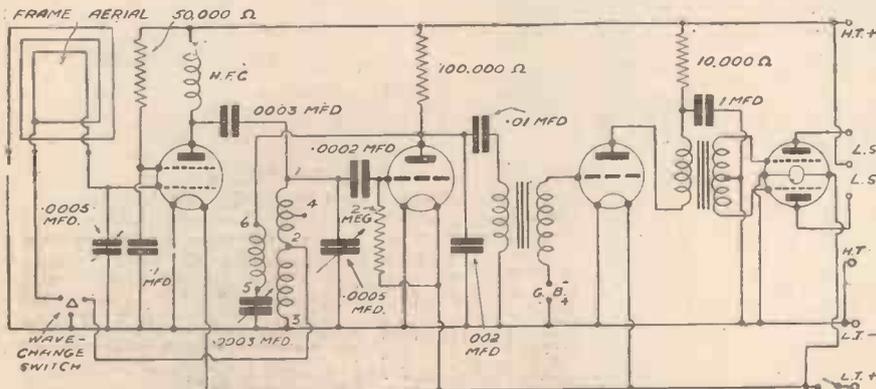
View of the rear of the receiver, showing the frame aerial winding.



Connections for the Bulgín coil, type C22, which is now specified for this receiver

sions also, and thus may easily be used in this receiver. A diagram is given on the right showing the connections to the terminals, which are numbered slightly differently from the original coil, and to enable this particular unit to provide maximum results it is suggested that the H.F. coupling condenser be reduced in capacity to .0003 mfd.

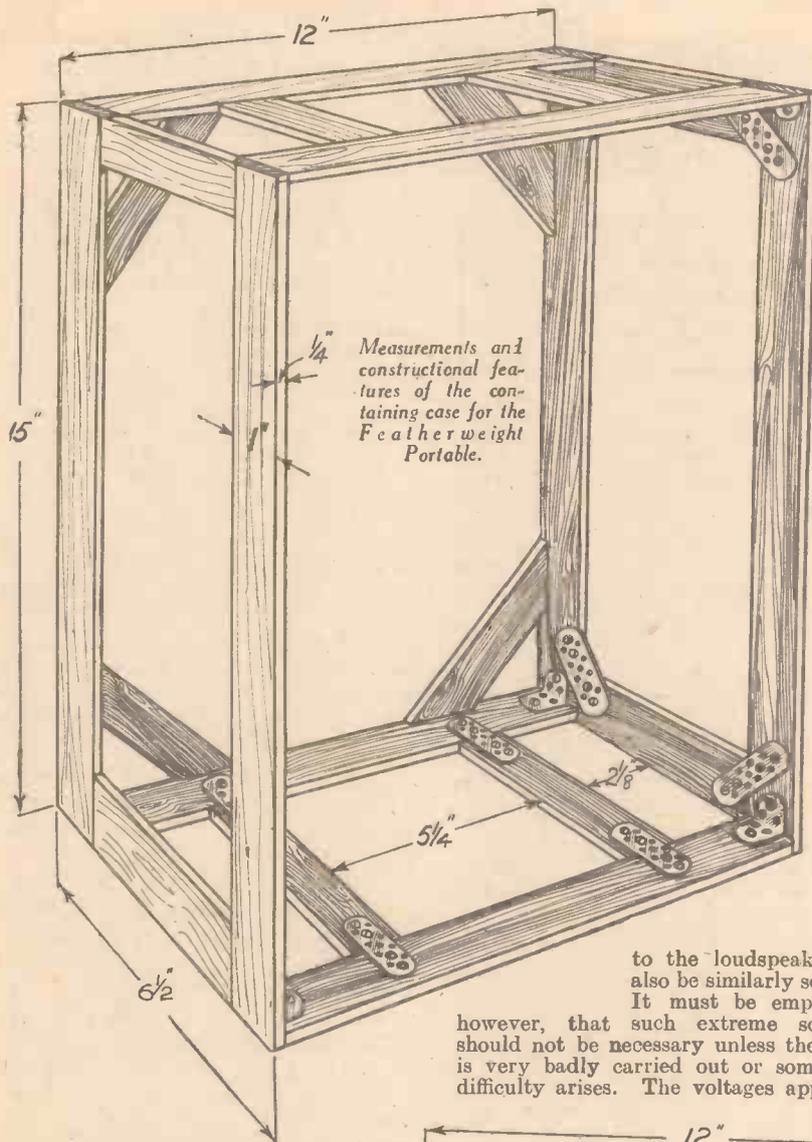
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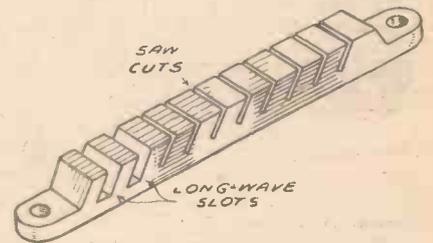
Theoretical circuit of the Featherweight Portable Four

### LIST OF COMPONENTS FOR THE FEATHERWEIGHT PORTABLE.

- 2 Bakelite condensers, .0005 mfd. (Litlos) (Graham Farish).
- 1 .0003 Litlos condenser (Graham Farish).
- 1 H.F. choke, type H.F.P.A. (Wright and Weaire).
- 1 dual range coil, type C.22 (Bulgín).
- 1 10,000 ohm wire-end resistor (Erie).
- 1 50,000 ohm wire-end resistor (Erie).
- 1 100,000 ohm wire-end resistor (Erie).
- 3 4-pin chassis type valveholders (Clix).
- 1 7-pin chassis type valveholder (Clix).
- 1 on-off switch, type S.38 (Bulgín).
- 1 3-pt. switch, type S.36 (Bulgín).
- 1 Lissen Class B driver transformer (Lissen).
- 1 2 megohm grid-leak with wire ends (Erie).
- 1 .01 mfd. fixed condenser, type M (T.C.C.).
- 1 .0003 mfd. fixed condenser, type M (T.C.C.).
- 1 .0002 mfd. fixed condenser, type M (T.C.C.).
- 1 .002 mfd. fixed condenser, type M (T.C.C.).
- 1 .1 mfd. fixed condenser, type 50 (T.C.C.).
- 1 1 mfd. fixed condenser, type 50 (T.C.C.).
- 1 Cossor 220 S.G. valve (metallised).
- 1 Cossor 210 H.F. valve (metallised).
- 1 Cossor 215 P valve.
- 1 Cossor 240 B valve.
- 1 Rola loudspeaker, type F5, PM.14, Class B.
- Quantity 24 D.C.C. and 34 D.S.C. wire.
- 1 Ediswan 120-volt H.T. battery, ref. 69706.
- 1 Ediswan 9-volt G.B. battery, ref. 69807.
- 1 Ediswan 2-volt accumulator, type E.L.M.2.
- 4 wander plugs, H.T.+, H.T.-, G.B.+ and G.B.-.
- 2 spades, L.T.+ and L.T.-.
- Connecting wire, flex, screws, wood for case, leatherette, carrying handle and hinges.



the various parts will occasion no difficulty. The H.T. positive lead is inserted into the maximum voltage socket on the H.T. battery and the two L.T. leads are connected to the appropriate terminals on the accumulator. The grid bias positive lead is inserted into the positive socket on the G.B. battery, and the negative lead should be inserted into the 9-volt socket, although where economy is not such an important item, this may be reduced to 7.5 volts. The latter voltage will enable slightly more volume to be obtained, although the anode current consumption will be increased. Therefore, the user of this particular receiver



Spacers for the frame aerial may be constructed as shown here from strip ebonite.

may experiment with voltages between 4.5 and 9 volts in order to find the voltage which gives the most satisfactory volume compatible with economy of operation. Finally, the two outside controls on the panel front are for tuning and must be kept more or less in step, the centre control operating the reaction condenser. Do not forget that a portable with a self-contained frame aerial of this type must be orientated so that the directional properties of the frame are utilised. Maximum volume is obtained when the frame is in a line with the station being received.

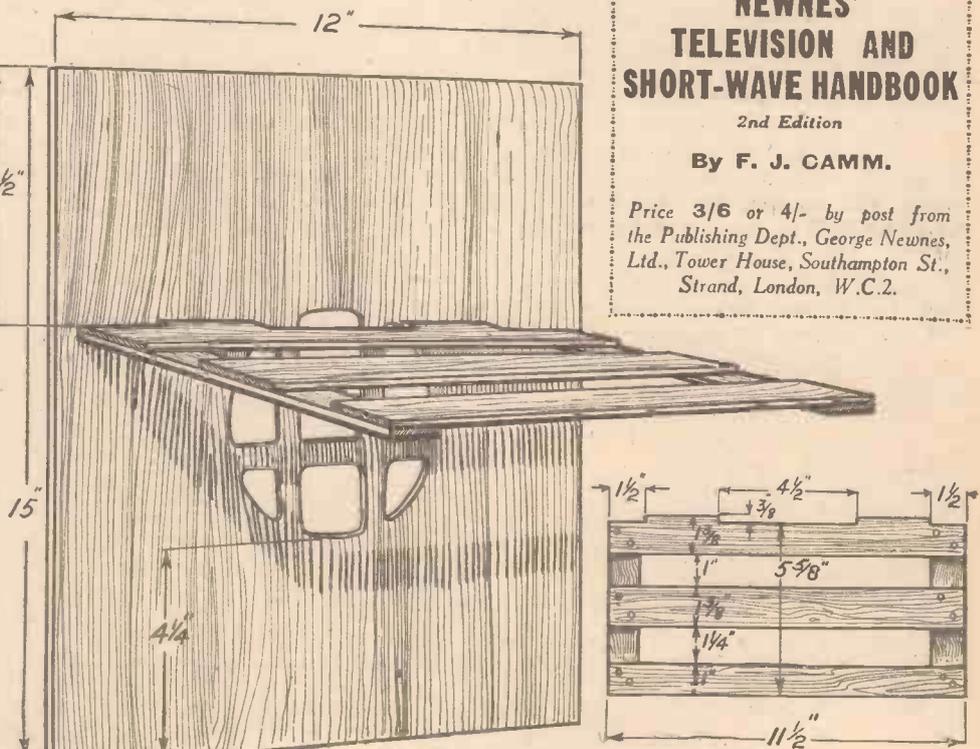
A full-size blueprint for this receiver, No. P.W.12, may be obtained from this office, price 1/.

to the loudspeaker may also be similarly screened. It must be emphasised, however, that such extreme screening should not be necessary unless the wiring is very badly carried out or some other difficulty arises. The voltages applied to

sists of 23 turns in each slot, and the finish of the winding is joined to the lower terminal of the left-hand tuning condenser. Upon completion of the frame aerial winding the slots may be sealed with sealing-wax or Chatterton's compound.

**Operation Notes**

Normally, the receiver should be perfectly stable in operation, but it was originally found that due to the compact form taken by the receiver, some constructors experienced instability. This is due to the fact that many of the wires were run too close together, and thus the first step to take if this trouble is experienced is to space out the wiring as much as possible. Initially, no screening of leads should be introduced, but if it is found impossible to obtain stable working the lead from the anode of the S.G. valve may be passed through a length of ordinary screened sleeving and the sleeving connected by means of a short length of wire to the nearest earth terminal. The leads to the reaction condenser may also be screened in a similar manner, whilst in a very severe case of instability, the two leads



The front of the cabinet and shelf dimensions.

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

2nd Edition

By F. J. CAMM.

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# On Your Wavelength

By THERMION



## Coronation Day

THE date of publication of this issue coincides with Coronation Day—which is the first since broadcasting commenced. There is usually not more than two Coronations in any one lifetime, so the occasion which will enrich our Island story should be one in which the B.B.C. should excel itself. As most of my readers know, I dislike medieval flummery, and I consider that flummery does not add to the dignity of the occasion. The decoration of the streets and the construction of special programmes are excellent as giving some timely colour to the occasion, and to make us realise its importance. History is in the making, but that is no reason why we should adopt the methods of history. I am all in favour of bringing things up to date, instead of endeavouring to live in the past. We should not be constantly reminded of the scandalous conditions which obtained in this country 500 years ago. In those days kings could impose taxes; they could have people shot, and compel you to work for nothing. The pomp and ceremony of those days was meant to instil fear into the people. To-day people do not suffer that fear. Now several firms are endeavouring to signalise the occasion by marketing special Coronation receivers, and I think this cheapens the occasion, and brings it to the level of the fanatical enthusiasm which you see on the countenances of those nitwits from the North who periodically descend on London for the Cup Final, complete with rattle, hooters, kazoos, streamers, and, of course, ties, comic hats, and other impedimenta in the club colours. I pity their mentality, and do not like to see the Coronation, a serious national occasion, besmirched by these methods. Let us keep the radio trade as a radio trade; let us

consider a wireless set as an instrument for listening to the special programmes; do not let us think that it will be a better wireless set because it is sold under some Coronation title.

## Epistle from Ormskirck

J. B., of Ormskirck, has, judging from his letter, been working himself up to the fever heat of excitement, the Ultima Thule of rage, the apogee of irascibility, and the apex of anger, and in order to relieve his blood-pressure I publish his letter:—

“I have been for some time saving my powder to have a go at you, although I admit you are quite right in a good number of your perpetual moanings, but with a large number I don't agree, e.g., dance music. In a recent number of PRACTICAL AND AMATEUR WIRELESS you say that everyone who wants dance music should buy gramophone records. No, not at all, Thermion. You have more money than we working men, so it is you who should buy records for such rubbish as concerts, promenade concerts and such-like piffle! And again, please remember that my 10s. for licence, although earned by manual labour, is worth just as much as yours.

“Then there is the matter of sponsored programmes. I travel a few hundred miles in a month and call in a few thousand houses, and 99 per cent. have the Luxembourg programme on when the transmitter is radiating. The same on a Sunday; how many listen to the B.B.C., except for the news and weather forecast?

“Well, having got a bit off my chest, I will take your side and will start with the dealers. How many are there that are *good* men at their trade? Very few; the rest are worse than I am with my typewriter; in fact, I almost had to fight one man over a resistance value. He said a megohm is a thousand ohms and I

said a million. What do you say about it?

“There is also the question of dud components. My first experience of this nature was when building the *Amateur Wireless* Lucerne Ranger. I bought kit ‘A’ from one of your advertisers and the rest of the parts were purchased locally. I completed the assembly and wiring on a Saturday night, and after trying until 2 a.m. I went to bed almost heart-broken. On Sunday I tried again until 11.5 p.m., still with no results (I may say here that my knowledge was then small and my test gear less). However, I was doubtful of the S.G. valve, so I walked eight miles (four each way) to a friend to borrow the valves from his set. Immediately I put his S.G. valve in, away she went. The dud was a B.V.A., so I returned it to the dealer, who tested it (so-called). His test was merely on the filament, and he refused to replace it. He said: ‘The filament is O.K., what more do you want?’ I have never been there since, but I have learned a lot since then, especially through PRACTICAL AND AMATEUR WIRELESS.

“Well, Thermion, may I suggest a nice superhet with home-made components—about four valves (battery), not too expensive, all-wave if possible. What about touching the ‘Experimenters’ about it? Maybe you are one of them?

“Well, I think I have taken enough of your time. I have none of those thundering big words you use (and no one but yourself can understand them), so I will close wishing you and all the staff (not forgetting the Editor) of PRACTICAL AND AMATEUR WIRELESS all the best.”

## Television in the Café

ON Friday, April 30th, Miss Anne Grey acted as hostess to a small party at the installation of the first television set to be installed in a café. This was at the Odeon Theatre, Southgate. I congratulate Odeon Theatres, Ltd., on their enter-

prise and I hope that the television receiver will be appreciated by their patrons. Such an installation should also help along the sale of television receivers.

#### Television at Radiolympia

WITH plans for this year's Radiolympia, which is open on and August 26th and extends to September 4th, now being formulated, and the promise of television demonstrations which will outweigh in both quality and magnitude those organised last year, it is gratifying to learn that the B.B.C. on their part are making every effort to improve the transmitting side. The camera work has not been quite so good of late, but this is attributed, I am told, to lack of studio space. This factor has militated against the most efficient of programme organisation and accounts partly for those annoying intervals when gramophone records are played and one gazes on a still showing the exterior view of Alexandra Palace. Surely a greater use of properly selected films could be made during the period separating direct vision material, for the stills are reminiscent of old magic-lantern days. It is stated, however, that the theatre at Alexandra Palace which the B.B.C. leased some months ago is now to be entirely reconstructed on most ambitious lines to meet the growing needs of television production. Several stage sets will be accommodated, with fades from one camera to the other to give continuity of subject and no long interruptions between separate items. A really efficient overhead lighting system will be installed, while platforms will allow top shots with cameras to be taken when desirable. It is to be hoped that the minimum of delay will transpire before this new proposal is put into effect and so remove the rather cramped atmosphere which now exists.

#### Coronation Day Recorded

UNDERSTAND that, in order to obtain a permanent picture in sound of the Royal Procession on Coronation Day, apparatus which normally equips one of the Corporation's mobile recording units will be temporarily installed in an office overlooking Admiralty Arch. As the cavalcade passes this spot on May 12th, hidden microphones will pick up the sounds which will be recorded on a series of discs.

Together with recordings of the actual broadcasts on Coronation Day, these will be available for use in future reminiscent programmes. Some of them will also be used the same night, and they will convey to those



#### Speaker Fault

AN A.C. Record Three was handed to us for test last week, the constructor complaining that the quality of reproduction was very poor. When the receiver was tested in our laboratory reproduction was found to be good and the general performance normal. Voltage and current readings were taken and were also found to be normal. The reader was consulted and asked to deliver the speaker for test, as the set was obviously quite in order. When his speaker was connected up the quality of reproduction was certainly poor, and a choking effect was produced. When the cone movement was checked it was found that a very small particle of solder was lodged in the gap, and as soon as this was removed the reproduction improved and the choking effect previously experienced disappeared. The effect was actually very similar to that produced by a low emission output valve, and therefore constructors who suspect their output valve should check the speaker cone movement before having the valve tested.

#### Condenser Noises

DUST can also become lodged between the fixed and moving vanes of the tuning condensers, thereby causing crackling noises. This fault is usually fairly easy to detect, as the crackling occurs when the tuning control is rotated. Crackling of this nature is not always due to dust between the vanes, however—it can also be caused by poor connection between the spindle and the wiper contact attached to the moving vanes, or to a loose dial lamp.

#### Minimum Tuning Capacity

A READER complained to us the other day that the minimum wavelength to which his receiver would tune was too high. He wanted to tune down to 200 metres, but could only reach 220 metres. We suggested that the minimum tuning capacity was too high and advised him to reduce the trimmer capacity by unscrewing the trimmer condenser screws and reducing the grid lead screening to the necessary minimum. He replied that his grid leads were unscreened and trimmers were at minimum, and asked whether he could reduce the minimum capacity by filing the vanes or reducing their size by cutting them! Of course, we told him that the minimum could not be reduced in the manner he suggested—cutting the vanes would reduce the maximum capacity and not the minimum. We advised him to remove a few turns from the grid winding of his tuning coil, but this would also reduce the maximum tunable wavelength.

who were unable to hear the actual broadcast a concise and vivid picture of the ceremony; for instance, many people such as policemen, ambulance men and others, who will be on duty along the Coronation route during the day, will be unable to follow the broadcast as it is relayed through loudspeakers to the waiting crowds.

The recordings will also be of interest even to those who did listen to the "live" broadcast, as the sound picture of the procession at Admiralty Arch will not previously have been heard.

Then, until the need arises for their incorporation in a programme, and afterwards, these records will find a place in the archives of Broadcasting House. Generations yet unborn will be able in years to come to hear the story of the day in sound.

Mr. H. L. Fletcher, who is in charge of recorded programmes, will supervise the work, and his department will also be responsible for recording the broadcast ceremony and description of the procession. This will be made available for those parts of the Empire which, because of difference in time, were unable to hear the actual broadcasts.

In addition, it is hoped that recordings will reflect the celebrations of Coronation Day in the provinces.

#### Broadcasts and the Blind

A COMPETITION was recently organised amongst the blind, for a play which would be suitable for those who have lost the use of their sight. It is, of course, well known that when one faculty is missing other faculties are developed beyond the average, and it appears that those who cannot see are extraordinarily keen of hearing. Accordingly, the wireless provides a very fine medium of entertainment. More than 60 plays from all parts of the English-speaking world were submitted by blind writers for this competition (organised by the National Institute for the Blind). The first prize of £25 has been awarded to a Yorkshireman, Mr. H. H. Coldwell, of Barnsley, and the second prize of £15 to an American girl, Miss Edna Mae Evelyn, of Berkeley, U.S.A.

The importance attached to the sense of hearing by people deprived of sight is indicated by Mr. Val Gielgud, of the B.B.C., who adjudicated, in his comments on the work submitted. "I notice," he says, "a general curious insistence upon small audible effects which, in my experience, I have discovered to be for the most part far better left to the listener's imagination."

# Practical Television

May 15th, 1937

Vol. 3.

No. 50.

## Another American Television Station

FROM the earliest days of television's history various American interests have concentrated on developments dealing with the different aspects of the science. The large radio combines of that country are now making a determined effort to bring transmission and reception to a stage where it will not only be acceptable to a critical public, but also ensure that the service is of a high standard both from the technical and programme points of view. It is in keeping with this policy that the Columbia Broadcasting System has made an application to the Federal Communications Commission for the necessary permission to construct an even more powerful television station than is at present being used in this country. The site chosen, after a very exhaustive study had been made by the engineers of the television research department, was the top of the Chrysler building in the city of New York. The carrier frequency will be between 42 and 56 megacycles, while the sideband employed will be at least seven megacycles so as to accommodate the accepted American picture standard of 441 line definition; 5 to 4 picture format and 30 pictures per second interlaced scanning, giving 60 frames per second. Bearing in mind the note published in PRACTICAL AND AMATEUR WIRELESS, dated April 24th, 1937, it will be seen that the line definition is derived from squaring the odd numbers of 3 and 7 and multiplying the products together. Whereas the peak power of the Alexandra Palace station is 17 kilowatts, the new C.B. station, when fully modulated, is to have a peak power of 30 kilowatts, and so be in line with the Eiffel Tower station now under construction. The station coverage is very conservatively estimated at 40 miles' radius (4,800 square miles' area), but bearing in mind the extension obtained with the B.B.C. station after practical tests, these figures should be very materially exceeded. The ultra-short-wave radio transmitter is to be located on the seventy-fourth floor of the building, so that the feeder cable linking this with the roof aerial will be relatively short and so ensure the maximum of power transfer without signal distortion.

## O.B. Problems

THE ambitious attempt to televise the Coronation procession from the Apsley Gate, Hyde Park, is presenting the B.B.C. engineers with a variety of intricate problems. The situation is made more difficult by the fact that most of the mobile equipment employed will be relatively untried owing to the late delivery of the apparatus by the manufacturers concerned. The vision signals generated by the cameras after being handled in the mobile control room will be fed into the coaxial cable linking the point of transmission with Alexandra Palace via Broadcasting House. Since the use of this cable is also in the nature of an experiment, a standby directional radio transmitter is to be available to take over in the event of failure. The multiple cable between the camera points and the mobile control room contains

27 conductors suitably insulated from one another both electrically and mechanically, and having an outer rubber and jute protection. This cable incorporates the two low-capacity vision signal lines, low-tension and high-tension feeds to the head amplifier in the camera, telephone wires for passing instructions from the producer to the camera operator, together with synchronising pulse lines for line movement, frame movement and focusing, and spares.

## Television Films

TELEVISION'S inevitable link up with films and the film industry is brought a stage nearer by the news that special B.B.C. films are being produced with as much secrecy as possible at the Stoll Studios, Cricklewood. Mention has already been made in these notes of the proposed historical television film, but now a film has been produced under the direction of Dallas Bower which includes several well-known variety stars, including George Robey, Leonard Henry and Nina Mac McKinney. These films have been made with the aid of a new type of American talking film camera, and to obtain the required light and shade effects special soft-toned grey-coloured scenery has been employed.

The successful televising of films with the present equipment available needs a very careful choice of subject, while the film gamma or contrast range must be low if the best results are to be secured. No doubt the film industry, when the exact needs of television are known, will themselves make the necessary films, but at the moment the market for such products is small, and the work so far can only be regarded as an interesting, although very important, experiment.

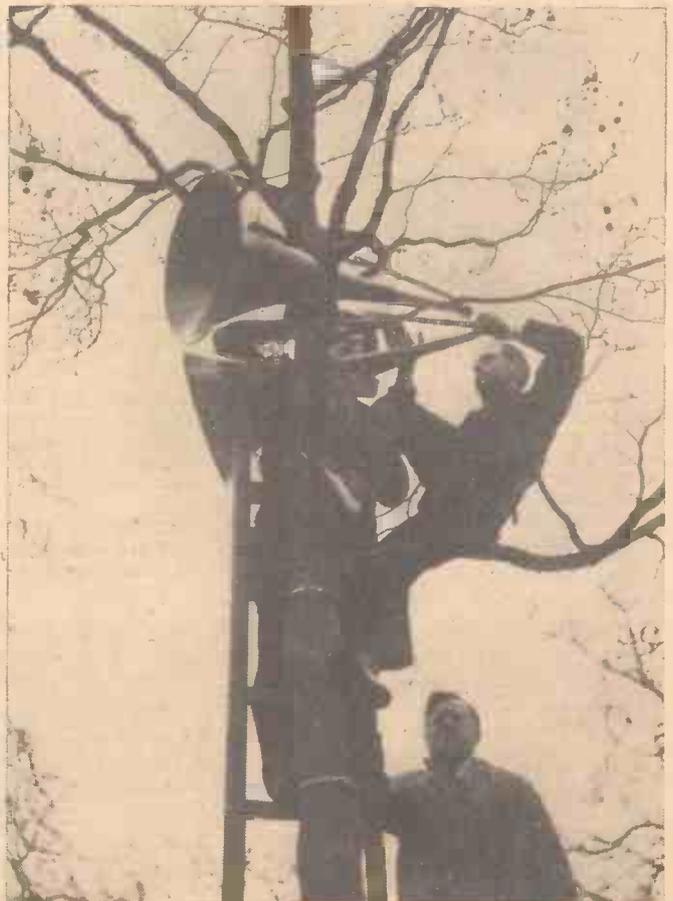
## Coaxial Cable Progress

BEARING in mind the importance of the coaxial cable for future television signal distribution purposes when the provincial stations are being planned, the recent paper read before the Institution of Electrical Engineers was particularly interesting as

it revealed the revolution which is taking place in trunk telephone working in this country. Hitherto it had been thought that the telephone circuits (some 200 in number) would be put out of action when the cable was required for television purposes, but it is now learned that four separate transmission units are embodied in the cable; two for television and two for telephones. The spacing of the repeater stations is to be nearly eight miles, while the single conductor in each coaxial link is one-eighth inch in diameter. In addition to the four coaxial cables, there are 16 pairs of other cables for trunk telephony purposes. The London to Birmingham section will be working in the autumn, and the further sections passing to Manchester, Leeds and Newcastle, will follow suit as soon as possible. In the light of the present knowledge concerning the signal radius covered by the London television station it is anticipated that the whole of the television position may be reviewed by the Television Advisory Committee in about two months' time. The greater range of reception will affect very materially the choice of the provincial station sites.

## Fewer Stations

A wider station spacing is contemplated than was thought possible when the findings of the original committee were published in January, 1935, and the pressing claims of the important cities will be analysed very thoroughly before definite decisions are made. There is every reason to expect, however, that those centres linked with the coaxial cable of the Post Office will be among the first to be equipped with television broadcasting stations.



Fixing loudspeakers on trees in Constitution Hill ready for the Coronation broadcasts.

# SOUND *Plus* VISION

The Reasons for a Single Tuning Control and the Best Methods of Arranging for it

By W. J. DELANEY

**M**ANY amateurs meeting for the first time a commercial television receiver are intrigued by the fact that the vision receiver is not provided with a tuning control. In most cases the television receiver is arranged so that when switched over to the television band a small trimmer knob only is operated and this tunes both the sound and the vision programmes. To obtain the correct adjustment the operator adjusts this trimmer until the sound is correctly tuned, and automatically the picture is then

if the vision receiver is in some way locked to the tuning of the sound receiver, it will be possible to adjust the vision to the exact resonant point, simply by tuning until the sound is clear, and this accounts for the usual method of arranging the combined sound and vision receiver.

### Circuit Arrangements

There are, however, several methods of carrying out this single tuning scheme, but the majority of them depend upon careful and accurate alignment of circuits with

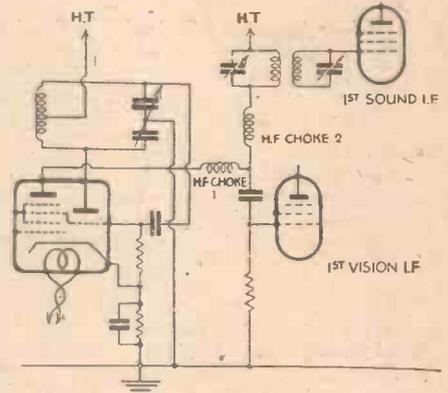
suitable oscillators and other instruments found in the factory but not in the hands of the average experimenter. No doubt the simplest scheme for the home-constructor is to build the vision section of the receiver as a complete unit, paying all the care and attention to detail necessary to produce a first-class picture. For this purpose inter-valve couplings must be very carefully arranged, and losses in the leads from the anodes must be avoided by keeping these as short as possible. In most cases this means that adjacent valves must be inverted so that the anode of one stage is in one direction and that of the other in the opposite direction. Each stage must also be adequately

screened, but it will generally be found that screening of the anode by means of the popular screened cap connectors is inadvisable in view of the high capacity to earth which may be introduced.

### Tuning

A superhet will obviously be employed, and the frequency changer which is found to provide best results on the ultra-short

wavelengths is the combined triode-hexode or similar multi-valve. The output from this stage should be arranged to provide two intermediate frequency beats and fed to a stage containing two I.F. circuits, one adjusted for the vision and one for the sound wavelength. A typical arrangement is shown below, where the anode circuit is tuned by a split condenser which gives rise to the two required intermediate

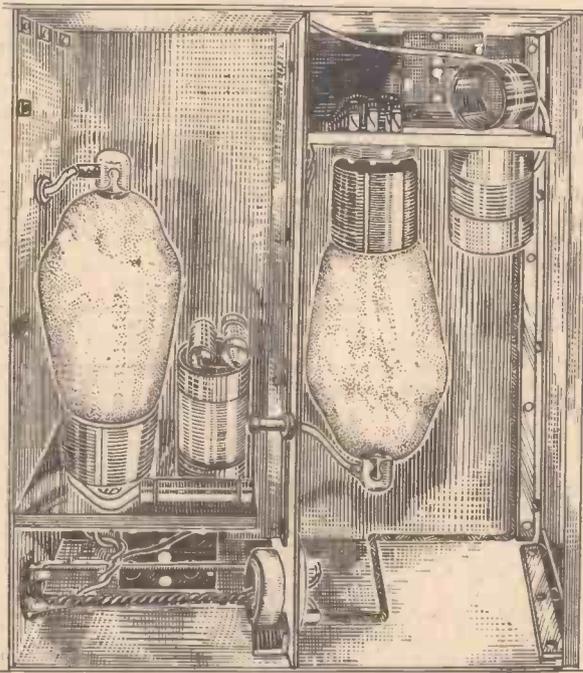


*Skeleton circuit arrangement of the input for combined sound and vision receivers.*

frequencies. For the sound section the ordinary type of I.F. transformer may be employed, but for the vision there are a few alternative schemes, one of the most popular, which is favoured by many manufacturers as well as by many constructors, is the single-sideband arrangement in which ordinary chokes are provided. This avoids certain constructional difficulties and does not require trimming in each stage.

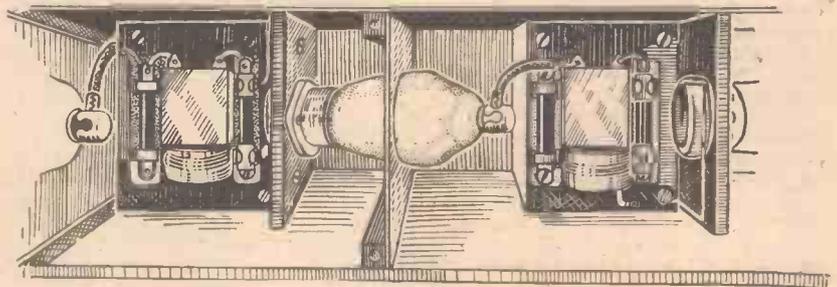
One way of providing the desired flatness of tuning is to wind the choke or transformer with resistance wire, and a simpler way is to use a standard component with a resistance connected in parallel: A suitable component which is now on the market may be obtained from Messrs. Bulgin, and with an appropriate screen-grid valve will provide an amplification or stage gain of about 10, thus enabling the total number of valves to be kept to a minimum. It is possible, with suitable care and attention to detail, to make use of a standard all-wave receiver for the purpose of receiving the sound section of the television programmes, but for the home-constructor there are a number of difficulties in the way of making a satisfactory job of this type of receiver. Screening, in any case, has to be carried out to the limit, and the slightest interaction between one receiver and another, not only through the inter-circuit wiring, but through the medium of radiated oscillation from the frequency-changer stage, will result in interference in either of the two sections of the television chassis.

Constructional details will be given in a later issue.



*One method of building the I.F. stages of a vision receiver to reduce losses.*

obtained at its best, except, of course, for adjustments of brilliancy and focusing. There are several reasons for this method of arranging for tuning, apart from a simplifying of the controls, of which there are already a large number in a combined television and radio receiver. First, the vision programme occupies a band of about 5 mc/s. Those amateurs who are used to handling a modern highly-selective receiver will know that as the set is put "off tune" the side-band cutting which takes place results in the speech being distorted and this is very noticeable. In the case of a very flatly-tuned receiver (such as a simple crystal set, for instance) one may put the set many degrees off the correct tuning point and no ill-effects of any kind are noticed. Thus, in the television receiver, it would be possible to put the receiver many kilocycles off tune so far as the vision section is concerned and on the majority of scenes broadcast no ill-effects would be noticed. On titles and certain scenes, however, the distortion would show up in various ways, according to the degree of mis-tuning. Therefore,



*An alternative constructional scheme which prevents some of the wiring difficulties met with in the scheme shown above.*

A PAGE OF PRACTICAL HINTS

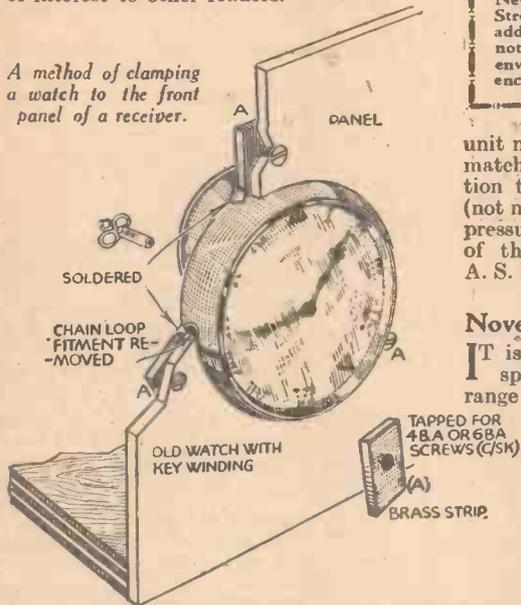
SUBMIT  
YOUR  
IDEA

READERS  
WRINKLES

THE  
HALF-  
GUINEA  
PAGE

**Clamping a Watch to a Front Panel**  
I HAVE incorporated on the front panel of my short-wave receiver an old-fashioned watch for checking times when logging DX signals, and the method which I adopted to secure the watch without obtrusive fitments proved itself so efficient and simple that I thought it might be of interest to other readers.

A method of clamping a watch to the front panel of a receiver.



The winding of this type of watch is accomplished by a fancy key and, owing to my receiver not being enclosed in a cabinet, I have very little difficulty in re-winding and setting, the whole assembly being kept as near to the one edge of the panel as appearance and components permit.

The brass strips were cut from a length of 1/4 in. by 1/2 in. strip, and then tapped as shown. After the holes have been drilled in the panel the construction is a matter of a few minutes, and the final rigidity is attained by soldering these small strips of brass to the watch case.—R. O. SEGERS (Northampton).

**A Simple Signal Generator**

HAVING found innumerable duties for this simple generator, I thought perhaps other readers would like to try the principles adopted. As will be seen from the illustration, the employment of a tuning fork provides the necessary vibrations for flux interruption in the pick-up coil. To cause the fork to resonate, an electromagnet is assembled with a small air-gap between the pole piece and one arm of the tuning fork, this arm providing the armature and having a back stop contact wired to one side of a 6-volt battery (D), one side of the coil going to E (contacting with the fork) and the other side of the coil going to the other pole of the battery, thus completing the normal bell circuit. This

**THAT DODGE OF YOURS!**

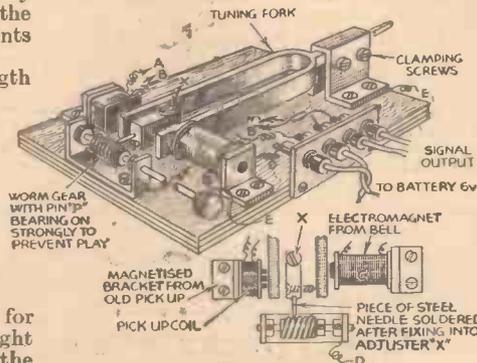
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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 Wrinkle.

unit may be used for continuity tests, coil matching, speaker adjustments, amplification tests, etc., and adjustment of pitch (not modulation) is attained by altering the pressure of the back stop contact by means of the worm gear and control arm.—A. S. E. PETERS (Bournemouth West).

**Novel Low-loss Coil Construction**

IT is well known that variation in turn spacing of coils affects the ultimate range owing to alteration of interwinding capacity and consequently self-induction, so I set to work to design a coil which would embody this characteristic, at the same time being adjustable to variations in circuit design. This then meant (1) an interchangeable inductance with this spacing feature; (2) secure fitment when in use; (3) minimum metal work; (4) facility for tapping; (5) ease of inductive coupling to other like coils.

The accompanying sketch shows the



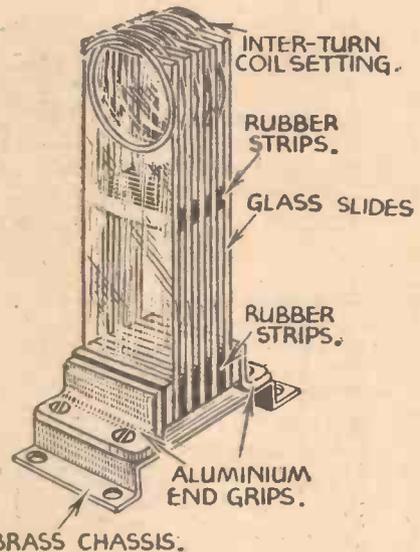
A simple signal generator in which a tuning fork is used for the vibrator.

method I employed, and I can vouch for its effectiveness and low-loss characteristics. The rubber strips were cut from rubber bands (square rubber type) and the slides were the microscope type, priced at 1d. each for a quantity. It will be seen that thicker rubber protecting strips are used between the slides and end grips. The end turns of any inductance, so assembled, may be varied by the employment of

thicker rubber strips between the slides in question.—T. N. GOODWIN (Cambridge.)

**Declining Selectivity**

THE selectivity of some receivers is liable to decline gently, until a point is reached where its owner wakes up to the fact that whereas it used to be possible to get this station free from that station, it has become



An effective method of mounting short-wave coils.

impossible. Go to the local dealer and he will tell you that it is valves, which is a wise diagnosis, as it is almost, but not quite certain, to be correct. Assuming that the set is not out of gang, all components are O.K., and there are no loose connections, the "not quite" element will be resistance in the actual switch contact. Recently, a troublesome switch was carefully measured for its resistance, and revealed the astonishing figure of .892 ohms, rather more than 25 per cent. of the H.F. resistance of a good grid coil at 400 metres. The trouble was that the wiper blades which formed one half of the switch contact had become tired, had lost the springiness they enjoyed in their youth, and touched the rotor portion of the switch so gently that a piece of tissue paper could be slipped between without the edge of the tissue paper being in any way crumpled, added to this the face of both the rotor and wiper had become oxidised, the pressure being no longer sufficient to keep them clean by friction.—D. LEIGR (Brighton).

THE ONLY STANDARD WORK!  
**WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA.**  
5/- or 5/6 by post from  
George Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2.

**A** ONE-VALVE short-wave unit using a triode valve operating on the leaky grid principle is a very adaptable piece of apparatus. It can be used as an adapter in conjunction with the low-frequency amplifier of a broadcast band receiver, as a converter in conjunction with a receiver employing one or more high-frequency stages, or as an independent one-valve short-wave set. When used as an adapter or a one-valve set, the unit will work satisfactorily on all wavelengths above approximately 10 metres, and normal reception on the medium- and long-wave bands is obtainable provided that coils of the correct inductance are used. When it is used as a converter, however, it is unsuitable for reception on wavelengths above approximately 100 metres. If reception above this wavelength is desired, a frequency-changer such as the pentagrid, triode-hexode, or triode-pentode should be used. The use of these valves complicates the design and greatly increases the cost however, and therefore, if the converter is to be used for short-wave reception only, a triode valve is preferable.

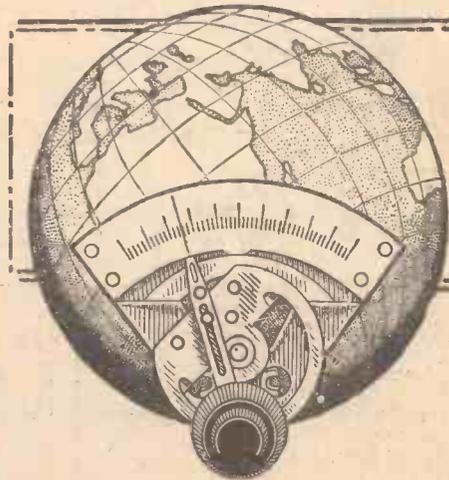
**Battery-operated Units**

Several designs of battery-operated units have appeared in this journal, but the constructor having a mains supply has been somewhat neglected. For the benefit of new readers, the diagram of a battery-operated unit is given in Fig. 3, however.

The valve in this type of unit should have an impedance of approximately 10,000 ohms—any reliable make of L.F. valve will be found suitable. The H.T. and L.T. current may be obtained from the battery and accumulator supplying the broadcast receiver, or a separate 60-volt H.T. battery, and a 2-volt accumulator may be employed.

**A.C. Mains Unit**

When an A.C. mains supply is available, the cost of running can be reduced and the efficiency slightly improved by using an indirectly heated mains type valve. It is not always safe to supply the L.T. current from the broadcast receiver mains unit, because in commercial receivers the mains transformer is designed to supply the receiver valves, and the extra load imposed by the valve in the unit can cause damage to the mains transformer winding, or a reduction of output voltage. A separate L.T. supply should, therefore, be provided. The anode current passed by the triode type of valve used in the unit is very low compared with the total consumption of the receiver valves, however, and therefore



**SH**

A Very Use  
Used as an

it is quite safe to supply the H.T. current from the receiver mains unit. This fact is of great importance, as it obviates the necessity for using separate rectifying equipment in the unit; raw A.C. can be supplied to the valve heater, and this can easily be obtained from an L.T. mains transformer. The price of a suitable transformer is approximately the same as that of an accumulator and, consequently, the A.C. unit need not cost more than a battery-operated type.

**Components**

The constructor is advised to use the components specified on the accompanying list. It is permissible, however, to use a home-constructed coil, and the one used in the "Simple Short-Waver" described in the issue of PRACTICAL AND AMATEUR WIRELESS dated December 12th, 1936, may be employed. The valve type is somewhat critical, but it is not essential to use the 41MHL—most A.C. mains valves of the HL type will give satisfactory results. It will be noted that a Heyberd L.T. mains

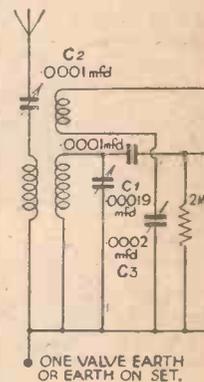


Fig. 2.—The

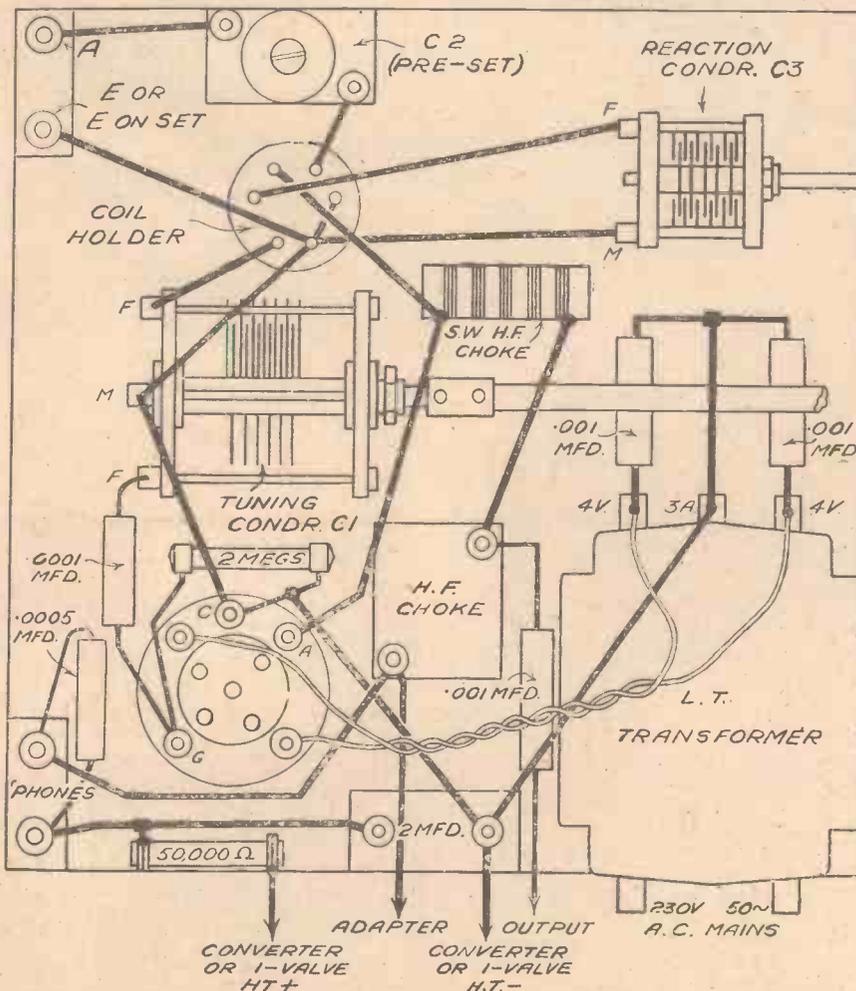


Fig. 1.—Practical wiring plan of the S.W. unit.

**LIST OF COMPONENTS FOR A.C. MAINS S.W. UNIT.**

- Two six-pin coils—type 6LB and 6Y (Eddystone).
- One six-pin coil base—No. 969 (Eddystone).
- One 192 mmfd. condenser—No. 942/180 (C1) (Eddystone).
- One preset condenser 100 mmfd.—No. 1088 (C2) (J.B.).
- One 200 mmfd. condenser—No. 957 (C3) (Eddystone).
- Slow-motion driving head, coupler, bracket, and extension rod (Eddystone).
- Short-wave choke 10-100 metres (B.T.S.).
- Broadcast-band choke 200-2,500 metres (B.T.S.).
- Headphones (B.T.S.).
- L.T. mains transformer 4v, 1.3A—No. 723 (Heyberd).
- Five-pin valveholder—No. 1016 (Eddystone).
- Two terminal blocks (Belling and Lee).
- Six fixed condensers: One .0001, three .001, one .0005 (Tubular 300); one 2mfd. (65) (T.C.C.).
- Two fixed resistances, 50,000 ohms, 2 megohms (Dubilier).
- Metallised valve 41MHL (Cossor).
- Wooden baseboard, 8in. by 8in. (Peto-Scott).
- Aluminium panel, 8in. by 5in. (Peto-Scott).

# SHORT WAVE SECTION

**AN A.C. MAINS S.W. UNIT**  
 Useful One-valve Short-wave Unit which Can be  
 Adapter, a Converter, or a One-valve Receiver  
 By IDRIS EVANS

transformer is specified for supplying the 4 volts required by the valve heater. Many constructors will have a spare mains

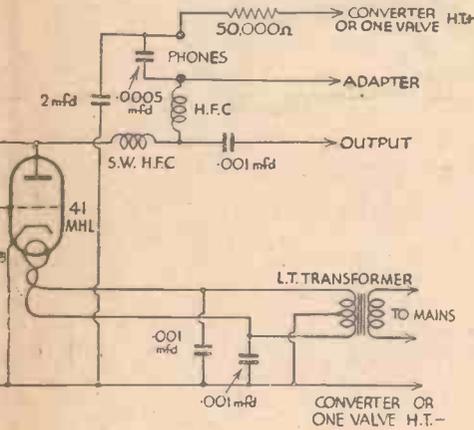


Fig. 2.—Schematic circuit of the A.C. Mains S.W. unit.

transformer having H.T. and L.T. secondary windings on hand, however, and if this has a 4 volt 1 amp. winding it may be used for supplying the unit valve. Others will have a spare 4 volt 1 amp. winding on the transformer used in their home-constructed set. In most cases, therefore, the special L.T. transformer will only be necessary if the receiver is a commercial type.

### Construction

The constructional work should not present any difficulties. A wooden base-board measuring approximately 8 in. by 8 in. may be used, and the components should be mounted in the positions indicated in Fig. 1. It is advisable to use extension rods for the reaction and tuning condensers, and the leads joining the tuning condenser to the tuning coil should be kept very short.

### Connecting and Operating

If the unit is to be used independently as a one-valver, a dry battery of 120 volts may be used for H.T. supply. This will last a long time as the consumption of the valve will only be approximately 2½ m/A—about a quarter of the consumption of a normal three-valve battery set. The headphones should be connected in the position indicated on the diagram, and the tuning and reaction controls operated in the normal

manner. When the unit is to be used as an adapter in conjunction with an L.F. amplifier the lead marked "Adapter" should be plugged into the anode socket of the detector valve-holder of the receiver, the valve having been removed. H.T. will then be supplied through the anode resistance or the transformer primary in the anode circuit of the receiver detector, and the battery H.T. supply will not be necessary, of course. When used as a converter, the unit lead marked "Output" should be connected to the aerial terminal of the receiver. The lead marked "Converter or One Valve H.T.+" should then be connected to a high-voltage point on the receiver—the L.S.+ tag or terminal will probably

terminal of the choke in the output-valve anode circuit may be used.

### 'Phone Terminals

The aerial lead should be transferred from the aerial terminal of the set to that of the unit, and the earth terminal of the unit should be joined to the earth terminal of the set. When the unit is to be used as a one-valver the earth lead should be connected to the unit-earth terminal and the H.T.—lead to the H.T.—socket of the battery—the H.T.—lead is not used when the unit is employed as an adapter, as the H.T. circuit is completed through the lead joining the two earth terminals. When the unit is used as an adapter the headphones should be removed from the 'phone terminals, and these two terminals must not be joined together, but when it is desired to use the unit as a converter the 'phone terminals should be joined by means of ordinary connecting wire.

### Aerial

It is advisable to use a short outside aerial in conjunction with the unit—approximately 30ft. will be suitable. If the aerial is longer than this it will probably be found necessary to use the present condenser C2 in order to obtain reaction. This has the effect of reducing the effective length of the aerial, thereby eliminating reaction dead spots.

When the unit is to be used as an adapter or a one-valve receiver, best telephony reception will be obtained when the reaction condenser is set as near as possible to the oscillation point. When using the unit as a converter, however, the valve must be kept oscillating for telephony and morse reception, and the receiver should be switched to long waves with the tuning condenser set to approximately 900 metres.

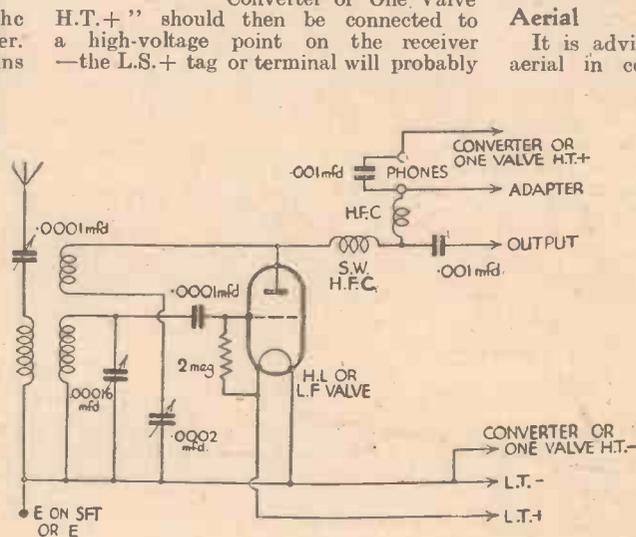


Fig. 3.—Circuit of a battery-operated short-wave unit.

be the most easily accessible. If the receiver speaker is parallel fed the H.T.+

## Leaves from a Short-wave Log

### Sunday Talks from Reykjavik

EVERY Sunday at B.S.T. 19.30 you may listen to a broadcast in English from TFJ, Reykjavik (Iceland), on 24.52 m. (12.235 mc/s). Following the reading of a news bulletin and a very interesting chat about the Island's activities, you will hear the National Anthem sung by a mixed choir. Later, a Scandinavian transmission is carried out and the station usually closes down towards B.S.T. 20.45 or 21.00. The studio opens with a tuning note, the call in Icelandic being: *Ríkisutvarp Island*. Short concerts are occasionally broadcast. Announcements are made in English in the earlier part of the programme, and in Swedish, Danish, and German for the second portion; the official presiding at the microphone proves himself to be an expert linguist.

### Listen to Trujillo City

Almost nightly it is now possible to pick up transmissions from HIN, Ciudad

Trujillo (Dominican Republic) working on 48.05 m. (6.243 mc/s) with a power of 750 watts. In its bi-lingual announcements (Spanish and English) the studio repeats its slogan *La Voz del Partido Dominicano* (The Voice of the Dominican Party) adding, in English: *The Land that Columbus loved*. The call is regularly put out every fifteen minutes, namely, at 10, 25, 40 and 55 minutes past each hour. The interval signal between items broadcast in the programmes consists of 3 chimes. Transmissions are made daily with the exception occasionally of Saturdays between G.M.T. 17.20-19.00 and again from 00.30-02.30.

### Another Peruvian Station

In addition to OAX4G, Lima, operating on 49.34 m. (6.08 mc/s), there would seem to be a new transmitter in the Peruvian capital. Readers report the reception of broadcasts from OAX4J, styling itself *Radio Internacional*, on 32.12 m. (9.34 mc/s). The interval signal heard was somewhat akin to that used by the N.B.C., i.e., 3 notes or chimes. Details of the programme are given out by both female and male announcers in Spanish and English.

# "Keepalite" Floating Battery Equipment

MANY of our readers are interested in battery charging, and it is well-known that many listeners use a "floating" charging scheme. This term is applied where a charge is fed into an accumulator whilst it is being discharged at an equivalent rate, and some listeners use a trickle charger arranged to deliver the same current as is taken by the valves in their receiver, and connect the on/off switch to the mains supply feeding the charger. In view of these facts the following details concerning a "floating" supply for an emergency lighting system such as is used in a cinema will, no doubt, be of interest.

One drawback common to the scheme in the past has been that no matter how carefully the rectifier output has been adjusted to keep the battery floating, i.e., neither charging nor discharging (or, if anything, slightly charging), any change in the circuit conditions has quickly thrown the floating out of balance, and the battery may either have been charged too much, with a consequent rise in voltage on the secondary lighting, or may have discharged too much, with consequent reduction in the capacity of the battery available for emergencies. This has led in many cases to the stipulation that the whole of the secondary lighting load of a cinema shall be switched on at one time, even though some parts of the cinema, such as daylight-lit staircases, corridors, crush halls, etc., would not require such emergency lighting by light until dusk.

A new equipment is now available in which the above-mentioned drawback has been completely overcome; the equipment is of the floating type approved by the authorities, and the secondary lighting is connected to the battery at all times. It is known as the Keepalite "B" equipment (the invention of Mr. Basil Davis under licence, patent No. 377,671). The

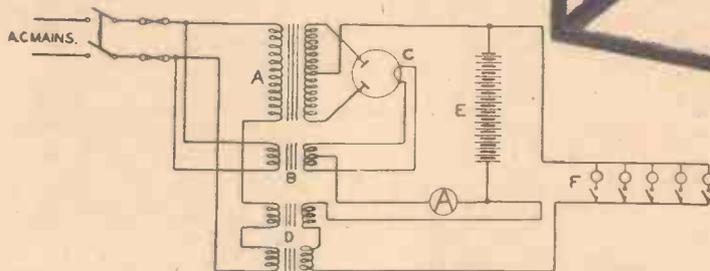
equipment, incorporating Chloride batteries, is marketed by The Chloride Electrical Storage Company, Ltd., for safety lighting in cinemas.

The principal feature of the new equipment, which employs a rectifier, is a set of governing chokes specially wound and so connected between the circuits that wide changes in loading can be made without affecting the accurate floating of the battery.

With the new equipment, it is only necessary for a cinema attendant to switch on the A.C. supply to the rectifier and then switch on the secondary lighting. The control automatically gives the proper floating position without further manipulation or adjustment. This ensures that the battery receives proper treatment and is thus maintained in good condition and fully charged with the minimum of attention.



View of the complete unit.



Simplified circuit diagram of the arrangement. A—Main transformer. B—Filament transformer. C—Full wave valve. D—Control chokes. E—Storage battery. F—Cinema safety lights.

The Keepalite "B" equipment is available in a range of sizes to cover all usual requirements from small to large cinemas, and full particulars may be had from The

Chloride Electrical Storage Company, Limited, at their Head Office, Exide Works, Clifton Junction, near Manchester, or 137, Victoria Street, London, S.W.1.

## Coronation Week Dance Music

THE B.B.C. announces that the arrangements for providing dance music throughout Coronation Week are now complete.

The dance music high spot of the week will occur on Coronation Night, i.e., from 10.15 p.m. on May 12th to 1 a.m. on May 13th. The programme, entitled "Britain Dances," has been devised by Paul Askew, and the dance bands who will co-operate have been drawn from all over the country. The B.B.C. Dance Orchestra, directed by Henry Hall, in London, will act as the link between the various contributions by bands in the provinces. At each provincial centre Coronation revelries are taking place. The B.B.C., through its Regional organisation, has selected dance bands representative of the area and they will furnish a sound picture of Britain celebrating in dance the crowning of the King.

Henry Hall, at the end of his opening broadcast in London, will hand over to the next band, Bobby Hind of Aberdeen. As Aberdeen finishes its contribution, the Aberdeen announcer will take listeners back to Henry Hall in London. This method of announcing will be adopted throughout the programme. The music,

except for the usual announcements, will be non-stop.

The schedule below sets out the timing, the origin and the name of each dance band taking part in "Britain Dances."

### A Full Rhythm Day

Thursday, May 13th, is a full rhythm day. Billy Thorburn broadcasts in the afternoon and will have with him three guest artists, including Esmé Percy. In the early evening in the National programme listeners will hear George Scott Wood and his Band. The late night dance music will be played by Ambrose and his Orchestra from the Coronation Ball at the Albert Hall, where a compère will introduce the dance numbers, and by Jack Payne and his Band from the Scottish Empire Coronation Ball at Grosvenor House.

Thus listeners will hear two first-class dance bands on this night and will also have the opportunity of hearing Gracie Fields in an interval in the dance music from Grosvenor House, as well as the pipers of the Scots Fusiliers.

On May 14th three sessions of dance music will be given. The B.B.C. Dance Orchestra, directed by Henry Hall, will be heard on the National wavelength during the lunch hour; Geraldo and his Orchestra on the National wavelength in the early evening; and Joe Loss and his Band will play during the late night session.

On Saturday, May 15th, four dance sessions will be provided. The B.B.C. Dance Orchestra, directed by Henry Hall, are to broadcast the lunch and tea dance music; Al Collins with the Berkeley Hotel Orchestra will be heard in the early evening; while the late night dance music will be provided by Billy Cotton and his Band.

TIME.	BAND.	PLACE.
10.15 to 10.30 p.m.	.. The B.B.C. Dance Orchestra, directed by Henry Hall ..	B.B.C. Maida Vale studio.
10.30 to 10.45 p.m.	.. Bobby Hind and his Band ..	Beach Dance Hall, Aberdeen.
10.45 to 11.0 p.m.	.. The B.B.C. Dance Orchestra, directed by Henry Hall ..	B.B.C. Maida Vale studio.
11.0 to 11.15 p.m.	.. Frank Rea and his Orpheans ..	Orpheus Restaurant, Belfast.
11.15 to 11.30 p.m.	.. The B.B.C. Dance Orchestra, directed by Henry Hall ..	B.B.C. Maida Vale studio.
11.30 to 11.45 p.m.	.. Larry Brennan and his Band ..	Tower Ballroom, Blackpool.
11.45 to 12 midnight	.. Douglas Swallow and his Band ..	Palais de Danse, Birmingham.
12.0 to 12.15 a.m.	.. The B.B.C. Dance Orchestra, directed by Henry Hall ..	B.B.C. Maida Vale studio.
12.15 to 12.30 a.m.	.. Glyn Samuel and his Band ..	Rolls Hall, Monmouth.
12.30 to 12.45 a.m.	.. Harry Evans and his Band ..	Grand Hotel, Torquay.
12.45 to 1.0 a.m.	.. The B.B.C. Dance Orchestra, directed by Henry Hall ..	B.B.C. Maida Vale studio.

# More Unsuspected Causes of Trouble

Some Interesting Experiences of Trouble Tracing, Where Normal Methods of Test Might Have Failed to Indicate the Cause of the Faults - - - By FRANK PRESTON

**L**AST week I described a number of receiver faults which could easily escape detection, even though the usual continuity and current tests were made. There are many besides those referred to, but this week reference will be made more particularly to faults which could be traced by means of meters, but which are of fairly unusual occurrence. Additionally, it will be noticed that the tests by means of which they could be traced are outside those generally employed by other than a service engineer.

## Fading

One fault which is less common than it used to be, but which cropped up again a few days ago, nevertheless, is of interest if only because it shows how mysterious some troubles can be. A three-valve "straight" A.C. receiver had been in use for a long time, and had been trouble-free until, suddenly, it was found that signals faded away after the set had been switched

was becoming red-hot. Another valve set matters right.

Due to a fault which had developed inside the valve—the grid and cathode components were not defective—the grid heated and so caused a "secondary" emission, so that the valve became "paralysed."

## "Crackling" Noises

Another fault, in some ways similar, occurred in connection with a frequency-changer, but in this case a pronounced "crackling" noise started as signal strength diminished. It was concluded that there was a bad internal connection, and that contact was broken as the electrode assembly became warm and expanded. In this instance the valve was almost new, and was replaced by the makers. This form of trouble has been experienced on a few occasions, in connection with other types of mains valves, although it has generally resulted in nothing more than an increase in background noises as the set has warmed up.

## Extension Speaker

Last summer a friend had taken an extension speaker from his A.C. mains receiver into the garden. The extension leads had to be about 20ft. long, so it was decided to use a choke-capacity output filter, as shown in Fig. 1, by employing the primary winding of the built-in speaker transformer as a choke. To save a second wire, the speaker was connected to an earth spike pressed into the soil. However, it was found the signal strength was much lower than usual, although the speaker was correctly matched to the output valve.

It was thought that the fault must be in the extension lead, so this was tested for continuity; it was perfectly sound. The owner had overlooked the fact that the 1,000-ohm bias resistor connected between the slider of the "humdinger"—wired between the filament terminals of the directly-heated pentode and earth—

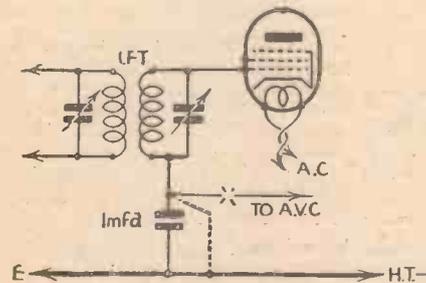


Fig. 2.—Hum was stopped by breaking the A.V.C. lead at the point marked X, and short-circuiting the condenser, as indicated by the dotted line, although the fault was due to inadequate smoothing.

on for about half an hour. It seemed evident that the fault must be due to the heating of a component, because the set behaved normally again after being switched off for a few minutes.

First it was thought that there might be a bad connection in the mains transformer, and that this came into evidence as the windings became warm and expanded. That fault had been met before, when the windings shifted on expansion so that a contact was broken. This seemed unlikely, because the heaters could all be seen to glow and there was a reading of over 200 volts on a meter placed between positive and negative H.T. terminals.

Additionally, the valves were all warm to the touch, and the output pentode was quite hot; this is not unusual, and did not at first suggest anything amiss. After turning the set so that the inside was well screened from the light, it was noticed that there appeared to be a dull glow from the pentode, which could just be seen despite the black coating inside the glass. This suggested that the valve was faulty, and it was soon discovered that the grid

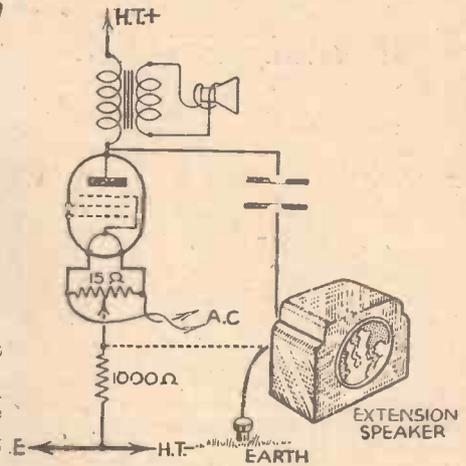


Fig. 1.—When using an extension speaker with a mains valve a direct earth connection to the speaker caused a loss in signal strength. Replacement of the speaker earth by the lead shown dotted rectified the fault.

was in series with the speaker leads when using the "remote earth." Consequently a large proportion of the output was being lost across this. The use of a second speaker lead connected directly to the "filament" side of the bias resistor overcame this trouble, and quality was unaffected when the two leads were kept a short distance apart.

## Irregular Hum

A mains superhet was the central figure in another case of unsuspected trouble. The fault was concerned with pronounced hum when the receiver was slightly off tune with the local station, or when a weaker signal was tuned-in. In other words, the trouble was the opposite of that due to modulation hum. The smoothing and decoupling circuits appeared to be adequate, and it scarcely seemed necessary to try any modification of these. During a few preliminary tests it was found that the hum ceased if the A.V.C. circuit were put out of action by disconnecting the A.V.C. lead and short-circuiting the condenser between the secondary of the I.F. transformer and earth, as shown in Fig. 2. A condenser of different capacity was tried, and the A.V.C. circuit completed again; this gave some improvement, but did not remove the trouble. Other condensers of various capacities produced similar effects.

In view of these tests it appeared that the smoothing circuits must be responsible, so additional and alternative resistors and by-pass condensers were tried, but without result. Then a new smoothing choke, of the same make and type as the original, was fitted. The trouble was entirely overcome. When the old choke was returned to the makers for examination it was learned that there was an internal short-circuit which resulted in more than half the winding being out of use. If the resistance values of the two chokes had been compared, the fault would have been evident at once. Apparently a "hum voltage" had been developed across the by-pass condenser, the original component resonating at the hum frequency.

## Instability

A four-valve (H.F. Pen-det.-L.F.-P.) battery receiver suddenly gave signs of serious instability after it had been removed from its cabinet and dusted. The con-

(Continued overleaf)

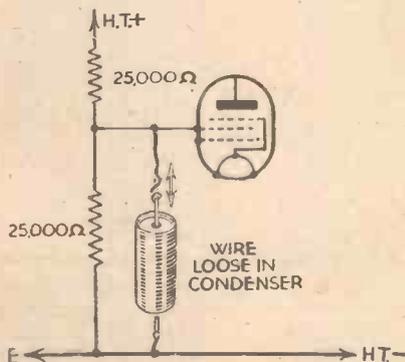


Fig. 3.—A loose connecting wire in a tubular S.G. by-pass condenser caused instability.

**MORE UNSUSPECTED CAUSES OF TROUBLE**

*(Continued from previous page)*

structor, thinking that the absence of the cabinet might be responsible, replaced the chassis. But this made no difference. When the first valve was cut out by joining the aerial lead-in to the anode terminal of the H.F. valve, results were satisfactory, although the range was, naturally, reduced. This indicated that the first valve was responsible for the instability. Another valve was fitted without any change being apparent. Screening had not been altered, nor had the positions of the connecting wires.

A further examination followed, in the course of which it was found that one connecting wire from the tubular screening-grid by-pass condenser was loose. It had not come adrift from the condenser, but could be moved backward and forward (See Fig. 3). Pushing it firmly into the condenser had the effect of eliminating the instability. In the first place the wire had been loosened due to the application of too much heat when soldering a connection, and this had caused the soldered joint inside the case to be weakened. During the "spring-cleaning" process this joint must have been broken completely, severing the wire from the condenser element within the tubular case. Moral: take care in making soldered connections to components of this kind.

**No Volume Control on M.W.**

The next fault was due to carelessness. A simple type of H.F.-det.-L.F. battery set had been made, using two separate coils not fitted with their own wave-change switches.

The basic circuit employed is shown in Fig. 4. Perhaps you can see at a glance what is wrong —? Anyhow, it was found that the variable-mu volume control had no effect on the medium-wave band, although it operated perfectly well on long waves. Thus, the potentiometer could not be at fault, and, since tuning was quite sharp on medium waves, the coils were considered to be above suspicion.

It took the constructor quite a long time to see that the three-point wave-change switch was short-circuiting the variable bias voltage when the contacts were closed for medium-wave working. It was necessary to use either two separate switches or else a two-point on-off switch with four terminals.

This brings to mind a similar case where

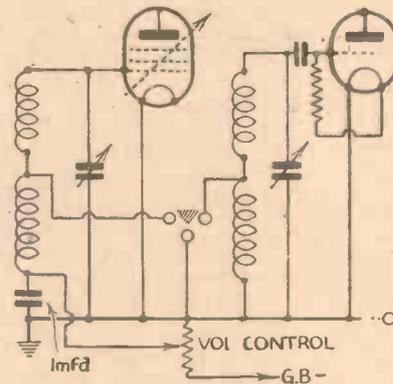


Fig. 4.—When using this tuning circuit the V.M. volume control was ineffective on medium waves. Why?

the volume control was ineffective on both wavebands. The potentiometer was mounted on a metal panel, but it had been overlooked that, in this particular case, the spindle was in contact with the slider. As a result, the slider was earthed through the panel, and the bias thus effectively short-circuited. Insulating bushes should have been used when mounting the potentiometer.

**Oscillator Bias**

A rather peculiar instance of fading came to light when using a four-valve superhet with pentagrid frequency-changer. When a transmission was first tuned in, signal strength was quite normal, but it rapidly faded away. If the gang condenser were detuned and then returned to its original position the signal reappeared at good strength, but again faded. As fading set in there was a suggestion of instability, although this was not pronounced. When a milliammeter was connected in the anode circuit of the frequency-changer it was noticed that the reading increased slightly as the signal faded. The same result was obtained by connecting the meter in series with the oscillator anode. This time the change in current was more noticeable, due to the lower reading obtained in normal conditions.

This indicated that the bias voltage on the oscillator portion was being reduced when a signal was tuned in. The 100,000-ohm grid leak did not appear defective on a rough test, but when it was replaced by a new one the trouble vanished. It was concluded that there was a partial open-circuit in this resistor which came into evidence when a signal was being handled.

**Ingenuity**

IN the early Long Acre days of low-definition television many ingenious schemes were devised in order to overcome wherever possible the limitations of the transmitting scanners. The small spotlight disc machine then in use was fixed in place and the artist was compelled to perform within the extremities of the scanning field. Any attempt to pan the revolving disc was frustrated, but a substitute was found by using a mirror combination. The mirrors could be moved about their axes and so, within limits, the scanning beam was capable of movement, since the mirrors were positioned relatively to one another something like the mirrors in a periscope. The beam, due to the double reflection, was under complete control and to a certain extent gave a degree of flexibility in scanning not possible previously. Quite recently the B.B.C. used a somewhat similar device in order to secure the effect of a ship rolling without moving the stage. A small mirror, driven by a slow-speed motor, was interposed between the camera and the televised scene. By setting the mirror at a slight angle a rocking picture was secured with all the illusion required for a television transmission. Adaptations of the same idea will no doubt be forthcoming for other purposes of a similar nature.

**In Public Places**

WHILE for the average man the present prices of television receivers may be too high to permit purchase to be made for installation in the home, this factor does not operate in many other quarters. Cafés, clubs, inns, public houses and so on are beginning to realise that patrons increase in number where steps have been

# TelevIEWS

taken to obtain one or more sets and have them operating during the scheduled broadcast periods. Just as in the early days radio sets and radio-gramophones in similar places proved an attraction to customers, so such a situation is evidencing

sales which otherwise may not have materialised. The Odeon circuit of cinemas are making an experiment by incorporating a set in one of their cinema cafés. If this should prove successful it will serve as a prelude to installations in all the company's theatres which are within the service range of Alexandra Palace.

**Which is Best?**

WITH the commercial television receivers now on the market, three different methods of viewing are employed. Cossor, G.E.C., and Pye have direct vision; that is, the picture built up on the cathode-ray tube screen is watched directly, the tube being mounted horizontally so that when seated the person looking in sees the picture at comfortable eye level. Bairds, Marconi, and H.M.V. use an inclined mirror with the tube held in a vertical position. This has the advantage of increasing the angle of vision, but unless the best quality mirror is used, reflected multiple images will appear and so tend to reduce the sharpness of the picture. The last two firms mentioned above also show the picture in a mirror, but enlarge it by incorporating a lens in the front of the set. A smaller C.R. tube can thereby be used, but care has to be taken to ensure that no optical distortion is evident. It is as yet impossible to assess which is the best scheme, for each has its advantages and disadvantages, and none at the moment is perfect. Again, there is the factor of personal choice which can never be eradicated, and until the whole question of design is a little more stabilised, engineers responsible for producing the sets will be able to give full rein to their ideas. Perhaps matters will change somewhat when larger received pictures are obtainable.

**"RHYTHM IN THE DAWN"**

*"Rhythm in the Dawn," a new musical rhapsody by Ord Hamilton, the British jazz composer, will have its first public performance in the evening television programme on May 15th. It has been specially scored for the B.B.C. Television Orchestra, which will be conducted by Hyam Greenbaum, and the composer will play the pianoforte part.*

*Ord Hamilton, who wrote the work in four days, describes it as "a rhapsodic tone poem." The piano solo part is not written in the usual concerto style, but is intended to give colour contrast to the rest of the work for orchestra.*

*"My idea in writing this rhapsody," said Mr. Hamilton, in an interview, "was to produce if possible a work by a British composer which could be compared favourably as a challenge to George Gershwin's 'Rhapsody in Blue.' It is not written in the classic jazz style, but is a melodic interpretation of its title. It is my first serious work since I left the concert world in 1920."*

*Ord Hamilton composed the music for "How D'You Do?" "The Nine O'clock Revue" and "Why Not To-Night?", and wrote the music for the film, "Death at Broadcasting House." He has already appeared several times in television.*

itself with television. No doubt the possibility of seeing the Coronation procession in comfort on a television screen has stimulated this side of the business, but in any case if the sets are operated properly by the proprietors it will undoubtedly result in a number of private



# IMPRESSIONS ON THE WAX

By  
**T. O'nearm**

## Decca and Brunswick

Of interest in this month's Decca releases is the first recorded performance of the Dvorak Piano Trio in F minor, Op. 65, by the Budapest Trio on Decca X 161/4. Most readers will no doubt know the "Dumky" Trio, but it is nowadays thought that the F minor Trio (violin, cello and piano) is a superior musical work to its more frequently played brother. I specially recommend this fine set of records.

If you feel jaded you should hear "A Truro Maggot," by Frederick Thurston (clarinet) and Myers Foggini (piano) on Decca K 858. Frederick Thurston is principal clarinet of the B.B.C. Orchestra and is one of our leading clarinet virtuosos. A jolly record this.

Two pre-eminent film stars appear on Brunswick 02406, singing "Good night, my Love" and "Will You?" They are Gene Raymond and Alice Faye.

"Trust In Me" and "Where are you" is presented by Connie Boswell, accompanied by Ben Pollock and his Orchestra on Brunswick 02401. The first tune is extremely good and I expect it will be a big "hit."

Ella Fitzgerald has teamed up with the Mills Bros. on Brunswick 02399, singing "Big Boy Blue" and "Dedicated to you." Definitely a good thing.

Crosby records are always popular and his latest recording on Brunswick 02402 is well up to standard. "What will I tell my heart?" is recorded in association with Jimmy Dorsey and his Orchestra, and "Moonlight and Shadow," with Victor Young and his Orchestra.

Another popular vocalist—the Street Singer—has also made a new recording—"Good night, my Love" and "Harbour Lights," on Decca F 6351.

## "Rex" Coronation Records

A RECORD which is typical at the moment is that made by Gracie Fields and Sandy Powell. It is entitled "Gracie and Sandy at the Coronation," parts 1 and 2, on Rex 9022.

An extremely impressive recording is "Coronation Cavalcade," parts 1 and 2, on Rex 9023. Part 1 is "Procession to the Abbey," introducing "Old Comrades," "Galopede," "The March of the Cameron Men" and "Distant Greetings." Part 2 is "Inside the Abbey"—"The King is Crowned," introducing "Coronation March," "Yadoc the Priest" and "God Save the King." These are just two of the excellent recordings made by Rex in their Special "Souvenir Coronation" issue.

## Dancing Time

DANCE bands have also been busy. Ambrose and his Orchestra have made "The Coronation Waltz" and "On the trail where the sun hangs low," on Decca F 6369, and "I may be poor but I'm honest," coupled with "Rhythm's O.K. in Harlem"—Decca F 6370, and Reginald Foresythe and his Orchestra have recorded "Aubade" and "Burlisque."

The unconventional style of this band may not appeal to everyone, but they do present "jazz" in an original dress.

Another "Kunz Medley," containing as usual his personal version of a collection of "hits" of the moment, appears on Decca F 6368. Hear this record.

For those of you who are interested, I draw your attention to the new batch of Irish records issued by Decca, full particulars of which are given in their latest supplement. It is not every Irishman that lives in Ireland, and I think most of these records should have more than a local appeal.

## H.M.V. Releases

SEVERAL of the new H.M.V. releases are, very naturally, of the national and patriotic type. Quite a novelty is the decorated Souvenir Coronation record which contains fanfares specially composed by Herbert Menges. John Gielgud then declaims two appropriate Shakespearian speeches in praise of England from "Richard II" (John of Gaunt's speech), and "King John," and the record closes with a mighty rendering of "God Save the King" to Elgar's arrangement. The price is 3s. and the profits are being handed to King George's Jubilee Trust. The number of the record is H.M.V. SCB 1.

Other records recommended as being in tune with the spirit of Coronation month are Meyerbeer's Coronation March from "Le Prophète" and Elgar's "Imperial March," played by the B.B.C. Symphony Orchestra, under Sir Adrian Boult on H.M.V. DB 3163. The Band of H.M. Coldstream Guards contribute two Coronation Marches, one being "Royal Cavalcade" and the other "Coronation Bells"—H.M.V. B 8556. They also play an attractive "Colonial Medley," introducing what might be called the "signature tunes" of Canada, Australia, New Zealand and South Africa, on H.M.V. B 8557.

## Well-known Vocalists

THEATRELAND at Coronation Time" is a tuneful selection featuring popular songs from current West End successes, sung by Garda Hall, Webster Booth, Stuart Robertson and Chorion on H.M.V. C 2903.

Peter Dawson in rousing fashion gives a good account of the new patriotic song, "Red, White and Blue" and "So it Goes On," both from the new Palladium show, "Swing is in the Air," on H.M.V. B 8558.

For swing music enthusiasts Benny Goodman's Quartet has recorded "Vibraphone Blues" and "Tea for Two," on H.M.V. B 8563 and also "Swing low, sweet Chariot" and "Take another Guess," on H.M.V. B 8564. "I'm gettin' Sentimental over You" (Tommy Dorsey's signature tune) and "Song of India" are attractively played by Tommy Dorsey and his Orchestra on H.M.V. B 8565.

## From the Films

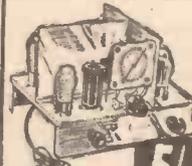
BEBE DANIELS and her husband, Ben Lyon, make their first record, "There's a Small Hotel" from "On Your Toes," which contains some amusing dialogue. On the other side Bebe Daniels sings "Sing Something in the Morning," from C. B. Cochran's Coronation Revue, "Home and Beauty"—H.M.V. B 8543.

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PANELS for all purposes, 1/2" thick, size 24" x 24", Paxolin 24/-; Ebonite, 12/-; Aluminium, flat sheet, 10ga. hard-rolled 12" x 12 1/2", 18" x 18", 5/6. Postage extra.

VARIABLE CONDENSERS. Short-Wave .0005 mfd. 1/6. Twin-kang Ameco .0005 mfd., 2/6. Standard Teleph. .0005 mfd. with geared B.M. all unused, 1/6. Reaction Condensers, 1/2. Transmitting Condensers for H.V., oil fill, brass vanes, glass container, dial and knob, .0003 and .0015 mfd., 15/-.

FLEX CORDS, for Mikes. Pick-up and 5 amp. connections 4-way braided in colour, 12ft., 1/-; 3-way twisted ditto 6 to 8ft., 6d.; 4-way ditto with switch plug and socket, 1/6. Double headphone cord 6' 6" with 2-pin plug, Govt. quality, 1/-.

SPOTLIGHT DISCS. Red or Green Glass 12" dia., 10d., pair, post 6d. SMALL PROJECTOR LANTERNS, on Stand with 250-watt focus bulb, 25/-; Arc lamps, slide lanterns and film projectors.

A.C. ELECTRO-MAGNETS for 230 volts 30 m/A holds 14ozs. SOLENOIDS for remote work or relay, 4 and 6 volts 1/2" stroke and 1oz. pull, silk covered coil, metal frame, 3/6.

Very Large ELECTRO-MAGNET for Lab. Research, wound for D.C. mains 200/400 watts with movable core and adjust. gap. Weight 40lbs. Cheap.

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## Important Broadcasts of the Week

### NATIONAL

Wednesday, May 12th.—Special Coronation Day Broadcasts, including an address by The King.

Thursday, May 13th.—Costume Ball, from the Albert Hall, and the Scottish Empire Coronation Ball, from Grosvenor House.

Friday, May 14th.—Dancing Through, Reminiscent Tunes, special Coronation programme.

Saturday, May 15th.—Gala Variety programme.

### REGIONAL

Wednesday, May 12th.—Special Coronation Day Broadcasts, including an address by The King.

Thursday, May 13th.—Gala Revue.

Friday, May 14th.—A. story by A. J. Alan.

Saturday, May 15th.—Duchy of Cornwall; a dramatised account of its six hundred years' history and a survey of its varied activities to-day.

### MIDLAND

Wednesday, May 12th.—Special Coronation Day Broadcasts, from London.

Thursday, May 13th.—Coronation Celebrations in the Cotswolds, described by E. G. Hilton.

Friday, May 14th.—Variety in the Midlands, a microphone tour including the Theatre Royal, Hanley; the New Theatre, Northampton; and Coventry Hippodrome.

Saturday, May 15th.—Coronation Concert, from the Town Hall, Birmingham.

### WESTERN AND WELSH

Wednesday, May 12th.—Special Coronation Day Broadcasts, from London.

Thursday, May 13th.—A Countryman's

Contentions, a Devon man discourses on world affairs in the "Pig and Whistle."

Friday, May 14th.—Variety programme, from the Prince's Theatre, Bristol.

Saturday, May 15th.—Duchy of Cornwall; a dramatised account of its six hundred years' history and a survey of its varied activities to-day.

### NORTHERN

Wednesday, May 12th.—Special Coronation Day Broadcasts, from London.

Thursday, May 13th.—Gradely Folk, or an hour to spare in the North, a programme of anecdote, verse and song.

Friday, May 14th.—Variety programme, from the Argyle Theatre, Birkenhead.

Saturday, May 15th.—Coronation Carnival, a recorded programme of Coronation Festivities in London and the Regions.

### SCOTTISH

Wednesday, May 12th.—Special Coronation Day Broadcasts, from London.

Thursday, May 13th.—Variety programme.

Friday, May 14th.—The River Clyde, its legend, story and song, feature programme.

Saturday, May 15th.—Gaelic Concert.

### NORTHERN IRELAND

Wednesday, May 12th.—Special Coronation Day Broadcasts, from London.

Thursday, May 13th.—Gala Revue, from London.

Friday, May 14th.—All British Variety, from the Empire Theatre, Belfast.

Saturday, May 15th.—Duchy of Cornwall, a dramatised account of its six hundred years' history and a survey of its varied activities to-day.

## 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.

R. G. (Ashton-u-Lyne). Use only 30 or 25 turns for the coil to cover the band in question.

R. T. J. (Porthcawl). We note your comments, but as pointed out in our previous reply there is no publication so far as we are aware which gives the details required. The Amateur Call Book gives the names and addresses and call signs of amateur stations in all parts of the world, but is necessarily incomplete.

D. W. (Rhymney). We regret that we cannot recommend a blueprint in your particular case.

R. A. (Lostock Hall). We regret that the issue in question is now out of print, but we will insert a request in our pages.

L. R. A. (Newcastle, 2). The lower value of resistance will get hotter as there will be a larger current flowing through it. In general, a 30 or 50 ohm component is quite satisfactory and if of the correct type should not get hot. You have apparently used an old type filament resistor designed to pass only .1 amp or so, and the heater current is of the order of 1 amp or more. You should therefore obtain a proper humdinger for the purpose.

A. J. H. (N.W.3). We regret that we cannot trace the valve types mentioned in your letter.

G. A. B. (Hinckley). We have not used the coil in question in any of our receivers.

C. C. H. B. (S.E.23). We are unable to insert your request free of charge, and suggest you take a small advertisement for the purpose.

G. H. W. (Gt. Malvern). We no longer include station identification in our query service.

M. A. W. (Loadan). Messrs. Peto-Scott can supply the complete kit or the receiver ready wired, and we suggest you get into touch with them. We cannot advise you concerning Customs duties, etc.

A. V. B. (S.E.19). What details do you require? Perhaps the back issues of the books in question would be of use to you.

H. S. J. (Prestatyn). The crystal is used only for stabilising purposes in transmitters as it oscillates at a definite frequency. You are apparently confusing this with the crystal used for rectification in a simple crystal set.

W. B. (S.W.10). The special Short-wave Section this week will probably help to solve your difficulty.

L. A. (Newcastle, 2). It seems that the trouble must be due to interaction between certain leads or to the lack of suitable decoupling components and circuits. It is not possible to advise definitely from the details given in your letter.

# The Philco Phone

THOSE readers who visit the cinemas regularly will have noticed that when the big business man is shown in an American setting, he always makes use of an inter-departmental 'phone of the loudspeaking type. Instead of lifting a receiver as we do in this country, he presses a switch and then talks to the person at the other end of the line via a microphone and loudspeaker circuit. There are, of course, many advantages to this type of 'phone circuit, and the Philco company are shortly introducing it to this country, the accompanying illustrations showing the essential parts.

The instrument has met with tremendous success in the United States where it has been installed in private houses, business houses, restaurants, doctors' offices, amusement places and many other buildings. Philco Phone provides two-way communication between a master control unit and one, two, three or four remote units. The system can be used between distant points in homes, offices, stores, hotels, factories, theatres, garages, hospitals or similar places. It is the least expensive but most efficient communication system on the market. It will sell for less than £20 for two stations with each additional station about £2 extra.

The apparatus is built of all Philco standard components, gives the usual

Philco high performance on either A.C. or D.C. mains, and can be installed anywhere within a few minutes. The master control unit is encased in a compact attractive walnut cabinet. Combination speaker-microphone permits instant conversation with one or all remote stations at will. A turn of the volume knob sends the voice to the remote units as loud or as low as desired. A red signal light on the master unit shows when system is in operation.

The remote unit provides instant 2-way conversation with master unit. It is not necessary for the speaker to stop his work either to speak into or hear the unit as it will pick up the softest voice from anywhere in a room, or it can be heard at a long distance, with a power consumption of only 45 watts.

Dealers are interested in Philco Phone because of the wide appeal it has among all sorts of business and professional people, as well as among housewives in both large and small homes. It is simply but sturdily constructed, does not require costly

and bothersome installations, and does not cause the dealer any service problems.

### For Trade and Home.

Philco Phones are expected to open up a tremendous new market. Plans are being made to interest medical and dental supply houses, office equipment concerns, typewriter dealers, and many other outlets in its distribution. The instrument is of use to architects, banks, solicitors, warehouses, hotels, cinemas and every other business where steps can be saved in delivering spoken messages between members of the staff.



The two main parts of the new Philco Ph.n.s.

## World's Largest Television Transmitter for Eiffel Tower

A NEW television transmitter, which, it is claimed, will be the most powerful commercial television broadcasting installation in the world, has just been ordered for the Eiffel Tower, Paris.

This new transmitter has been commissioned from Le Materiel Telephonique, the French associates of Kolster Brandes, Ltd., by the French Ministry of Posts, Telegraphs and Telephones. It will have a peak power of 30,000 watts fully modulated at the antenna, and will be capable of broadcasting on the basis of 405 lines, with a band width of 2.5 megacycles.

It is proposed to install the new transmitter at the base of the Eiffel Tower with the antenna projecting from the top of the flagpole, which is 984 ft. above ground-level. The transmission cable from transmitter to antenna will be approximately 400 metres long, over 5 ins. in diameter, and will weigh about 12 tons. Of the semi-flexible coaxial type required for the highest quality transmission, it will run up the framework of the tower to the centre of the topmost cupola.

### Special Problems Involved

The construction of the transmission cables raises several novel and difficult problems. Since the cable is to pass upward from the point mentioned, it will be necessary to substitute a new hollow metal pole for the one now in place. This with the transmission conductor inside must be pushed up through the opening in the collar that crowns the steel structure to a height of 12 metres. The antenna will continue for another vertical distance of 3 metres above the flag.

Another problem concerns the installation of the transmission cable between studios and broadcaster. This will be accomplished by a specially adapted transmission cable with special terminal equipment necessitated by the alternative systems of positive or negative control which require different characteristics in the transmission lines.

### Programme Arrangements

The equipment will include a "monitoring set," corresponding to a listening-in control station on a broadcasting or long-distance telephone circuit. This will enable a technical operator to have full control, and to know at all times just what quality of television broadcast is going out on the air. The audible portion of the programmes will go out from a regular P.T.T. broadcasting station. Programmes will be produced from two studios, situated in the Radio Building of the Exposition and the Post Office Building.

Although the P.T.T. has been broadcasting an hour's television programme daily from the Eiffel Tower since December, 1935, with encouraging results, it was felt by technical experts of the Ministry that progress had been such as to warrant the substitution of a more modern and powerful installation. Thus the Eiffel Tower, whose career began with the Exposition of 1889, is to play a leading role in the 1937 Exposition.

The contract just signed with Le Materiel Telephonique, in whose laboratories the equipment has been developed after two years' research, specifies that the new station shall be ready for service with reduced power by July 1st of this year.

Radio Today

## EUROPE'S RADIO FLAIR

New designs that speak another language

**RADIO EAR**—speaker at top that set comes off and can be dragged elsewhere in the room.

**FUN IN BED**—except for sleeping in London it has "over valve." Home boys use multiple (Stenstrom) speakers with remote control.

**PERMANENT WAVE**—is the nickname for a German hit built of fancy woods plus bakelite.

**FLATTEST EVER**—mechanism for record playing results in a new table combination.

**FEASER DIAL**—the most convenient dial has become a popular gadget on the continent.

**OBLONG STYLE**—kept the Europeans happy some three years before the Americans went to work on it.

**GEOGRAPHY LESSON**—on a "Radio-Map" that showing locations rather than letters.

January, 1937 21

This reproduction of a page of an American radio journal shows the American view of the British Radio Industry.

## A CATHODE-RAY TUBE PROBLEM

WHEN considering how the use of the projection type of cathode-ray tubes is likely to lead to future developments which will give a larger picture size than now possible, one or two important factors are overlooked by those not familiar with the intricacies of cathode-ray tube technique. With the greatly reduced screen area of these projection tubes the size of the fluorescent spot which traces out the scan in the shorter available height becomes a factor of extreme importance. The focusing devices, either electromagnetic or electrostatic, have to be adjusted with great care, while steps must be taken to ensure that no defocusing occurs when the electron beam, and, in consequence, the visible spot, is modulated by the incoming television signal. The spot diameter should remain

quite constant and only its brightness alter in accordance with the fluctuating intensity of the received signal. Again, if the fluorescent screen should happen to be of a coarse grain this will set the limit of picture clarity irrespective of the smallness of the spot itself. These are only two of the reasons why considerable research is being undertaken by cathode-ray tube manufacturers to ensure that the tube's performance will be satisfactory in every way with the minimum of adjustment by the individual user. It will be some time, however, before these devices are available to the public, and in the meantime advantage should be taken of the present receiver models which give clear, bright pictures with good detail built up directly on the screen face.

## RADIO CLUBS AND SOCIETIES

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

### The Liverpool S.W. Radio and Transmitting Club.

THE first meeting of the above club was held on Thursday, April 22nd, and it was decided to hold the future meetings at Mr. J. E. Crabtree's premises at 11, Wavertree Road, until suitable club rooms were obtained. Will any interested persons please communicate with the Hon. Secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20 ?

### International Short-wave Club (Guernsey Chapter)

ALTHOUGH less than a year old, the Guernsey Chapter of the International Short-wave Club is forging ahead. Even in such a small island as Guernsey the short-wave interest is apparent, and meetings are held every alternate Tuesday at 8 p.m. at No. 5, Well Road, St. Peter-Port. The obvious difficulties that beset the officers of this Chapter have been met with, and to a certain extent overcome. Morse code lessons are a feature, and a lecture by Mr. P. Denison, A.I.Rad.E., on "Amateur Radio Before Broadcasting" (illustrated with lantern slides), inaugurated an innovation, and a series of lectures on theory in radio are to be given by the members themselves. At the last meeting it was decided to continue activities throughout the summer, and to run a reception contest to sustain interest. The meeting was under the direction of Mr. J. Dowding (G8DO), President, supported by Messrs. T. de Putron (G8MF), E. W. Vaudin, and C. de la Huliniere (Committee), and the Hon. Secretary, Mr. F. S. Le Pavoux (2BTP), from whom full details of the Guernsey Chapter's activities may be obtained. The Secretary's address is: 8, Upper Canichers, St. Peter-Port, Guernsey, C.I.

### The British Short-wave League

THE above society is still making steady progress, both in Great Britain and Overseas, and, no doubt, some of its recent developments will prove of interest to the short-wave fraternity.

Having passed the 600 member mark, it has been decided to stimulate interest yet further by producing Certificates of Merit to be issued to members, and these certificates are styled the "Heard All Continents" and the "Heard British Empire." These will be awarded to members producing the requisite verifications from all continents in the case of the "H. A. C." and from zones of the British Empire for the "H. B. E."

Another new feature is the QSL Distributing Bureau under the management of L. J. Le Breton, BSWL 538, 95, Bridport Road, Dorchester, Dorset, but, of course, the Bureau facilities are available to members only and the B.S.W.L. cannot handle non-members' cards.

The League's *Review* is now the official organ of the World Friendship Society of Radio Amateurs, and its notes are published monthly within the *Review*. Next month, the League hopes to produce its first ultra-short-wave number, and it is hoped to publish a fine list of high-frequency stations and their addresses. Regular 10-metre articles by G6PD are

proving extremely popular and the majority of members are finding this band the centre of interest.

A firm supporter of International Goodwill, the League invites listeners of any nationality to join. Particulars of the League may be had from the Secretary, F. A. Beane, British Short-wave League, Ridgewell, Halstead, Essex, and a specimen copy of the *Review* will be sent free on request.

### Southall Radio Society

A SERIES of meetings dealing with Direction Finding have been well attended. On April 20th, the speaker was Mr. A. Stephens, 2CCH, who dealt with the general construction of D.F. gear. A receiver illustrating his points was exhibited by Mr. W. G. Lee, 2BLX. On April 27th, Mr. C. Rapsey dealt with the theory of Direction Finding, and demonstrated a receiver which included a number of his own ideas.

Other subjects to be dealt with are Map Reading, Sense Finding and Team Work. Meetings are held each Tuesday at 8.15 p.m. at the Three Tuns Hotel, The Green, Southall, and visitors are welcome.

On April 28th a number of Southall members visited the Thames Valley Amateur Radio and Television Society at Twickenham, when Mr. C. Rapsey gave a talk on "Direction Finding" to that society.

### Hackney and District Wireless Club

THE first meeting of the above club was held on Monday, April 26th, and all present were interested in a lecture given by Mr. S. Cockerill (2CAU) on the transmitting side of radio. Mr. Cockerill gave diagrams of a simple CO/PA/FD transmitter, and this was received with enthusiasm.

The following members were elected to act on the Club's Committee: Messrs. Brown, Laplain, Cockerill, Kingston, Bates, with E. Penrose acting as Chairman. Morse instructor, Mr. R. Kingston.

The next meeting of the club will be held on Monday, May 31st, and some field days are being arranged.

Particulars of the club can be obtained from the Chairman, Mr. E. Penrose, 2, Coopersale Road, Homerton, E.9.

### Morpeth Amateur Radio Society

THE data kindly sent to the above society by readers has now been tabulated and, as promised, we are submitting a very brief summary of our conclusions, which we think will be of interest. Here it is:

1. The weather affects short-wave reception to a greater extent than the moon.
2. The 20-metre band is more affected by weather than the 40 m. band, while 30 metres remains somewhat indifferent.
3. The best possible short-wave conditions exist when the weather is frosty, sky clear, and moon full.



Harry Roy and his Band, whose broadcasts are a popular feature.

### Golders Green and Hendon Radio Scientific Society

ON Sunday, May 23rd, in the country about St. Albans, The Coronation Direction Finding Competition on 80 metres will be organised by the Golders Green and Hendon Radio Scientific Society, directed by Lieut.-Col. H. Ashley Scarlett, D.S.O. This annual event is open to all interested in radio. After tea a conference is to be held, to which radio enthusiasts are invited, as well as those participating in the competition.

On June 2nd and July 11th 5-metre field days will be held to test out apparatus; and a 5-metre competition will be organised on September 12th.

Full details of the above may be obtained on sending a stamped and addressed envelope to the Secretary at 60, Pattison Road, N.W.2.

4. Adverse conditions were always experienced when the weather was damp and warm.

As our investigations are really just starting we would like to collect much more data on this subject—so may we appeal to P. and A.W. readers once more ?

To those who are willing to co-operate we ask them to send us reports on W2XAD received on May 22nd, 27th and 31st. Either on any one of these dates or on all of them. The weather conditions should be stated in full at time of reception. To all senders of useful reports a Special Certificate will be issued.

We appeal especially for the help of readers residing in the following counties: Westmorland, Devon, Kent, Norfolk, Pembroke and North Scotland.

Please send reports to: The Hon. Sec., M.A.R.S., Chas. L. Towers, 2, Edward Street, Morpeth, Northumberland.



The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

**A Reader's Thanks**

SIR,—About a fortnight ago I wrote asking you if you would forward a letter to Mr. Bowden, of Paignton, asking him for a copy of the America one-valver. I have received same from Mr. Bowden, for which many thanks.

It is service such as this that makes readers feel like one big family, and increases the popularity of a paper.—JAS. A. BRUCE (Dundee).

**Back Numbers Wanted**

WE have requests for copies of PRACTICAL AND AMATEUR WIRELESS for December 7th, 1935; January 11th, 1936, and also for a copy of *Amateur Wireless* containing the circuit diagram of the Olympus Four. Will any readers having these copies to spare kindly forward them to the address given in the notice at the foot of this page?

**Triode v. Pentode**

SIR,—In the article on Triode v. Pentode in your May 1st issue, your contributor has been rather unfair to the pentode by not mentioning the improvements to the pentode when negative feed back is used. Using this circuit in an AC/DC amplifier on 230v. D.C. mains an output of between 3 and 4 watts can be obtained, using push-pull Pen. 3520's, with a quality indistinguishable from push-pull PX4's on A.C.

Negative feed back, of course, does reduce the sensitivity of the pentode, but it is not so low as that of the triode, the difference being, roughly, that the same grid swing is required for the Pen. 3520's as for PX4's, but about 80-100 volts less on the anode. The improvements are good damping on the speaker, a lower optimum load, and a more constant output when the load varies, giving a better frequency response.

One disadvantage is that the output may rise with frequency, as much as 15 db. at 10,000 c/s, due to phase shift, but resistances of the order of 70,000  $\Omega$  across the input transformer secondaries, effectively cure this. I should be glad to hear of any reader's experience using negative feed back.—M. G. N. HINE (Slapton, S. Devon).

**An Enthusiastic S.W. Listener**

SIR,—I envy the experience of your correspondent, Cecil Bradbury, Burton-on-Trent, in logging over 10,000 stations over the past eight years. I am a newcomer to short-wave listening, my interest in which was originally aroused by the letters of readers of PRACTICAL AND AMATEUR WIRELESS.

I have been operating an 0-v-1 receiver for three weeks and to date have logged W2XAD, W2XE, W8XAL, W3XAL, W8XK, W1XAL, RAN, JVM, JZJ, all of the European S.W. transmitters, and over 150 amateurs in 12 countries.

I consider this a good send-off, and one day I hope to equal, if not surpass, the

record of your correspondent.—A. R. GRAY (London, N.).

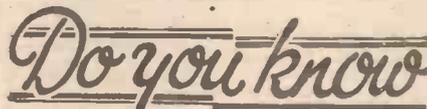
**A Good Log from Ealing**

SIR,—Not having seen an S.W. log from this district in your paper, I submit mine. All calls were heard during the last month, the receiver being a 4v. battery S.W. superhet, antenna 15ft. inverted L-type (indoor). I only listen between 22.30-00.00 and 06.30-07.30, and all calls were heard on the 20m. band—131 Americans, 9 Canadians:

- VK4LJ, 3HK, 2HM, 2XU; PY2EJ, 2EG, 3AW; VP9R; VO4A; VP3VG; LU4A, 1UA; CN8AA, 8MB; TI4AE; XE2W; SU1CH, SUIKG; CO2KC, CE3DW; NY2AE, and CE1AH (all 'phone).

I have been a reader of *Amateur Wireless* and *Practical Wireless* and now PRACTICAL AND AMATEUR WIRELESS, and have been engaged in S.W. work for the last four years. I should like to get in touch with any reader interested in S.W. work in my district.—W. COLCLAUGH (31, Lancaster Gardens, Ealing, W.13).

**CUT THIS OUT EACH WEEK.**



- THAT it is often desirable to include an H.F. choke in each heater lead of a frequency changer for an S.W. mains set.
- THAT it is important to consider the wattage dissipation across chemical fixed resistors.
- THAT to enable the makers' recommendations to be adhered to it is often desirable to connect a number of such components in series rather than to use a single resistor.
- THAT warped gramophone records produce a form of distortion due to the irregular speed produced by the needle travelling up and down the uneven surface.
- THAT records which have become warped may be flattened by placing between two sheets of glass exposed to a gentle heat.
- THAT when measuring the voltage of an L.T. accumulator the valves which are fed from it should be switched on in order to obtain a true reading.

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.

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

3/6, or 4/0 by post from GEORGE NEWNES, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

**NEW AUSTRALIAN BROADCASTING ORGANISATION**

WE are informed that Mr. Stuart Doyle, the Chairman of Directors of the Commonwealth Broadcasting Corporation of Australia, has just organised an Australian Wide Circuit of Commercial Stations on the American principle.

According to Mr. Doyle the Commonwealth Broadcasting Network now covers 3UZ, Melbourne; 3SR, Shepparton; 3YB, Warrambool; 3UL, Warragal; 2UW, Sydney; 2WO, Wagga; 4BC, Brisbane; 4MB, Maryborough; 4RO, Rockhampton; 4GR, Toowoomba; 4BB, Kingaroy; 4RM, Roma; 5KA, Adelaide; 7UV, Tasmania; and 2HD, Newcastle.

The new network was completed recently, following several conferences in Sydney, when the whole organisation of the new network was completed, and plans made for the operation of the Group.

The new organisation will consist of fifteen of the leading broadcasting stations in the Commonwealth, including four high-powered relay stations in the country districts of the three states. The directors of the Commonwealth Broadcasting Network state that their group of stations will have an aggregate coverage of 80 per cent. of the population of New South Wales, Victoria, Queensland, South Australia, and Tasmania.

**Better Programmes**

Commenting on the matter, Mr. Doyle said that the Commonwealth Broadcasting Network had been formed for the purpose of giving better programmes to the listening public. "Commercial broadcasting," he stated, "can only be operated successfully if service to the public is the first consideration. This service we believe can best be given by a combination of interests whose purchasing power of artist and programme features is unrivalled. The new group, with its theatrical and musical associations, has a great opportunity to give the Australian public an improved service which the Commonwealth Broadcasting Network will concentrate its energies in achieving."

Broadcasting in Australia adopts both the British (B.B.C.) system, operated by a Government commission, and the American sponsored programme system. The latter is by far the most popular with listeners.

It is the commercial stations with which Mr. Stuart Doyle and Mr. Frank Albert control the majority throughout Australia.

**"IN TOWN TO-NIGHT" DURING CORONATION WEEK**

WE are informed that five continents will be represented by interesting and picturesque personalities who will come to the microphone during the Coronation week broadcasts of "In Town To-night."

Europe, Africa, Asia, America, and Oceania will be represented on successive nights from Monday till Saturday (with the exception of Coronation night). Chosen from the multitude of visitors to the metropolis for this historic and memorable week, they will bring to listeners a unique picture of life in all parts of the world. Who they will be, however, must remain a secret until a moment before they broadcast.

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		
	Date of Issue.	No. of Blueprint.
<b>CRYSTAL SETS</b>		
<b>Blueprint, 6d.</b>		
1937 Crystal Receiver	0.1.37	PW71
<b>STRAIGHT SETS. Battery Operated.</b>		
One-valve : Blueprint, 1s.		PW31A
All-wave Unipen (Pentode)		
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
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, 2LF (RC & Trans))		PW34A
Leader Three (SG, D, Pow)		PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF, Pen, D (Pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow)		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))	Jan '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	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)		PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
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))	5.12.36	PW72
<b>Four-valve : Blueprints, 1s. each.</b>		
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 "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
<b>Mains Operated.</b>		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D Pen, Pen)		PW18
A.C.-D.C. Two (SG, Pow)		PW31
Selectone A.C. Radiogram Two (D, Pow)		PW19
<b>Three-valve : Blueprints, 1s. each.</b>		
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)	7.4.34	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)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	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
<b>Four-valve : Blueprints, 1s. each.</b>		
A.C. Fury Four (SG, SG, D, Pen)		PW20
A.C. Fury Four Super (SG, SG, D, Pen)		PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)		PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	0.2.35	PW47
<b>SUPERHETS.</b>		
<b>Battery Sets : Blueprints, 1s. each.</b>		
£5 Superhet (Three-valve)		PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet (5-valver)		PW58
F. J. Camm's "Vitesse" All-Waver	27.2.37	PW75
<b>Mains Sets : Blueprints, 1s. each.</b>		
A.C. £5 Superhet (Three-valver)		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		PW59
F. J. Camm's Universal £4 Superhet 4		PW60
"Qualitone" Universal Four	16.1.37	PW73
<b>SHORT-WAVE SETS.</b>		
<b>Two-valve : Blueprint, 1s.</b>		
Midget Short-wave Two (D, Pen)		PW38A

<b>Three-valve : Blueprints, 1s. each.</b>		
Experimenter's Short-Wave Three (SG, D, Pow)		PW30A
The Perfect 3 (D, 2 LF (RC and Trans))		PW63
The Bandsread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
<b>PORTABLES.</b>		
<b>Three-valve : Blueprints, 1s. each.</b>		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	16.5.36	PW65
<b>Four-valve : Blueprint, 1s.</b>		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
<b>MISCELLANEOUS.</b>		
S.W. Converter-Adapter (1 valve)		PW48A
<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
<b>CRYSTAL SETS.</b>		
<b>Blueprints, 6d. each.</b>		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set		AW444
150-mile Crystal Set		AW450
<b>STRAIGHT SETS. Battery Operated.</b>		
<b>One-valve : Blueprints, 1s. each.</b>		
B.B.C. Special One-valver		AW387
Twenty-station Loudspeaker One-valver (Class B)		AW449
<b>Two-valve : Blueprints, 1s. each.</b>		
Melody Ranger Two (D, Trans)		AW388
Full-volume Two (SG det., Pen)		AW392
B.B.C. National Two with Lucerne Coil (D, Trans)		AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)		AW338A
Lucerne Minor (D, Pen)		AW426
A Modern Two-valver		WM409
<b>Three-valve : Blueprints, 1s. each.</b>		
Class B Three (D, Trans, Class B)		AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)		AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher : Baseboard Model (SG, D, Pen)		AW417
1934 Ether Searcher : Chassis Model (SG, D, Pen)		AW419
Lucerne Ranger (SG, D, Trans)		AW422
Cosmor Melody Maker with Lucerne Coils		AW423
Mullard Master Three with Lucerne Coils		AW424
£5 5s. Three : De Luxe Version (SG, D, Trans)	10.5.34	AW435
Lucerne Straight Three (D, RC, Trans)		AW437
All-Britain Three (HF Pen, D, Pen)		AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)		WM271
£6 6s. Radiogram (D, RC, Trans)		WM318
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
Iron-core Band-pass Three (SG, D, QP21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)		WM371
PTP Three (Pen, D, Pen)	June '35	WM398
Certainty Three (SG, D, Pen)		WM393
Minutube Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM400
<b>Four-valve : Blueprints, 1s. 6d. each.</b>		
65s. Four (SG, D, RC, Trans)		AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen)		AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above : Blueprints, 6d. each)	25.8.34	AW445A
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, 2LF)	Feb. '35	WM381
The H.K. Four (SG, SG, D, Pen)	Mar. '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	April '36	WM404
<b>Five-valve : Blueprints, 1s. 6d. each.</b>		
Super-quality Five (2 HF, D, RC, Trans)	May '33	WM920
Class B Quadrydne (2 SG, D, LF, Class B)	Dec. '33	WM344
New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
<b>Mains Operated.</b>		
<b>Two-valve : Blueprints, 1s. each.</b>		
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Economy A.C. Two (D, Trans) A.C.		WM286
Unicorn A.C.-D.C. Two (D, Pen)		WM394

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.
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Wireless Magazine	1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to Amateur Wireless, PM to Practical Mechanics, WM 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., Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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Holiday Portable (SG, D, LF, Class B)	1.7.33	AW303
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
TWO H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)		WM367
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Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
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<b>Three-valve : Blueprint, 1s.</b>		
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Short-wave Adapter (1/-)	Dec. 1, '34	AW456
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B.L.D.L.C. Short-wave Converter (1/-)	Aug. '36	WM405
Wilson Tone Master (1/-)	May '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)		WM408



# QUERIES and ENQUIRIES

## Telsen Coil Connections

"I have a Telsen Variable Selectivity Aerial coil on which there are eight terminals marked from 1 to 8. Could you give me the connections for this coil as I wish to include it in a two-valve set I am about to build?"—N.B.C. (Glasgow).

A SMALL variable condenser is included in this coil unit and is connected between terminals 1 and 2, and thus the aerial may be joined to either of these terminals, dependent upon whether or not the aerial condenser is to be included. Terminal 8 is joined to the grid condenser and fixed vanes of the tuning condenser, and terminals 6 and 7 are joined to the earth line. Terminal 5 is joined to the moving vanes of the reaction condenser, the other side of which is, of course, connected to the detector anode. A three-point switch is required for wave-change purposes and one contact is joined to earth whilst the other two are joined to terminals 3 and 4.

## Mains Energised Speaker

"I am making an A.C. version (my own) of the Signet 2, using AC/HL and AC/Y Hivac valves. I have a 2,500 ohm moving-coil speaker which I wish to use as the smoothing choke, but have been told the speaker field will effect a considerable voltage drop if used as a choke. I intend using H.T.9 rectifier which will deliver a higher voltage than I require. Will it therefore be in order to use the field as a choke and what should the input voltage to the rectifier be?"—R. M. (North Harrow).

THE total current consumption of the two valves in question will be approximately 40 mA, and at this load the output from the H.T.9 will be nearly 400 volts. This is with an input of 240 volts 200 mA. Thus, if you include a field winding with a resistance of 2,500 ohms in the H.T. positive line, you will obtain a voltage drop of 2,500 times .04 (amps.) or 100 volts. This leaves just under 300 volts as your main H.T. supply, and from this must be taken the bias required for the output valve, namely 10 volts. Thus the output valve may be fed direct through the speaker transformer and will receive approximately 250 volts, whilst the detector should be fed through a suitable decoupling resistance to enable the voltage at the anode to be reduced to a suitable level.

## Energised Speaker and Battery Set

"I have a Magnavox mains-energised speaker Model 144. Is it possible to use it with a battery S.W. set which is run on an H.T. unit and trickle charger? If so, could you please give me instructions of how to rig it up?"—A. H. C. (Hampton-on-Thames).

THE speaker could not be operated satisfactorily from your present receiver, but it could be used with a separate energising unit. For this you require a mains transformer and a rectifier, and as the set is a short-wave receiver it would also be desirable to include a smoothing choke

and two smoothing condensers as used in a standard H.T. circuit. The rectifier may be a simple half-wave Westinghouse unit and a 500-milliamp fuse should be included in the positive lead. A suitable kit of parts for the purpose may be obtained from Messrs. Benjamin Electric, Ltd., Brantwood Works, Tariff Road, N.17, or from Messrs. Heayberd and Co., 10, Finsbury Street, E.C.2.

## Two Sets—One Aerial

"I am living with people where we are on two floors and wish to avoid putting up another aerial. I have erected a really good outside aerial which feeds my set on the lower floor, but we have been trying to

### 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.

Please note also, that queries must be limited to two per reader, and 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 different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. 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.

connect the upstairs set to the same lead-in in order to reap the benefits of the good aerial in both cases. All of the schemes I have tried have resulted in failure. Either the tuning of one upsets the other, or we can only get the local. I have made two or three coupling coils without effect and rather than waste any more time I am asking if there is any cheap and simple way out of this difficulty."—G. R. (Homerton).

A USEFUL unit for your purpose, costing 5s., may be obtained from Messrs. Bulgin, of Abbey Road, Barking. This is known as the Multi-set Aerial Coupler, and enables up to three different sets to be operated from a simple aerial system. There are five terminals on the base of the unit and the aerial is joined to one terminal, whilst the aerial terminals on the receivers are connected to the other terminals, with an earth connection to one of them. Although not essential, the aerial leads to the receivers may be screened, and earth leads may be used on each receiver. It will be necessary to try the scheme under your own conditions to find out whether the screening or earth leads is desirable.

## Vibrator H.T. Supply

"I am building a portable on lines recently mentioned in your paper and desire to fit a special H.T. unit utilising a vibratory rectifier. I should like to know whether this type of supply will provide an undue

load on the accumulator which I am also using to supply the filaments of the valves. Can you give any idea of the consumption of the unit?"—G. R. (Harringay).

THE consumption will be dependent upon the H.T. load, in exactly the same manner as with an ordinary A.C. transformer-fed apparatus. Therefore to calculate the load on the accumulator the output wattage should be calculated and this will give the input wattage without allowing for losses in the transformer and rectifier. The current is then obtained, from the usual formula by dividing by the accumulator voltage. Thus, if you intend to employ an output of 150 volts at 20 mA, the formula would be as follows:— $150 \times .02$  (amps.) = 3 watts. Allow percentage for losses which will bring this to about 5 or 5½ watts and divide by 6 (voltage of the accumulator), which will give approximately .8 amps.

## Adapter and Converter

"I have been watching for constructional details of a good short-wave adapter. I like the 5-160 metres adapter in the April 17th issue, but I am doubtful as to whether I can use it with my two sets, which are 4-valve A.C. and 5-valve A.C. Superhet. Please tell me if and how I can adapt it to these sets, or perhaps you intend giving more particulars of adapters soon. Also, please tell me the difference between 'Adapter' and 'Converter.'"—L. M. (Clontarf, Dublin).

IT would be possible to use the adapter by fitting a 5-pin valveholder, and using an indirectly-heated valve. In this case, however, the plug on the adapter would have to be inserted into the second detector stage in your superhet, and thus the advantage of the valves preceding that stage would be lost. Similarly, with your 4-valve receiver, only the detector and following stage or stages would be in use. Therefore, the best arrangement in your case is to use a converter, which is joined to the aerial terminal on your set, and which then makes use of the H.F. stages in the receiver as I.F. stages, giving greater selectivity and amplification. The design shown on Blueprint PW.48A would therefore be most suitable in your case, and this is designed for either battery or mains use.

## The Qualitone Universal Four

"Can you inform me whether you are publishing a data sheet for the Qualitone receiver which was published in your January issues? I should also like to know what the figures mean which are given in the Osram valve guide for the U30 rectifier."—J. S. H. (Glasgow).

WE shall publish a data sheet for the receiver in question in the near future. We cannot, however, give an exact date in this case. The figures show the voltage input (delivered by the secondary of the mains transformer) and the voltage output at the maximum current given in the data sheet of the valve in question. The two sets of figures relate to the use of the valve as a half-wave and as a full-wave rectifier. For the latter arrangement the secondary of the mains transformer has to be provided with a centre tap.

The coupon on Cover iii must be attached to every query.

## Miscellaneous Advertisements

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

## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

# RADIOMART

## SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7d. including catalogue.

1937 Short-wave Catalogue only (3 times enlarged) price 1½d., post free.

## 44, HOLLOWAY HEAD, BIRMINGHAM 1

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

WARD, 40, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

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**SOUTHERN RADIO'S** Wireless Bargains. All lines advertised in previous issues of "Practical and Amateur Wireless" still available.—Southern Radio, 323, Euston Road, London, N.W.1 (near Warreu Street Tube). Phone: Euston 3775—and Branches.

All lines previously advertised still available.

**RADIO CLEARANCE, 63, HIGH HOLBORN, W.C.1.**

All goods previously advertised are standard lines, still available. Post card for list free.

**VAUXHALL UTILITIES, 163a; Strand, W.C.2.** Over Denny's the Booksellers. Temple Bar 9333.

**BRITISH** Radiophone Radiopak, 535.C, 2 I.F. transformers, cost £4 10s., 30/-.—H. Lond, Diss, Norfolk.

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**ROLA** SPEAKERS, BRAND NEW BOXED, 8", 1,000 ohms, with matching transformer 6/6. Postage 6d. Linecorda, 2/-.

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Have you had our GIANT ILLUSTRATED CATALOGUE AND VALVE LIST? Send 4d. IN STAMPS FOR THIS BARGAIN LIST.

**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 3 S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

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**MAINS VALVES**, famous Europa 4 v. A.C. types, 4/6 each, H.L., L., S.G., Var.-Mu-S.G., H.F. Pens., Var.-Mu-H.F. Pens. 1, 3 and 4-watt A.C. directly heated output Pentodes. Full-wave rectifiers, 250 v. 60 ma. A.C./D.C. types. 20-volt 18 amp. 8/6; Var.-Mu-S.G., 1E, H.L., Power and Pen. Following types all 5/6 each. Full-wave rectifiers, 350 v. 120 m.a. and 500 v. 120 m.a. 2½ watt indirectly-heated Pentodes, Octode Frequency Changers.

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**AMERICAN VALVES**. Genuine American HYTRON and TRIAD first-grade Valves, 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 3/6 each. New Metal-Glass Valves, all types, 6/6 each. Genuine American DUOTRON Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. OCTOL bases, 9d. each.

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Electric SOLDERING IRONS, 200-250 v., A.C./D.C., 2/3.

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Special Offer BTH Energised Moving Coils. 10½ in. diam. 1,650 ohms field. Power or Pentode transformer (state which), 14/6.

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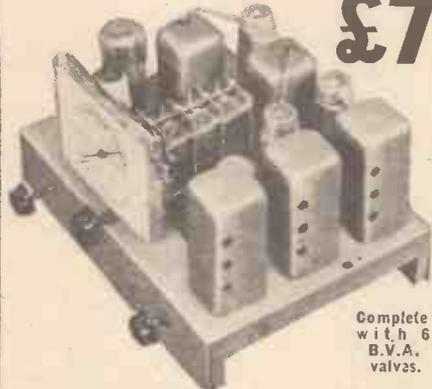
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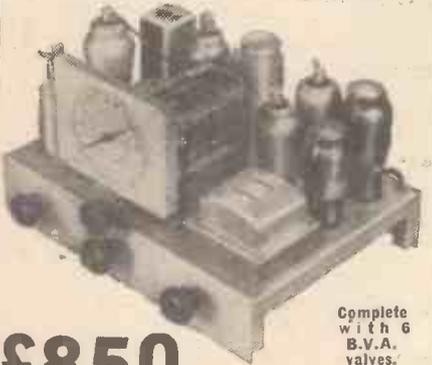


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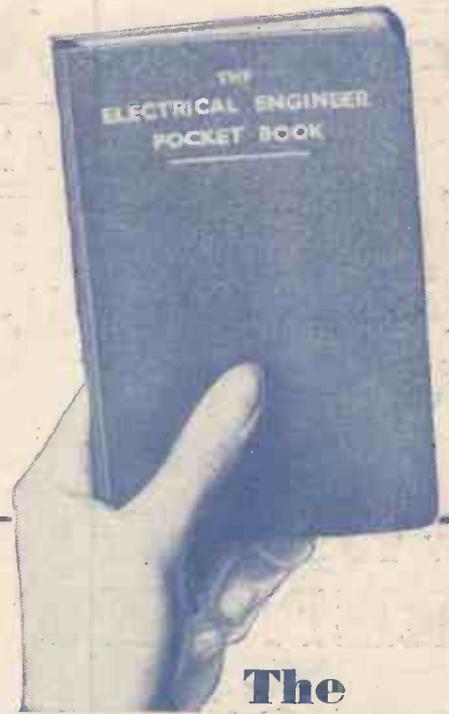
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12 Issues

Practical and Amateur Wireless, May 22nd, 1937.

**WAVE-CHANGE SWITCHING**—See Page 228.

# Practical and Amateur Wireless

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EVERY  
WEDNESDAY

Edited by F.J. CAMM

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Vol. 10. No. 244.  
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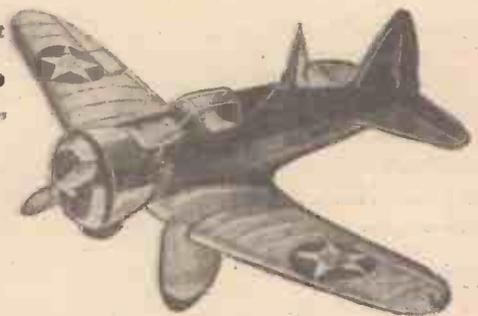
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# BUILDING A LATTICE MAST—See page 220




## 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. X. No. 244. May 22nd, 1937.

## ROUND *the* WORLD of WIRELESS

### A Simple Microphone

THE articles recently published on home-recording and public-address work have led many wireless experimenters into the associated branches of radio, and they have found the importance of the microphone in such work. For the amateur there are many different types of instrument available, and each has its individual merits. With care, the simple carbon instrument may be made to provide very good results, but it is, in general, too noisy for critical work. The transverse current instrument, of which a typical example was recently given in constructional form in these pages, will provide better results, but still fails to provide the highest quality, although its sensitivity is very high. There are left two types, and these are employed in the modern broadcast studio and recording studio, and provide the highest quality although they need care in constructing and in using. Of these the condenser or capacity type is simplest to construct, but most difficult to use, leaving the ribbon or velocity instrument as the next best to the amateur to build for himself. In our issue dated June 30th last we described the main principles of the ribbon instrument and gave data for experimental constructional work, and in response to many requests we publish this week full constructional details of an instrument which has been constructed and which will, if used in the correct manner, provide the maximum quality from standard apparatus.

### Radio in Hen-house

TO add to the many uses to which radio has been put we have now received details of a further development. This time the news comes from America and relates to the use of a musical background from radio apparatus as an aid to the hen in its work of laying eggs. It is stated that the apparatus is connected to a loudspeaker in the hen-house and the music and speech is kept going continually. This results in the hens becoming accustomed to noise and when the poultry-farmer enters the hen-house the birds are not disturbed. As a result the egg output is increased.

### Home Television Screen

WHAT is the limit to the size of the picture obtainable in the home? This problem worries many who are

interested in the development of television, and we understand that a 5ft. by 4ft. picture can now be obtained by means of one system. No complete details have been released, but for the benefit of those who are interested in experimental work it should be pointed out that any magnification of the present picture will naturally result in a magnification of the lines and thus the present 12in. by 8in. is the maxi-

are installed here and may be used simultaneously, alternately or consecutively, and special "editing clocks" are linked with these tables so that it is possible to note exactly which of the grooves (there are 100 to the inch on each disc) on any disc is being cut. It is thus possible, when a disc is received by the programmes department to know exactly where to locate any special passage or item on any disc without playing the entire record through. Incidentally, it is possible from a remote control room to drop any pick-up automatically on any one of the six turntables at a pre-arranged groove.

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mum practical size of picture which can be obtained where the lines are masked by the detail in the received picture.

### Broadcast Receivers in 'Planes

AS an example of the go-ahead activities of one of the leading car-radio manufacturers in this country it should be noted that the De Haviland company have now specified Philco receivers as standard optional equipment to the machines produced by them. These receivers are of the two wave-band type, receiving the standard medium and long waves.

### B.B.C. Records

A SPECIAL recording room is fitted out at Broadcasting House in order that special events may be recorded for redistribution and for use in special composite programmes. Six gramophone turntables

### Sunset With the Fleet

THE ceremony of "Sunset" will be broadcast from the Fleet at Spithead on May 19th. Except in bad weather the scene when the White Ensigns tumble down as the bugle calls "Sunset" is picturesque, with the last aurora of the sun silhouetting the various ships moored at Spithead. The B.B.C. observers will be aboard H.M.S. "Nelson" a day previous to the Coronation Review, and it is proposed as a trailer to the following day's spectacle to describe the scene a few moments before the Ensigns of the Fleet go fluttering down. The "effects" microphones aboard H.M.S. "Nelson" will pick up from the Flagship the bugle sounding first "Attention" and then "Sunset." Echoes from other ships of the Fleet may, owing to the time lag, be heard slightly afterwards.

### Olympia Royal Tournament

ON May 31st a running commentary will be given in the Regional programme of the Royal Tournament at Olympia. This gay, annual military spectacle never ceases to attract interest and from a radio point of view the change from horse to mechanical transport has not depreciated its value. The Tournament, supported with its bands, horse and foot, yields a superb sound pattern, and with the B.B.C. observer telling listeners of the scenes in the arena the Tournament will be brought into thousands of homes.

### Binding Cases and Indexes

BINDING cases and indexes for volume 9 of PRACTICAL AND AMATEUR WIRELESS are now available. The binding case, complete with title page and index, costs 3s. 6d., and the index alone 7d. by post.

# ROUND the WORLD of WIRELESS (Continued)

## New Midland Regional Music Director

WE are informed that Dr. W. K. Stanton has been appointed Midland Regional Music Director, and will begin his duties in September next.

Dr. Stanton was Director of Music at St. Edward's School, Oxford, from 1915 until 1924, and since then has been Director of Music at Wellington College, Berkshire. From 1927 he has also been Director of Music at Reading University. He obtained his Mus.D. degree in 1935.

## INTERESTING and TOPICAL NEWS and NOTES

### New Radio Stations for the Arctic Regions

THE Soviet authorities are to set up three new radio stations this season beyond the Arctic Circle, as soon as the opening of navigation on the Northern Sea Route permits the delivery of the necessary equipment. Of the three stations,

### Colliery Band Broadcast

THE New Haden Colliery Band from the Cheadle district of Staffordshire has its first Midland broadcast on May 25th. It is conducted by William Halliwell. In July last it won the Challenge Cup at the Ashby-de-la-Zouch contest. In the inter-ludes, Alfred Dickin (tenor) and Arthur Williams (baritone) will sing duets.

### Variety from Bristol

A VARIETY programme from the Western Regional on May 26th will include Reginald Williams and his "Futurists" Dance Band, June Bussell (impressions), and Stan and Jan (two Devonshire rustics).

### New Radio Comedy

"PARDON me, Professor" is the title of a new radio comedy which is to be broadcast from Newcastle on May 24th. The author is G. Morley Swain, whose "Scintillating Brilliance" and "Hotel Palatial" were broadcast some years ago. The play tells of a dance band leader who posed as a street musician and so made the acquaintance of a beautiful young heiress; he cultivated the acquaintance by posing as a Professor of the violin—Professor Green, of Greenwich. Henry Reed, the young Manchester composer and pianist, has written a theme song for the play called "Waiting For You."

### Mozart, A Musical Biography

THIS is the last of the six programmes arranged and presented by Eric Blom, the music critic, and Leslie Heward, with the latter conducting the B.B.C. Midland Orchestra. The closing period of the composer's life will be represented on May 23rd in this programme, which will include two Quartets from Requiem Mass and the finale of Act II of "The Magic Flute." Noel Eadie, Mary Jarred, Arnold Matters, William Parsons and Harry Wendon are among the vocalists who will take part. Some reference will be made to the Masonic influence on Mozart.



In last week's issue we published a note concerning the installation of a television receiver in the café of the Odeon Theatre, Southgate. The above illustration shows Miss Anne Grey (centre), who acted as hostess on that occasion.

### Musical Comedy

A MUSICAL comedy programme by the B.B.C. Welsh Singers and the B.B.C. Welsh Orchestra, conducted by Idris Lewis, will be broadcast on May 26th. The artists in this programme will be Elsie Eaves (soprano)—who is at present the victim of whooping-cough, Haydn Adams (tenor), and Sidney Evans (comedian). The programme will be arranged by Glyn Jones, whose series of light programmes entitled "When Day is Done" has proved so very popular.

### Organ Recital from Aberdeen

HAROLD COOMBS will broadcast for half an hour on May 20th from the Capitol Cinema, Aberdeen. He will play: March, "The Washington Post," by Sousa; Selection from "Sunny," by Kern, arranged H. M. Higgs; "Dragonflies," by Gustard; Foxtrot, "Love please stay," by Mayhurst and Mayer; and a Selection, "Classica," arranged Ewing.

### Famous Bands at Derby

AS a holiday attraction, the Black Dyke Mills Band has been engaged to play at the Derby Arboretum. They will be heard on May 19th in a popular programme, conducted by Arthur O. Pearce. Arthur Wood's suite, "Yorkshire Moors," is one of the works to be given.

one will be situated on the southern shore of Kotel Island, one on the De Long Archipelago, and the third on Cape Chaplin, near Providence Bay. The stations will signal to ships information relating to ice and weather conditions in their respective sections. This will enable them to take shorter cuts along the Route. All three stations will be in constant communication with the radio centres of Tixie Bay and Anadyr.

### Making the Best of It

IN his series of talks "How to Make the Best of . . ." Moore Raymond will deal on May 25th in the Midland Programme with the lot of those who are "on nights" and have to work while others are sleeping, and get sleep and leisure while other people are working.

### Newtownards Air Radio Station

NEWTOWNARDS, Co. Down, is one of five radio stations operated by the British Air Ministry, which now gives a twenty-four hours' service. The hours of service of the Newtownards station have been increased to provide radio facilities for aircraft from 7.30 a.m. until 4 a.m. on the following day. The other stations which will give the twenty-four hours' service with Newtownards are Bristol, Manchester, and Renfrew.

## SOLVE THIS!

### PROBLEM No. 244

When Dean tried out his home-constructed three-valve battery receiver, volume was excessive and could not be controlled by the 50,000-ohm bias-voltage potentiometer of the variable-mu H.F. valve. He found, however, that the control functioned as soon as the G.B.—lead attached to the L.F. transformer was disconnected, but quality of reproduction remained poor! Where was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions 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. 244 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, May 24th, 1937.

### Solution to Problem No. 243

The smoothing condenser in the mains unit of Ashley's receiver had become disconnected. The following three readers successfully solved Problem No. 242, and books are accordingly being forwarded to them: T. H. Chester, 16, Thornton Avenue, Plymouth; S. E. Stevenson, 102, Howard Road, Uppminster, Essex; R. Cretney, 482, Kingsway, Levenshulme, Manchester.

# Making a Ribbon Microphone

In this Article Constructional Details are Given of an Inexpensive but Sensitive Instrument

THE ribbon, or velocity microphone, which is now used extensively by the B.B.C., is in principle a very simple instrument, and much experimental work in the electrical and mechanical design has been necessary in developing the instrument to its present state of perfection. However, there is no reason why the experimenter with a penchant for making things should not build a very serviceable microphone of this type from simple and inexpensive materials; moreover, once the framework has been constructed there is an endless field for experiment in trying ribbons of varying thickness, tension and pitch of corrugation.

Originally due to Gerlach and Olson, the ribbon microphone consists essentially of a very thin and light metal strip—which is corrugated in order to break up its acoustic resonance—suspended in a powerful transverse magnetic field. Under the influence of sound waves the ribbon takes up the motion of the air, the velocity of the ribbon being proportional to the intensity of the sound. The ribbon thus cuts the magnetic lines of force, and has generated in it an alternating current corresponding to the frequency and intensity of the sound. The voltage is exceedingly small, but can be stepped up by a suitable transformer before being applied to an amplifier.

and bottom. In the centre of the other face of each pole-piece two holes are drilled and tapped 2 B.A. at a distance apart corre-

This is secured with a 2 B.A. bolt and knurled nut to a base made from two pieces of 2in. by 1½in. oak 8ins. long, "halved" in the centre. The microphone is clamped at the desired angle on the swivel stand by means of two 2 B.A. terminal nuts. In the writer's microphone the magnets were given a coat of aluminium paint, and the pole-pieces painted with dull black enamel. When the pole-pieces, magnets and iron straps had been assembled for the last time, preparatory to fitting the ribbon, the whole magnet system was taken along to a local magneto repairer and livened up on a large electro-magnet. This considerably increased the strength of the field in the gap.

Details of the two small ebonite saddles which support the ribbon are best seen from the sketch, Fig. 4. Each is drilled with four holes—two 4 B.A. clearance countersunk for attaching to the pole-pieces, and two 6 B.A. clearance countersunk for the 6 B.A. terminal screws. The latter, the knurled heads of which are at the back of the microphone, serve to clamp down on to the ribbon at each end a small strip of thin brass 1½in. by ¾in. By slackening one screw at top and bottom the ribbon can be adjusted for centering and tension.

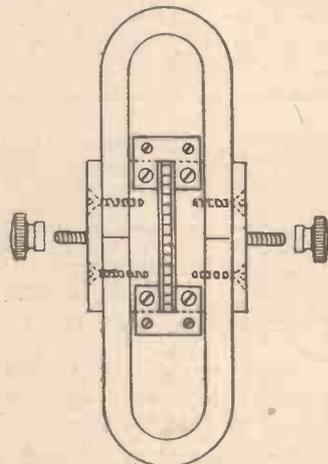


Fig. 1.—Front view of the magnets and pole-pieces assembly for the ribbon microphone described in the text and illustrated on our cover.

sponding with the holes already to be found in the permanent magnets. This avoids the necessity of drilling the magnet material, which is very hard and intractable. The inner edges of the pole-pieces are slightly chamfered with a file, and they are trimmed so that the gap will be slightly over 5/32in.—in order to give clearance to the ½in. ribbon.

### Assembling the Magnets

The two soft iron straps, 3in. by 1½in. by ½in., which are clamped on the outside of the magnets by the same 2 B.A. bolts which secure the pole-pieces in place, are shown in Fig. 3. As in the case of the pole-pieces, these straps are drilled with holes corresponding to those in the permanent magnets, but this time the holes should be 2 B.A. clearance size, and countersunk. In the exact centre of each strap a further hole is drilled and tapped 2 B.A. Into these two holes are soldered 2 B.A. screws with the heads sawn off, so forming projecting studs by which the microphone is supported on its swivel stand. The stand is made from a U-shaped strip of ½in. sheet aluminium, 1in. wide.

### Corrugating the Ribbon

Regarding the material for the ribbon—in the professional instrument this is of aluminium alloy one ten-thousandth of an inch or less in thickness. The actual strip shown in the photograph was made from aluminium foil used for wrapping photographic films; it is rather less than one two-thousandth of an inch in thickness. The strip, ½in. wide, cut with a sharp knife and straight-edge, was corrugated by being rolled carefully between two gramophone gear wheels. When doing this, it is necessary to take care that the ribbon is not torn or partly cut through in any place.

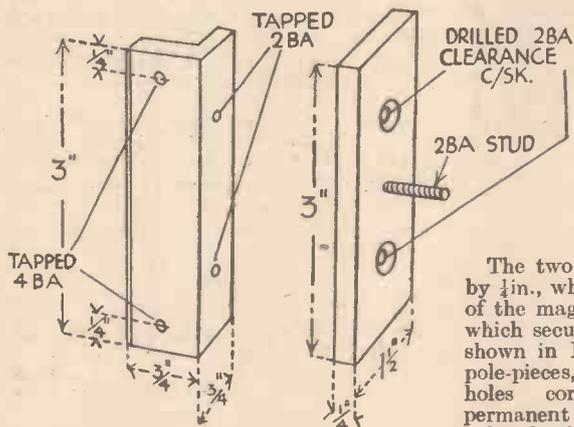
The impedance of such a microphone is very low indeed—a fraction of an ohm—so that the leads to the microphone transformer must be short and of heavy gauge. A short length of stout screened cable is suitable, and the ends should be soldered to the brass plates which clamp the ribbon, while the screening casing can be "earthed" to the metal-work of the microphone.

### Transformer Details

Regarding the transformer itself, the design of this is outside the scope of this article, but if properly sectionalised it may have a very high step-up ratio. However, in this case the effect of any undue capacity (such as long leads) across the secondary will be serious. In professional use a microphone-to-line transformer of moderate ratio is sometimes used, a further transformer

giving additional step-up to the grid of the first amplifier. On the whole, it will be found best to use a transformer of medium ratio,

and to rely on a little more pre-amplification. For preliminary trials a loud-speaker output transformer might be used (one designed for a very low-impedance speaker, and used at its greatest ratio), or one of the commercial microphonic components.



Figs. 2 and 3.—Details of the pole-pieces and damping strap.

### Constructional Details

The magnet system of the microphone illustrated was made from two horse-shoe magnets, placed together with like poles adjacent. Those actually used were from two old "Weston Relays"—relics of the early nineteen-twenties, found at the bottom of a scrap-box with all kinds of missing portable iron-work adhering to them. There are many similar magnets to be picked up for a shilling or two, however—those from magnetos, or from old cone speakers, for instance—and probably the only alteration necessary in the dimensions given in Fig. 2 will be in the positions of the holes drilled in the pole-pieces and iron straps.

The pole-pieces consist of two strips of ½in. angle iron 3in. long. In the centre of one face of each of these, two holes are drilled and tapped 4 B.A., ¼in. from top

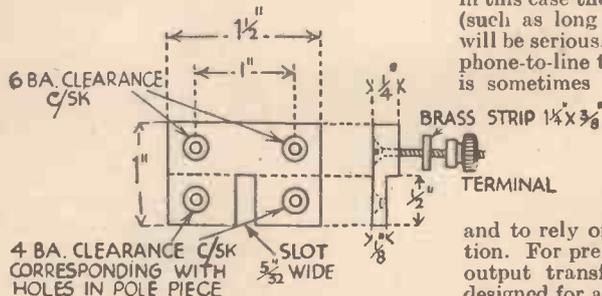


Fig. 4.—Details of one of the ebonite saddle pieces.

# TRANSMITTING TOPICS

I HAVE now had in use in a very exposed spot for just over two years, a wooden lattice mast which I designed for the home constructor, and as it has proved very satisfactory, and drawn many favourable comments from enthusiastic amateurs, I give brief details of its construction below.

The whole thing is exceptionally light, easy to handle and erect, very strong, and adds a very business-like look to the station.

It is thirty feet in height, but there is not the slightest reason why it should not be forty or forty-five feet; the cost was approximately £1, and it can be built in about 40 hours at the outside.

The main framework is constructed from  $\frac{7}{8}$  in. square finished straight grained pine, the wood being supplied in 10ft. lengths. The lattice work is carried out with selected lathing, which can also be obtained in the same length. This, however, is not important as each single piece of lathing used is much shorter than 10ft.

For ease of construction, the mast is constructed in three sections, provision being made for them to be screwed together on completion.

The diagrams are self-explanatory.

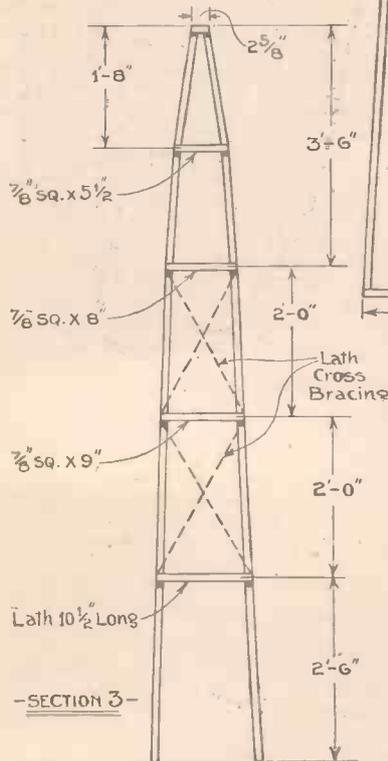
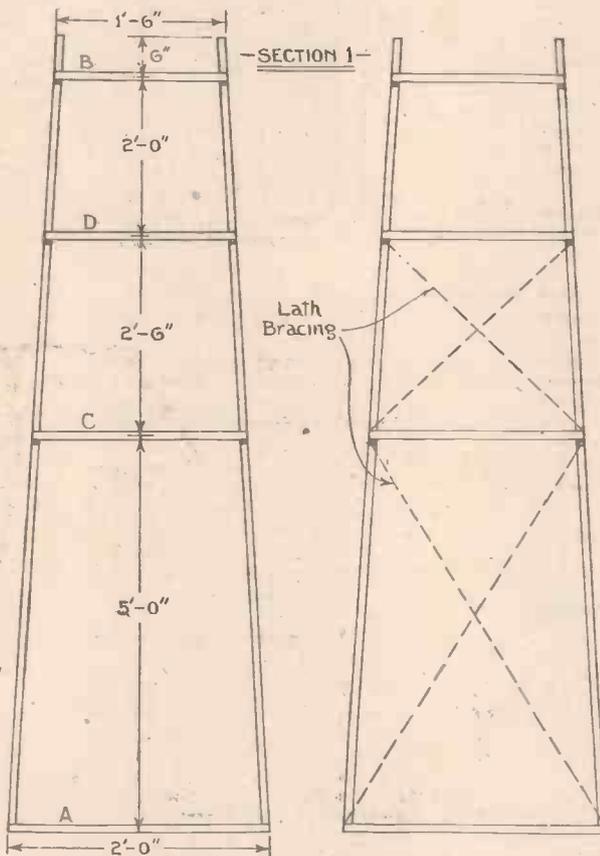


Fig. 3.—The third or top section of the mast. All dimensions are given in the illustrations on this page.

Continuing the Subject Dealt With Last Week, Full Details of a Lattice Mast are Now Given By L. ORMOND SPARKS

tory, while the illustration last week gave some idea of the appearance of the finished job. It will be noted that guys were used,



Figs. 1 and 2.—Method of building the first section and fixing cross-bracing strips.

but providing the base of the mast is securely anchored to a prepared bed, say, concrete, they are quite unnecessary.

### Hoisting Masts

The hoisting of masts can often prove a rather troublesome and awkward job, unless it is tackled properly.

For masts of the scaffold pole type, not exceeding, say, 25ft. in length, it is not very difficult, providing the heel of the mast is placed in position and anchored as shown last week, to prevent it slipping and tilting. If one helper lifts the head and walks towards the base, gradually raising the mast, while another person hauls on the opposite side on the aerial halyard, the pole can soon be raised to a vertical position.

With masts exceeding 25ft., especially in the case of joined and metal tubular types, it is often necessary to adopt the

arrangement shown in Fig. 6, in last week's issue, otherwise "whip" will be experienced, which, if it once gets beyond the control of the hoisters, can prove most awkward and dangerous. When erecting such masts, it is essential to have at least four helpers, one hauling, one taking the strain in the opposite direction, and one for each side guy.

It is in this direction that the lattice mast scores as it is so easy to erect, two men being able to do the job quite comfortably.

There is one point to watch. When the mast is in the vertical position but before the guys are anchored, don't, if you are the one holding the base of the mast while the others see to the guys, look up the mast, as the slightest movement creates the impression that the whole lot is going to topple over and causes much unnecessary apprehension and undue strain. It is quite unnecessary to haul the guys really tight; just take up the strain and leave for a couple of days until they have stretched, and the mast has settled down; then go over everything and make final adjustments.

If any doubt is placed upon the aerial supporting rope, some arrangement should be made to facilitate its replacement without having to lower the mast or pole.

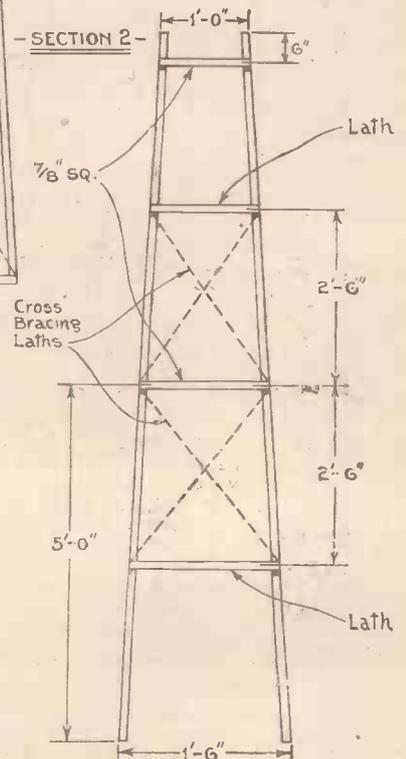


Fig. 4.—Showing the dimensions for building the second (middle) section of the mast.

# Constructional Details of "Practical Wireless" Receivers—5

THE minimum number of valves which can be employed in a receiver which is to be relied upon to provide not only good volume from the local but a reasonable selection of distant stations, is three, and these must be arranged to provide H.F. and L.F. amplification in addition to a simple reacting detector stage. A receiver of this type will also provide a reasonable degree of selectivity as there are two tuned circuits, and by a suitable selection of components these may both be tuned by a single control, thus providing simplicity of operation. Such a combination was employed in the Leader Three receiver which was described in 1934 and which was the subject of Blueprint No. 35. As the issues describing the construction of this receiver are now out of print, and as this type of receiver is so often called for, the following main constructional details and instructions for fitting a modern coil are given, and, of course, the blueprint may still be obtained from this office, price 1s.

The coils originally specified were Wearite Universal types, but the makers have modernised these coils and the latest type is known as the Unigen. These are practically identical from a circuit point of view, but are wound in a slightly different manner and provide greater selectivity and signal strength, and are provided with a tapping point on the primary winding. This enables a higher degree of efficiency to be obtained on the medium-wave band,

The Leader Three, a Simple and Efficient S.C., Detector and L.F. Receiver, is the Subject of This Article

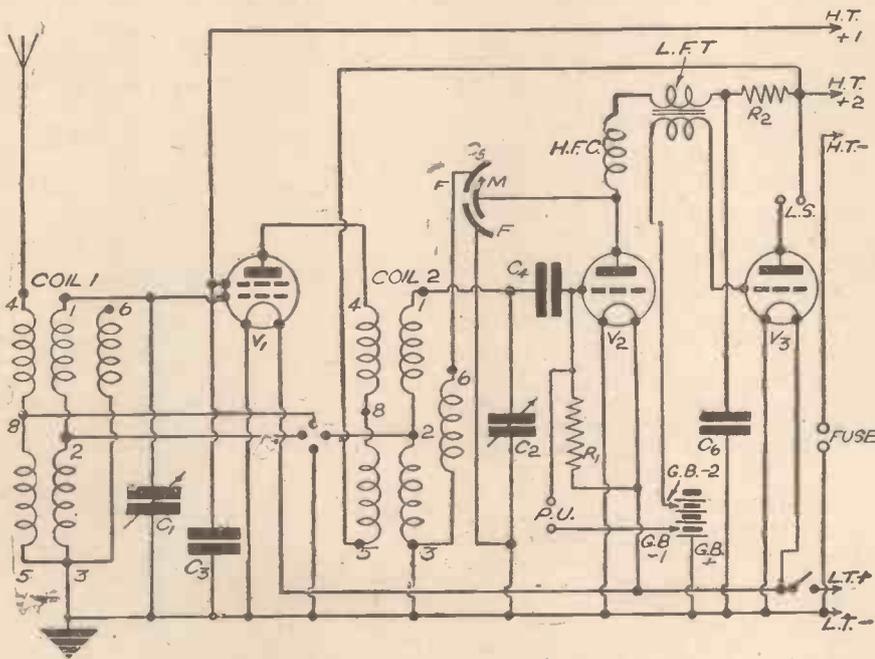
earthing terminal was connected. Thus, the wiring will have to be modified slightly, and the theoretical diagram reproduced on this page shows the modernised circuit, whilst the skeleton wiring diagram shows the connections now required for the coils.

### Earth Returns

It will be seen that the fixing screws for each of the screened coils are used as anchor and junction points for earth leads, and it is essential that the enamel on the base of the coil be scraped away before the wire is placed in position. The simplest

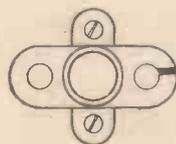
way of making this connection is to cut a short length of connecting wire, remove the insulation if the covered variety is in use, and make loops at the ends. These loops are then placed between the screw and the base of the coil and thus will be in firm contact with the metal when the screw is tightened up. A further earth return is carried from the coil nearest the controls to the four-point switch, which is also linked to the ganged condenser, a suitable fixing point being found on the front where the dial is attached. It will be noted that an additional wire is now recommended from the fuse-holder to the first coil, and by utilising these wire returns for earth there will be no risk of losses occurring through the metallised surface of the baseboard due to dirt or grease. This point is mentioned as it has been found on some of the receivers which have been sent to us for servicing that, due to continued mishandling, the surface of

(Continued on next page)

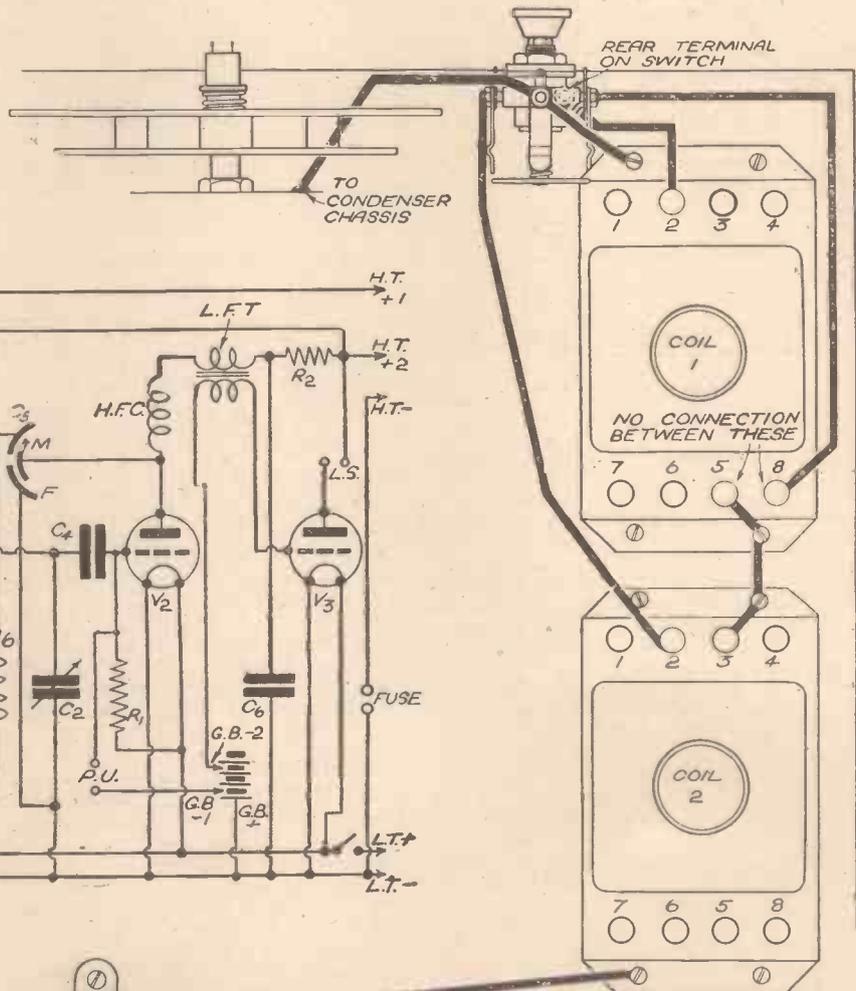


Theoretical circuit of the new Leader Three.

but it has been found that it is not essential to switch the primary of coil No. 2. The general arrangement of the terminals on the coils is also identical with the original design except that the additional terminal (No. 8) is now placed where the original



Details of the new wiring required for the modern Unigen Coils in the Leader Three. Note that the wire removed from terminals 5 and 8 on coil 1 must now be taken from 5 to earth.





# Running a Radio Club

**T**HERE undoubtedly exists in many districts not only the potential membership for, but also the desire on the part of a proportion of these wireless enthusiasts to join, a properly organised society.

Since radio took on the status of everyman's hobby, many radio clubs have been formed, some of which have lasted perhaps six months, while very few of those inaugurated only three years ago still exist. The reason for this is nearly always due to two causes acting together: faulty organisation and selfishness, perhaps unconscious, on the part of a few members.

The writer, while he does not lay claim to omniscience in these matters, has yet had a good deal of experience in the formation and running of radio societies catering for different types of membership. This experience, for what it is worth, is offered herewith in the hope that the club movement may benefit.

The first step in the formation of a local society is for the people interested in the proposition—who may simply be two or three who happen to know one another well enough to discuss it—to arrange among themselves that they each get in touch with all their acquaintances who might join and arrange a meeting at a café, or even at someone's house, where the preliminaries can be discussed over a cup of coffee and a cigarette. If an announcement can be inserted in the local paper, so much the better.

At this first meeting, there will be a certain amount of shyness and, on the part of some members, a lot of high-flown talk. But to the sensible and discerning observer, the choice of the man for secretary will soon make itself obvious. Have him elected right away. Don't ask for volunteers, because the wrong man *always* responds. The correct procedure is for someone to propose a willing member, and ask for a seconder to the proposition. This will be forthcoming readily enough, and if a second proposal is made and a vote becomes necessary, this can be taken on a show of hands.

## Choice of Officers

The secretary is the most important man in any society, and he should therefore be carefully chosen; moreover, he should be willing to take on the job. Do not bother about the chairman or other officers at the first meeting, as there are various considerations which are more important, and in any case the best man to be chairman will not show himself till one or two meetings have been held and the members have got to know one another better. If at the first meeting a secretary is elected, and those present feel he is the right man for the job, the foundation will have been well and truly laid.

## Club Premises

But many societies have reached this stage safely, and have even then foundered

Preliminary Details, Hints for Successful Management, and Lines of Activity are Discussed in this Informative Article

because the further organisation has been too hurriedly arranged. The thing to avoid is rushing off and taking a room somewhere before the club has found its feet properly. It is far better to have the first few meetings either at members' houses in turn or at a café where a private room can be obtained. Avoid public-houses, even if everybody seems agreeable to going to one, because a

to carry the club, financially or otherwise, and it is therefore important that early activities be kept within the income available.

## Subscriptions

This is a point which requires careful consideration, and in the writer's experience the successful society is the one where the subscription is kept as low as possible, so that junior members can afford to join. It is also desirable to arrange that this subscription be payable either annually, monthly, or even at each meeting. That is, while some members would be able to pay 25s. annual subscription in advance, others would find it more convenient to pay a shilling at the fortnightly meetings. This involves proper book-keeping, which should always be entrusted to an honorary treasurer, if possible a member who is in business and understands the handling of money. In any case, to ensure a regular income on which a budget can be drawn up, the payment of subscriptions should be put on a proper basis, and whatever method of payment individual members offer, it should be adhered to in the interests of all.

## The First Few Months

If the general plan outlined above is followed, the first few months of the club's life is really devoted to accumulating funds, which is as it should be. Meetings will be almost if not entirely self-balancing in the matter of expense, since the room being used will be paid for by members themselves under the agreement suggested. A further useful argument in favour of

this arrangement is that those who are really keen will see it through, but those who joined in the first flush of enthusiasm without any real interest in radio will gradually drop out. The net result is that when the club finally settles down, the membership will be steady and well-knit, which is one of the biggest factors making for success.

During this period, regular talks and practical demonstrations should be given, and for this a technical committee must be selected charged with the sole duty of arranging these matters, regarding which the wishes of members must, of course, be consulted. Here another point in organisation arises: The membership of any successful radio club will necessarily consist of all sorts and conditions as regards knowledge and experience. Therefore, if the club activities are kept continuously on too high a plane, those members who joined to learn will spend most of their time in the dark and will soon drop out, because meetings will be of little use to them. Similarly, the more technical members will lose interest if every meeting is of an elementary nature.

## Programme Arrangements

Consequently, it becomes necessary to devise a programme which will always appeal to some section of the membership.

(Continued overleaf)



A well-organised club can offer many benefits. Here is the International S.W. Club (London Chapter) examining some television apparatus.

certain very worthy type of member is immediately frightened away, and the club gets a reputation which is wholly undeserved. It is usually possible to come to an agreement with a café proprietor to have the use of a room in return for the money members will spend on refreshments.

## Meetings

These meetings should be properly conducted, in that the secretary should have the minutes of the previous meeting ready to read, while any other items of business should also be put on the agenda and dealt with in turn. For this procedure, a chairman is necessary, and after the first few meetings, it should be clear who is the best man for chairman. He need not necessarily be technical; it is far better to have somebody who is keen enough to attend every meeting and who, by reason of his standing and similar considerations, is able to exact that respect for the chair which is essential for orderly meetings.

The chairman's job is to see fair play in any discussion which may arise as to the club's affairs, and also to restrain the more talkative and irresponsible members from rushing it into schemes which are either uneconomic or not of general interest and benefit. He should not be expected

### RUNNING A RADIO CLUB

(Continued from previous page)

This is obviously done by finding out in what directions members' interests lie: Broadcast reception and/or construction, short-wave listening and experimenting, amateur transmission, and so on. Those members able to deal with these various aspects should be asked to give talks and demonstrations with their own apparatus, assisted if necessary by the technical committee. A Morse class is nearly always an attraction, especially if a qualified operator is available. This is, of course, not always possible, but much can be done by members getting together with buzzer and key.

#### Club Headquarters

When the club has settled down and a few pounds of working capital have accumulated, it is time to look for permanent quarters. Here a few words of warning. It may seem foolish and unnecessary to adopt what appears to be a long and roundabout way to the goal of the club's own quarters, when there are perhaps members who are able and willing to assist with money and kind. Apart from the arguments against this which have already been set forth, there is the fact that human nature being what it is, those who pay the piper often feel entitled to call the tune, even where they are helping their own club. If a lot of assistance of this kind is accepted, therefore, it often ends in the affairs of the society getting into the hands of a clique who run it without much regard to the rest of the membership. The writer's best advice, based on experience of this very point, is that everything the club undertakes should be a strictly communal effort, paid for out of the common fund, and that the club should never be in such a position

that it is deeply beholden to one member or group of members.

Suffice it to say, then, that with diligence on the part of the officers of the society, a room can usually be found which can be rented for a few shillings a week, where it is possible to put an aerial up and get light and heat connected.

#### Management Committee

To run the club-room, a small management committee should be formed, having the duty of drawing up rules, arranging the supply of refreshments, cleaning and similar necessary services, while from this committee stewards should be appointed to attend each night the club-room is open.

The technical committee will be responsible for the installation of the club's own permanent apparatus, such as receiver, amplifier, power supply, test instruments and so forth, and the constructional work should be given out to those members capable of working to specification and a reasonably high standard. Components for these items should, of course, be bought from the funds, any such expenses being duly ratified by a full meeting, so that all members have a voice in regard to the disposal of their money. The treasurer must always be prepared to render a financial account, and it is his duty to make sure that the funds in his charge are used as carefully as possible.

Along the lines outlined, a bare room obtained at quite a low rental can be turned into a comfortable and well-equipped club-room to which members will always be glad to come.

Having reached this stage, the future of the club, provided the enthusiasm and drive of the responsible officers is maintained, will work itself out. The membership as a whole should vote conscientiously

whenever called upon to do so, and the prompt and regular payment of subscriptions be made a point of honour.

#### Lines of Activity

Various lines of activity will emerge which will be found to have the greatest appeal, and these will automatically become the club's main interests. At this time of year, when the possibilities of outdoor work are receiving attention, direction-finding and tests with portable equipment are useful outlets for latent abilities, particularly if the assistance of amateur transmitters can be secured.

The secretary's work will become more responsible as the club grows and becomes established. Careful records should be kept of every aspect of its work; manufacturers should be asked to supply their literature regularly, and lectures and demonstrations arranged with them where possible. A small library of good technical books should be started, and the radio periodicals kept on the table. A monthly report of activities should be prepared for the radio press, while a certain amount of discreet advertising in the local paper is also helpful. In this connection, "press-gang" methods of increasing membership should be carefully avoided. The most likely prospects are those who come along of their own free will, and it will often be found that the best members do not appear till they are satisfied the club is worth joining.

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# On Your Wavelength

By THERMION

## Dial Calibrations

I WAS at a friend's house the other day and, happening to look at the dial of his wireless set, a new commercial all-wave receiver, I noticed that the name illuminated on the dial was "Regional," while the programme which we were listening to was definitely coming from the Berlin station. My friend tells me that the names are quite a long way out throughout the range, except on the short waves. For example, W2XAD came in right on the pip, and later in the evening so did W2XAF, and also the locals, but on the medium band one had to remember that the station you wished to tune in was the one two names below the one you wanted if the station was at the top of the dial, and a few stations below if at the bottom.

This reminds me of the story of the Irishman's clock which, when the big hand pointed to 7 and the small



Station-indicating dials.

hand pointed to 3, struck 4, indicating that it was 20 minutes past 12, or midnight in Italy, or perhaps Wednesday over here. Quite a number of commercial receivers have wonderful dials which do not mean a thing; they can never have been calibrated. Of course, in some sets, the aerial will have something to do with it.

## The Squeaking Mouse

DID you hear that senseless broadcast the other Sunday

afternoon when the B.B.C. spent a considerable sum on transatlantic telephone to bring to listeners the sound of a mouse squeaking? We hear a lot about how hard up the B dot B point C is, and yet they can spend money on an item such as this. The search for novelty is going too far, although the daily papers on the following Monday morning were full of praise for the broadcast. It was inevitable that a reader should write to a daily paper and report that his cat made one leap at the radio set and knocked it off the table in an effort to get at the mouse! Believe if you like, and if you don't you can't deny it.

## Dud Coils

YOU will remember that a few weeks ago I published a letter from L. B. J., of Weston-super-Mare, who regaled us with his woes in endeavouring to get a perfect set of coils. Here is a further missive from which you can draw your own conclusions:

"Thank you 'Thermion' for publishing my letter in your recent issue of PRACTICAL AND AMATEUR WIRELESS, although when I wrote I did not expect it would be interesting enough for publication.

"You may be interested in the sequel. Towards the end of my previous letter I said that I was now awaiting the arrival of another 'faulty' coil.

"It came. I could get no reaction, tried everything, wrote to you. You helpfully replied, on April 21st, telling me if batteries were correct to call in reliable local engineer. I did; he spent over two hours, could find no fault nor get reaction.

"Once again I return coil to makers. This is their reply, or, rather, an extract. 'We tested your coil upon receipt and our ordinary test showed no fault whatsoever. In view of the trouble you have had we arranged to test the coil under actual

working conditions in a similar circuit to which you are using. It was then found that the coil would not give proper reaction effects on the medium waveband as stated in your letter. We have, therefore, replaced your coil by another one which has been tested under the same conditions in the receiver.'

"Can you beat my bad luck with coils? I believe if any firm made 10,000 coils and only one of those was faulty, I would get it.

"The manufacturers of the coil have been obliging and courteous right through. I am making no complaint and merely write as a matter of interest and as further proof that there is something wrong with the manufacture of coils."

## Marconi House Becomes Ariel House

AN historic radio landmark in the West End of London has lost its identity. Marconi House, the cradle of wireless communication, has been taken over by the Air Ministry and will henceforth lose its connection with radio.



The Singing Mouse causes trouble.

This building was erected in 1903 and was called The Gaiety Restaurant and Hotel. It continued in this capacity and flourished until 1912, when the Marconi Wireless Telegraph Company acquired the building and site and opened it for business on May 16th of that year.

In 1922 the Marconiphone department, under Major McCullam, was formed and commenced trading in domestic receivers. In November of

that same year The British Broadcasting Company commenced transmission from the top floor of the building which housed the studios, transmitting plant, and offices, and which was the birthplace of Britain's radio entertainment.

The Marconiphone Company left Marconi House prior to its amalgamation into the group now known as Electric and Musical Industries Limited, but Marconi Wireless and Telegraph Company continued to occupy the premises until they moved to Electra House on the Victoria Embankment in December, 1933. Since that year Marconi House has suffered many vicissitudes, and now this building becomes the property of the Air Ministry. It became Ariel House on April 30th, when it was opened as such by The Duke and Duchess of Kent and the Secretary of State for Air.

It is interesting to note that on that occasion Marconiphone returned to its old home for one performance only, as during the opening ceremony one of the latest of the Air Ministry flying boats flew over Ariel House and a two-way conversation ensued between His Royal Highness The Duke of Kent and the flying boat. The radio reception and amplifying arrangements on this occasion were carried out by the Marconiphone Company, Limited.

Although Ariel House will no longer be officially associated with the name Marconi, one imperishable link remains, as many years ago (the actual date is not known), Marconi himself in an idle moment, used his diamond ring to scratch his name on the window pane in Captain Round's laboratory on the seventh floor. The Air Ministry are taking steps to preserve this historic relic.

#### Silent Radio

I WAS reading the other day an advertisement for a radio pillow or some such gadget which was supposed to enable the listener to recline in an easy chair or on a divan and hear the programme without it being audible to anyone else in the room. This idea seems to me to be a good one, and I wonder it has not received further attention. It often happens in the home that one member of a family wishes to hear an item which is not appreciated by the others and such a device would be welcome, although perhaps it may be inconvenient to recline in such a manner that the pillow is brought into the correct position. Some years ago I remember an experiment where dancers in a hall all wore headphones, and the music



## Notes from the Test Bench

### Vitesse Coil Unit

IT has been found in some of the Vitesse receivers submitted to us for test that the aerial and A.V.C. line leads from the coil unit have been reversed. The aerial lead should connect to the front section of the wave-change switch, and the A.V.C. lead to a 500,000-ohm resistance. When these leads are reversed, no reception can be expected, as the resistance acts as an effective barrier to the signal picked up by the aerial. Constructors of this receiver are also warned once more that the paint must be scraped off underneath the M.C. tags, otherwise effective connection to earth will not be obtained.

### The Telecent

READERS who are experiencing difficulty in obtaining smooth control on the Telecent should try a lower value potentiometer in series with a fixed resistance. A 25,000-ohm potentiometer in series with a 50,000-ohm resistance may be used, the resistance being connected between the H.T.2 lead and the potentiometer tag. Our experiments indicate that a short-wave triode, such as the D210, will also work satisfactorily as a detector in this receiver. When this valve is used the .0005 mfd. fixed condenser must be replaced by a variable type, however, and a 20,000-ohm resistance should be joined between the .1 mfd. condenser and the P terminal of the L.F. transformer. The super-regenerative effect is not so pronounced on the ultra-short-wave bands with this valve in use, but very satisfactory reaction control is obtainable on all wave-bands.

### Valve Additions

WE often get inquiries from readers concerning the addition of a valve to their receiver. In some cases helpful advice can be given, but it is often impossible definitely to state whether an extra valve will improve the performance of a set, or even whether it is safe to add a valve. If the receiver is of the one- or two-valve battery-operated type, it is generally found that an additional valve greatly improves the performance. An extra H.F. stage can generally be added to advantage to a three-valve battery set, but if more than three valves are already in use an extra valve is likely to cause instability. The same reasoning applies in the case of a mains-operated set, but the additional precaution of finding whether the mains transformer will supply the extra current required must be taken.

to which they danced was picked up by a small device in one of the ear-pieces. Surely, then, it is not a difficult step to so relay the music that it could be heard by individuals without elaborate apparatus? I can visualise the time when we shall not use radio receivers of the kind in use to-day, but will merely select mentally the station to which we desire to listen, and some form of ear control will automatically adjust a special H.F. receiver worn inside or behind the ear in complete obscurity.

### Sulphuric Acid

EVERY battery user knows the main properties of the acid which is used in his accumulator, and I have just been reading some interesting facts about this chemical. Contrary to the beliefs expressed by many users sulphuric acid does not give off any fumes. Furthermore, it has no odour, and if you can smell it, it indicates that during the manufacturing process the acid has not been cleared entirely of its sulphurous acid compound. The neat acid such as is used for accumulators (specific gravity 1.840) can be transported in iron or steel tanks without in any way attacking the metal, but as soon as the smallest amount of water gets into it, it starts to attack the iron, forming ferrous sulphate. You should, therefore, be most careful when handling this chemical, and remember that it does not evaporate—only the water does so. Thus, when the level of your accumulator falls, top up with distilled water, unless the acid has been spilled. Incidentally, I hope all my readers know what to do if the acid is spilt on the body or on fabric?

### Statistics

I DON'T know whether you like the kind of statistics which are often produced to emphasise the magnitude of some production. You know the kind of thing—if all the hens laying eggs for so-and-so's product were placed end to end they would reach from here to Bombay and back. Well, I have just received some interesting figures from the well-known Philco people, and the figures are very interesting. If you are fond of this type of information, here it is.

At least 334 six-room homes could be completely papered every year with the engineering blueprints used every 12 months in the production of Philco radios. That enormous volume, 1,000,000 square feet a year, is produced in keeping Philco Radio abreast of scientific progress.

A PAGE OF PRACTICAL HINTS

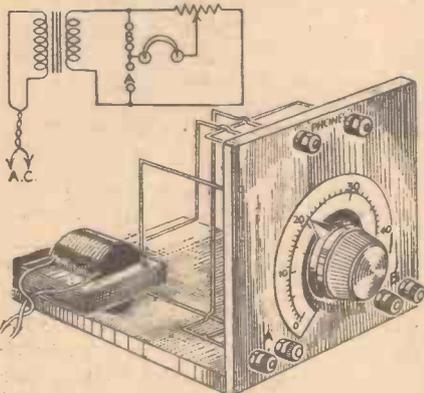
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Simple Test Bridge

WISHING to find the value of an unknown resistance I fitted up the device shown in the accompanying sketch. It consists of a bell transformer, a 50,000 ohms volume control, and a pair of headphones. The unknown resistance is connected across B and another known resistance is connected at A. The volume



Theoretical circuit diagram and a view of the completed test bridge.

control must be untapered and must also be provided with a scale. The mains transformer is switched on and the volume control adjusted for no buzz in the 'phones.

Then the resistance of B =

$$\frac{\text{No. of degrees to the right}}{\text{No. of degrees to the left} \times \text{value of A.}}$$

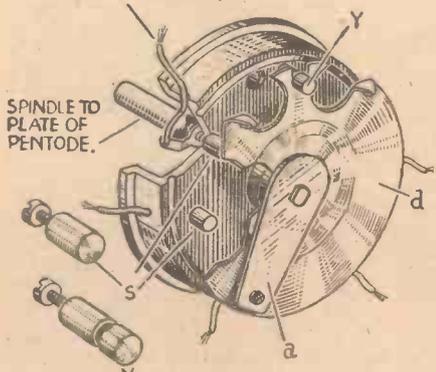
Thus, in the example shown, if A=3,000 ohms

$$B = \frac{50 - 21}{21 \times 3,000}$$

B=2,174 ohms, or approximately 2,000 ohms.

This device can also be used for condensers, substituting a fixed condenser of known value in place of the known resistance. It is really a modification of the famous Wheatstone Bridge.—R. J. S. STEPHENSON (Lincoln).

VIA EXTENSION SPEAKER TO H.T.



An extension speaker switch for use in conjunction with a pentode output stage

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." D. NOT enclose Queries with your wrinkles.

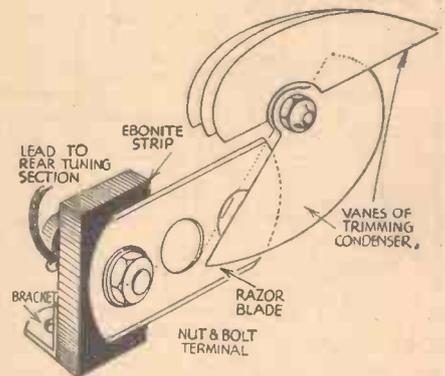
Using Pentodes and Extension Speakers without Choke-filter Output

I HAVE found it possible with this idea to effect an alternative to the more usual choke-filter output stage, when employing a pentode and having a number of extension speakers in circuit. As is generally known, an open or intermittently open-plate circuit in the pentode stage will cause the emission of the pentode to depreciate in time, and in utilising this idea the normal plate-speaker-H.T. circuit can be used, and in switching in and out the various speakers the operation is as follows: The disc (d) is depressed by the arm (a) and contacts with each of the five studs (s) in turn, but before the contact of each stud in turn is broken the next one is made, thus maintaining continuity of load throughout the complete revolution of the rotor arm. The contact studs (s) were made out of 1/4 in. brass rod and taper tapped to take 8B.A. screws as shown. Owing to the volume control used for this model having the spindle common to the disc, it was

necessary to insulate with an ebonite bush when mounting on a chassis.—W. R. HOBBS (Ilford).

Differential Trimming

I HAVE often found difficulty in trimming an S.G. 3 receiver owing to mismatching of the various circuits. After experimenting for some time I found that a neat trimmer of the "differential" type could be constructed from a condenser as shown in the accompanying sketch. It will be seen that one (or perhaps two)



A simple differential trimming device.

vanes of the moving section are turned so that they project in the manner shown. An old razor blade is next screwed or bolted to a post of ebonite mounted on a small metal foot, and this is connected to the remainder of the condenser section. Thus, as the condenser is turned the single plate provides an additional capacity through the razor blade. I have also used a similar idea for aerial trimming purposes, as well as for automatic reaction.—R. J. LACEY (High Wycombe).

Short-wave Tuning

AFTER experimenting with some short-wave sets I found that the greatest difficulty was in tuning. I stripped several well-known condensers down in an endeavour to improve matters, but nothing seemed to overcome the main trouble, which was noisiness and uneven tuning. Finally, I made a condenser which seems now to fill the bill. A strip of metal was obtained 1/4 in. in width and a number of chisel cuts were made in it. Some plates from an old condenser were cut with a projecting lug to fit in the cuts in this strip and they were all soldered to it. The spacing was about double that normally employed. A moving section from an old condenser was dismantled and reassembled with double spacing, and to the lower spacing ring a length of copper braid was soldered, and over this was passed a length of insulated sleeving. Thus, no noises were obtained due to the pigtail rubbing, and the length was such that no inductive effects were obtained. The result is a noiseless and very efficient condenser.—G. DEAL (Highbury, N.)

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# WAVE-CHANGING

Various Methods of Switching Broadcast and All-wave Reference Being Made to Some  
By FRANK

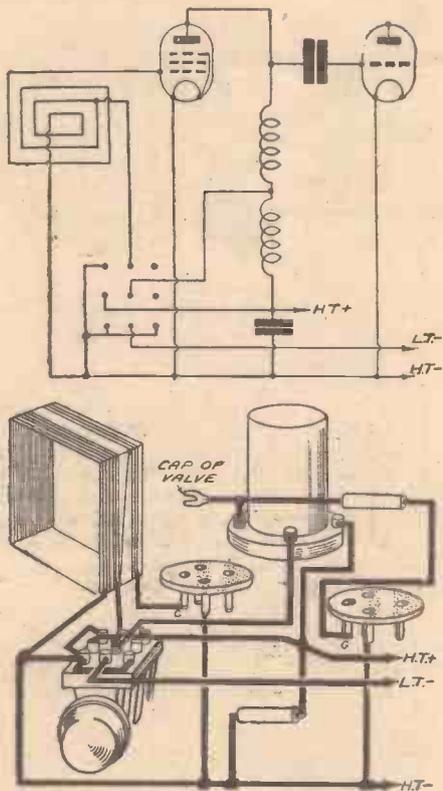


Fig. 1.—Circuit diagram and pictorial view of three-pole change-over rotary switch used for two-waveband switching and also for battery on-off switching.

SWITCHING circuits are always interesting, since there are generally various possible combinations and alternative arrangements. Switching for the purpose of wave-changing can be extremely simple or very complicated, according to the type of tuning circuit employed. In any case, the arrangement of contacts has been considerably simplified during the past year or so by the introduction of various new patterns of switch. The main difficulty is in following a wiring plan in which the switches are shown; this is because there are usually several contacts close together, so that many

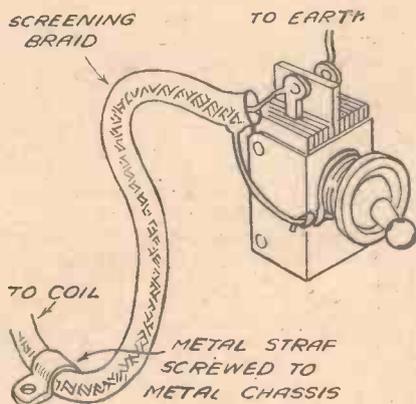


Fig. 2.—Where switch leads are long they should be screened, the screening braid being earthed to the chassis. One good method of earthing is shown here.

wires appear to radiate from a common centre.

But if the action of the switches is first understood it will be found that the wiring can be followed far more easily. It will be better to start by showing the connections for the simplest type of wave-change switch, such as that illustrated in Fig. 3. In this case there is simply an on-off switch, serving the purpose of short-circuiting one winding when the lower wave-band provided by the coil is to be covered. The same connections apply whether the coil is designed for medium and long waves, or for two short-wave ranges.

### Choice of Switch

Although the switch shown is of the Q.M.B. pattern, it might be replaced by a simple push-pull component, or by one of a wide range of on-off switches of the same

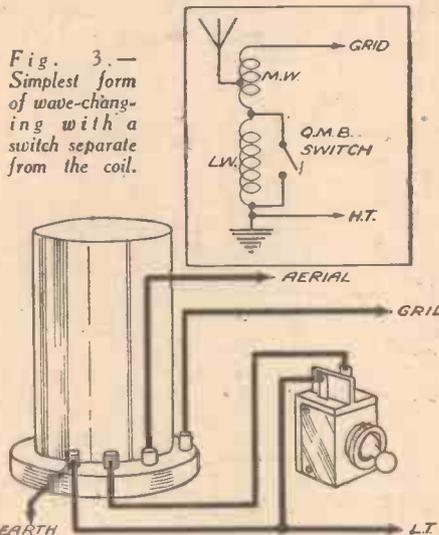


Fig. 3.—Simplest form of wave-changing with a switch separate from the coil.

type as is used for switching in battery circuits. Generally, however, the Q.M.B. type is most suitable, since it makes a sure contact and there is very little capacity between the terminals or soldering tags. The latter point is of importance only in the case of a short-wave set. It is worth mentioning, in passing, and for the benefit of those readers who are comparatively new to home construction, that Q.M.B. switches are generally available with either soldering-tags or small screw-terminal connections.

### Position of Switch

One of the most important points to watch in construction is that the switch should be placed as near as possible to the coil with which it operates. If this is not done there might be a comparatively high capacity between the connecting leads and other wires running close to them. If the leads must be long it is desirable that the one which is not earthed should be screened with metal braiding, the braid being earthed. The most convenient and reliable method of earthing—to a metal or metallised chassis—is by clamping the lead to the chassis by means of a small strip-metal bridge, as shown in Fig. 2.

When there are two coils in the receiver it is generally desirable that a single switch should be used for wave-changing on both coils. Thus, with two coils, we have the connections shown in Fig. 4. In this case a three-point on-off switch is used, and this again might be of the Q.M.B. or push-pull type, although the latter is indicated. Here it is still more important that the connecting leads should be short and/or screened. There might be difficulty in keeping the wires short, especially if the coils are mounted in a line at right-angles to the panel. The difficulty could then most easily be overcome by using a pair of on-off switches ganged together, each switch being placed beside the coil with which it works. This can easily be

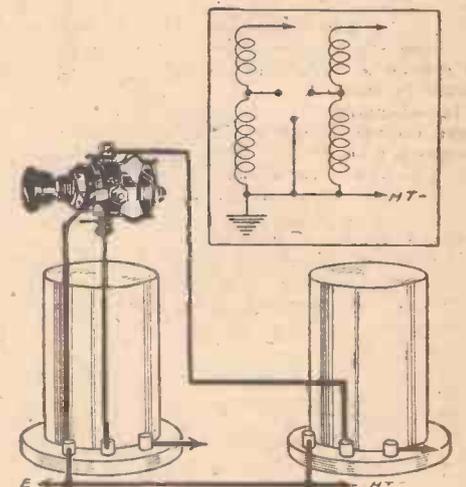


Fig. 4.—Sometimes a three-point wave-change switch can be made to operate on two coils, as shown.

arranged by using Q.M.B. switches of the baseboard-mounting type, arranged as shown in Fig. 5. These switches are not fitted with the usual type of toggle arm for operating, but have a rotating bush through which a ganging spindle can be run. The spindle is gripped in each switch by means of a grub screw.

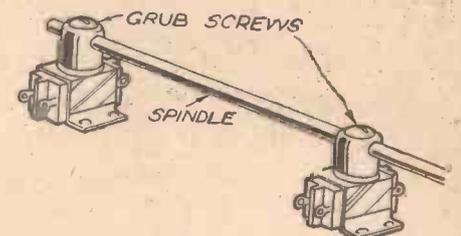


Fig. 5.—Baseboard-mounting Q.M.B. switches which can be ganged together and operated through a single spindle.

# SWITCHING

## as Required for Both Receivers are Described, of the Newer-type Switches. PRESTON

When using a system such as this—and it is an extremely good system—it is always a good plan to earth the metal spindle. One method is by soldering a short length of flex to it and to a screw passed through the metal or metallised chassis, and another is by fitting springy-metal contacts on the chassis in such a position that they bear against the spindle. In most cases, a single earth contact is ample, but if the spindle is more than, say, 5 ins. long, it is often better to earth it at two or more points.

### Variable Bias

When a variable bias voltage or A.V.C. is applied through one or both of the coils, as in Fig. 7, it is essential to use either two separate switches or otherwise a single one of the two-pole type. If this were not done, the bias would be short-circuited, or otherwise the bias decoupling circuits would be shorted.

In arranging the switching for an all-wave receiver, somewhat different switching devices are necessary, since any number of on-off switches would be either useless or cumbersome. This can be seen from Fig. 6, where it is assumed that two separate coils are used in the aerial circuit of a leaky-grid detector. Each coil covers two wavebands; one coil is for two short-wave ranges, and the other is for medium and long waves. It is, therefore, necessary in turn to connect points marked A, B, and C to point D (earth). This could be done, in a very inconvenient manner, by connecting separate on-off switches between A and B, B and C, and C and D. For the shortest waveband it would

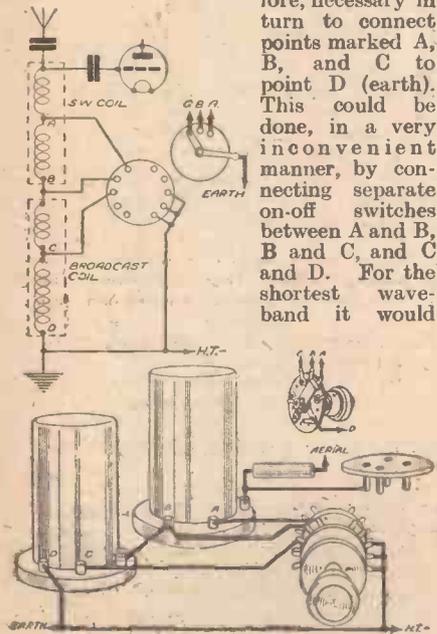


Fig. 6.—How a single rotary switch can be used to give four-waveband switching with two two-range coils wired in series.

thus be necessary to close all three switches; for the second short-wave range the two lower switches would be closed; for medium-waves that between C and D would be closed; and for long waves all three would be open.

### Four-Circuit Switching

A far simpler and more convenient method is that shown, where a rotary switch is employed. A convenient type would be one such as the Bulgín type S.153, which is shown in Fig. 6, in conjunction with operating spindle, knob, and scale. There are ten contacts arranged so that each of five contacts can be connected to one of five opposite ones. By joining together three contacts, connecting these to earth, and connecting the opposite contacts to the points marked A, B, and C, any one of the four wavebands can be brought into use simply by rotating the one control knob. Any number of these switches can be used together, for they fit on to a square-section control spindle, which serves for

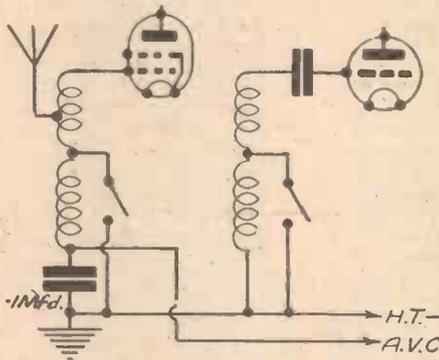


Fig. 7.—When bias or A.V.C. is applied through one of the coils it is necessary to use either two separate switches or a two-point (four-terminal) on-off switch.

convenient ganging. Each switch unit comprises two sets of ten contacts, so that one unit can be used for two windings. Thus, two units could be used for four circuits in an H.F. receiver, as shown in Fig. 9.

A less expensive switch for use in the circuit given in Fig. 6, is the simple three-way model shown inset in the same illustration. In this example, the rotating arm forms one connection, and makes contact with any one of the four fixed contacts as the knob is turned.

### Wave-change and On-off

In the case of portable receivers it is often desirable to have a single switch to serve for wave-

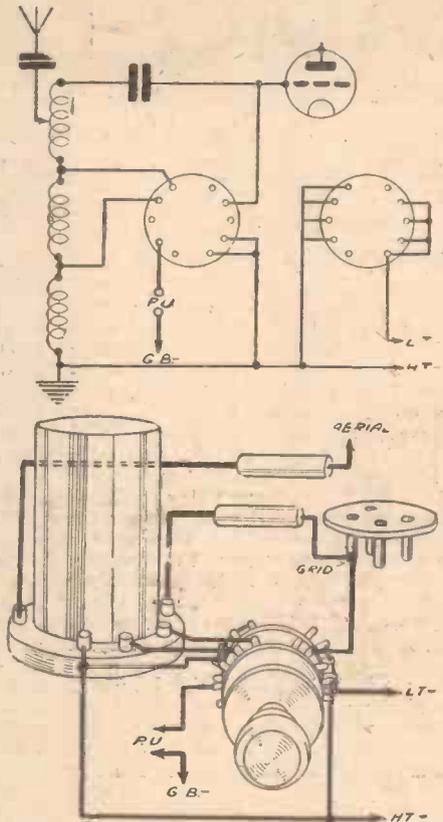


Fig. 8.—Theoretical and pictorial diagrams, showing how a double-pole five-way rotary switch can be used for wave-changing on three bands: radio-gram, switching, and on-off switching.

changing and on-off switching. Assuming that there is one tuned circuit in addition to the frame aerial, this can easily be arranged, as shown in Fig. 1, by using a two-pole anti-capacity rotary switch, such as the Wearite 1.23. It has nine terminals in three sets of three, and one set is used for battery switching whilst the others are used for wave-changing; one set acts on the frame and the other on the tuning coil. This type of switch differs from the usual patterns of on-off switch or change-over switch in that when in its

(Continued on page 232)

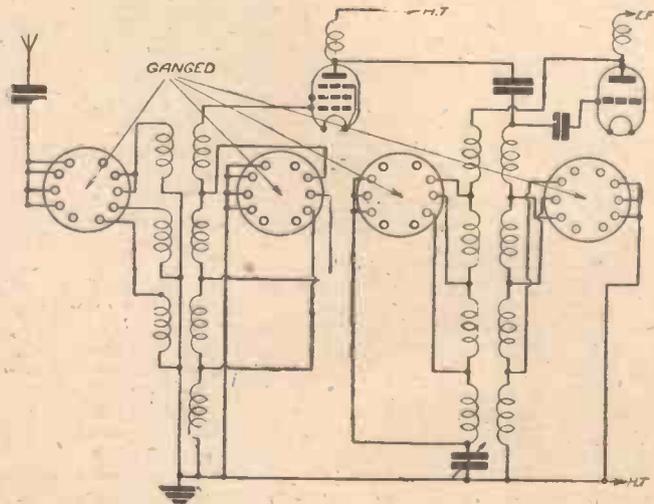


Fig. 9.—Four-waveband switching in four circuits with a Bulgín switch assembly (two S.153 sections joined together).

# RADIO FAULT TRACING-1

In this Series of Articles Fault Tracing in Connection with Commercially Built Receivers will be Considered, the Main Aim Being to Show How a Large Proportion of the Difficulties that Can Arise so Easily in "Service" Work Can be Avoided by Proper Method and Procedure  
By L. F. OSTLER

**T**HE types of defect that can cause trouble in radio receivers are quite small in number compared to the number of possible faults. If the word "fault" is used in the sense as normally understood by technical people this statement is not as paradoxical as it may seem at first sight. A high resistance soldered joint (dry joint) is a well-known defect but a dry joint at one end of a bias resistance must be regarded as a very different fault to a dry joint at one side of an I.F. trimming condenser. So very great is the number of fault possibilities that it is a useless proposition to attempt to draw up a comprehensive list of faults, with their symptoms, quite apart from the fact that combinations of faults can occur simultaneously, with correspondingly complex results.

A defect which, in itself, is simple enough may not always be very easy to track down, particularly if the fault symptoms do not give definite indication as to the type of defect, and its probable position. For any measure of success in fault tracing it is absolutely necessary to work systematically, and one of the secrets of rapid fault tracing is that of dividing the work into distinct sections, each with a definite purpose. An example of a typical plan of campaign is:—

1. Ascertain the general fault symptoms and decide, as far as possible, what sections of the receiver are NOT faulty.
2. If the fault symptoms are of multiple character, pick on one particular symptom feature as the first item requiring clearance.
3. Localise the particular circuit containing the fault concerned.
4. Trace the fault itself.
5. Clear the fault.

If there are still other faults remaining, start over again at 1, and so on. There are exceptions to every rule, and it is not always possible to adopt the actual plan outlined above, but every effort should be made to get on to some such scheme whenever circumstances permit.

## Tackling the Dead Receiver

We assume the case of the receiver that gives no radio reception on any wave-band. Adopting a very broad classification of the fault possibilities these can be regarded as being in three groups:—

1. Battery supply faults, or mains supply faults;
2. Valve faults;
3. Faults in other components, or wiring.

The first move should always be to check up on possibility No. 1. Meter tests are not always necessary at this stage for it may be obvious immediately upon switching on the receiver that voltage supplies are not lacking. No doubt should be permitted upon the matter, however.

The next move should be to check the output stage, including the speaker, for "life," and attention should not be withdrawn from the output stage until it is known that it is capable of responding to an L.F. input. The trouble with the receiver may prove to be in the output stage, or may be detected while the output stage is being tested, but if such is not the case

the next job is that of locating the faulty stage.

There are various ways in which this can be done, the best method being determined by circumstances. Sometimes whole sections of the receiver can be checked by quite simple tests involving no testing gear. For example, if a straight receiver is provided with reaction in the detector circuit, and it is found that operating the reaction control produces the familiar sounds in the speaker caused by the receiver jumping into oscillation, then it is fairly reasonable to assume that the detector valve itself, and all sections of the receiver following the detector are in order. Again, bringing the aerial lead forward, circuit by circuit, towards the grid circuit of the detector may enable trouble on the H.F. side of the receiver to be located. A gramophone motor and pick-up, or an L.F. oscillator, provide most useful devices for testing stages from the detector onwards (second detector if receiver is a superhet.). A modulated H.F. oscillator is extremely valuable for testing the stages of the receiver up to and including the detector (or superhet second detector). In the case of a superhet receiver a modulated H.F. testing oscillator can save a great deal of time and worry. By applying modulated oscillations, at I.F. frequency, direct to the I.F. stages the latter can be checked over for response without any dependence having to be placed on the actions of the receiver oscillator and signal frequency stages. If the I.F. and receiver oscillator stages are known to be in order, the signal



For the service-man, an all-valve tester of this type will be found essential in tracing faults and saving time.

frequency stages can be checked by employing the output of the testing oscillator, at signal frequencies.

The possibility of the receiver oscillator being out of action must never be overlooked where the case of a dead superhet is concerned, but it is advisable to make quite certain of the I.F. stages before going to any trouble in checking up on the receiver oscillator section. If it appears probable that the receiver oscillator is out of action a valve test should be made, or a substitution valve tried, and if there is no valve fault a test should be made for H.T.

on the oscillator anode. If this proves to be present there are now the alternatives either of making a close search for a fault in the oscillator circuit, or of making absolutely certain first that the oscillator really is out of action. If the exact arrangements of the oscillator stage are familiar and coil ends, etc., are readily accessible it may pay to test round for a fault immediately the suspicion arises that the oscillator is out of action. If, however, there is any uncertainty as to the oscillator arrangements, or if the oscillator coils and condensers, etc., are very inaccessible, then it may be advisable to prove definitely that the oscillator is not generating before exploring the "works."

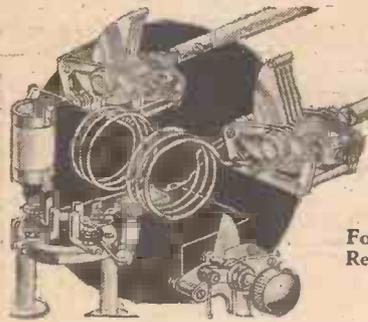
## Anode Current Value

The fact that the mean oscillator anode current when the valve is oscillating differs from the current value when the valve is not oscillating indicates one possibility of testing for the existence or otherwise of the local oscillations. A comparison should be made between the anode current value with the connections unaltered and the anode current value with the grid coil short-circuited, or with a large capacity condenser connected between oscillator grid and earth. A more indirect, but quite useful way of finding out if the receiver oscillator is out of action is to use the output from an external test oscillator. Unmodulated oscillations should be injected into the signal grid circuit of the frequency changer, or first detector, and the test oscillator and receiver should be tuned for signals as a combined outfit. If signals can be brought in in this way there will be no doubt that the receiver oscillator has a fault. Incidentally this external oscillator test would disclose the fact if the receiver oscillator happened to be generating but to be hopelessly out as regards frequency ranges. It is very unlikely that the receiver would have been completely "dead" under this condition but, in any event, with the external oscillator in use it would be possible to pick up the beats between the two sets of oscillations if some searching were carried out with the test oscillator.

If the receiver oscillator does prove to be out of action, coils should be tested for continuity and short circuits; the possibility of an open-circuited or short-circuited condenser should also be allowed for. This note does not cover all possibilities but faults of more tricky character will be considered at a later stage.

After this digression in connection with the oscillator of a superhet we will return to the general case under consideration and assume that the position has been reached that a particular stage of the receiver has been located as faulty, but that the fault itself has not yet been tracked down. The valve itself must come under suspicion first and no further move made until it is definite that there is no valve trouble.

(To be continued)



# Short Wave Section

## NOVEL SHORT-WAVE CIRCUITS

Following the Recently-published Details of Short-wave Receivers Employing Uncommon Circuits We Give This Week Details of a Two-valve S.W. Reflex.

By W. J. DELANEY.

A GREAT deal of interest was aroused amongst keen experimenters by the recently-published details of uncommon short-wave circuits, and from the correspondence which we have since received it appears that many constructors were able to obtain splendid results from unorthodox arrangements. There are undoubtedly in existence some original schemes, evolved either as the result of "hit or miss" experiments carried out by inexperienced amateurs, or as the result of careful thought in the laboratory. From time to time such details are published in various parts of the world, and short-wave experimenters will no doubt be interested in the accompanying circuit, which shows a two-valve arrangement evolved in Germany. It is already well known that an H.F. stage proves of great value in a short-wave receiver, both on account of the fact that it removes the ill-effects of certain aerial-earth systems, and on account of the fact that the tuning is stabilised. The simple detector-L.F. circuit can, in experienced hands, provide all that is required in the way of short-wave reception, but an aperiodic H.F. stage enables the same results to be obtained in many cases without any previous short-wave experience.

### C.W. Reception

Many amateurs, too, are interested in receiving C.W. signals, and need some circuit where regeneration may be applied so that such signals may easily be received. The ordinary reaction control will, of course, be quite adequate for this purpose, but a resistance-controlled form of reaction circuit provides better results, especially when an appropriate valve is used. The well-

known method of using an S.G. valve as detector with this form of voltage-control on the screening grid is, of course, very popular. In the circuit now under discussion, the aperiodic H.F. stage is built round an output pentode valve, and this also acts in its normal capacity of an output valve. The second valve is a high-efficiency triode, and it will be noted that a novel form of coupling is introduced

was obtained, the quality was terrible. With battery valves, the Cossor 230 PT was found quite satisfactory in the particular set tried out, and in the mains class the Mazda P.220A was found most suitable. It must be pointed out, however, that two or three hook-ups were made up round this circuit and results were found to vary considerably, and thus each experimenter should be prepared to devote some time to finding a satisfactory combination.

### Component Values

Similarly, certain components were found very critical, especially on the H.F. side, and although one hook-up worked without screening, it is desirable that the two stages should be built on either side of a vertical screen, with the components arranged on each side as indicated by the broken line representing the screen in Fig. 2. It must be pointed out that no exact layout for this receiver can be given (although the skeleton scheme shown in Fig. 3 was found very satisfactory), neither can values be definitely recommended where they are not

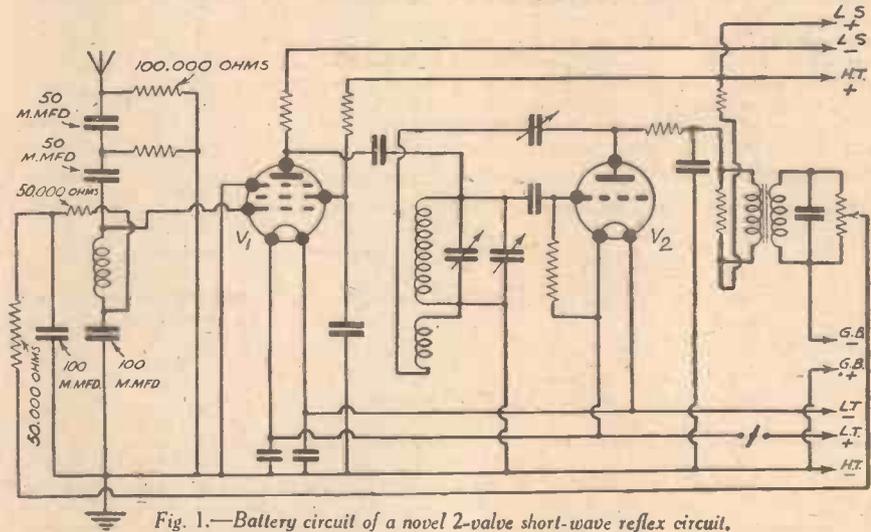


Fig. 1.—Battery circuit of a novel 2-valve short-wave reflex circuit.

between the two valves. In rough tests tried with this circuit it has been found that various triodes will provide good results, but the output valve has been found critical. With some types the set was very unstable, and with others, although stability

given in the diagram. Values which are critical are given, and for the rest some experiment must be carried out. The set which was made to work was tried on various aerials, and, strange to relate, best

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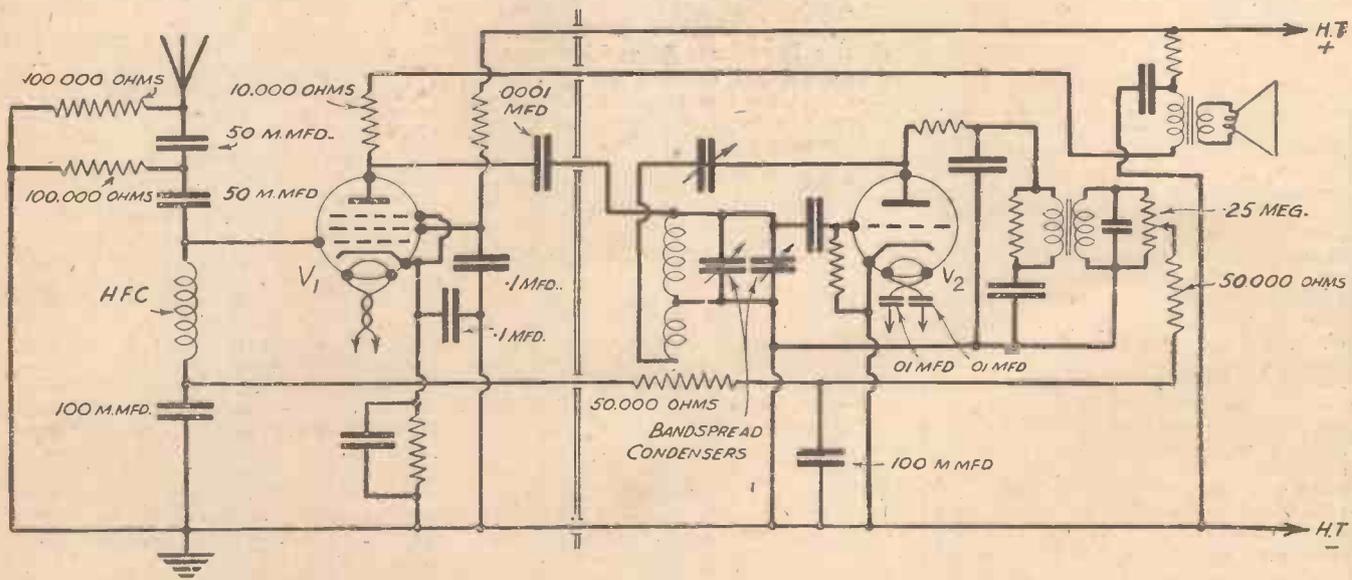


Fig. 2.—A mains version of the reflex circuit, giving principal component values. A suitable layout is given on the next page.

## S.W. SECTION

(Continued from previous page)

results were obtained on a full-length aerial. This was actually the full size H.M.V. all-wave aerial which was tried with it on account of the switching scheme which is incorporated, and which enables a long, medium, and short (5ft.) aerial to be tried in turn. A temporary indoor aerial, fixed round a picture rail was found to be very ineffective, whereas the same amount of wire hung outside the house in a vertical position was productive of very much more noise, but very little gain in signal strength. A plug-in coil was used, and on the amateur bands change-over switching showed that the full-length aerial just mentioned gave loudest signals and freedom from interference, in spite of the fact that the screened down lead was cut out.

## Mains Circuit

The mains version of the receiver should be built as a separate unit, with the mains section in a metal box to avoid pick-up of hum which was found very troublesome, and in this case best results were actually obtained with a well-known commercial mains unit enclosed in a metal box connected to earth and placed nearly 3ft. from the receiver. Little difference was made by the addition of an earth connection, although during tests on one evening, when atmospherics were rather bad, the con-

ditions seemed to be worse with the earth connection. No doubt this may be accounted for by some form of instability which gives a build-up in signal strength and thus provides a greater signal-mush ratio. A plug-in coil wound for the broadcast wavelengths was tried in the receiver, but results were very inferior, and quality was very poor indeed, but it is thought that the circuit is sufficiently novel to warrant the keen short-wave experimenter trying out the arrangement, and we shall be glad to receive from any reader who builds it details of the results obtained.

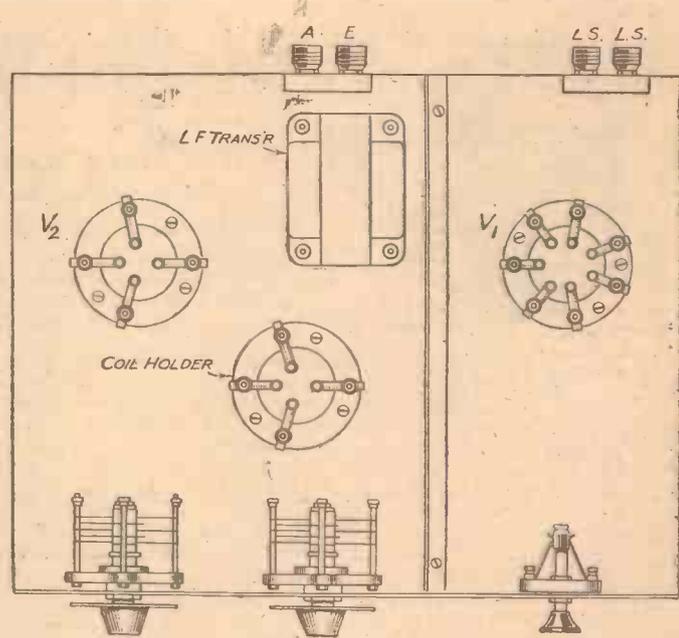


Fig. 3.—General layout for the battery circuit shown on the previous page. A similar scheme may be followed for the mains set, but the power section should be separated.

## Leaves from a Short-wave Log

## Radio Melilla

FURTHER broadcasts of Spanish war news in the English language interspersed with concert items may now be picked up on 46.1 m. (6.507 mc/s) from Melilla (Spanish Morocco). The transmissions are carried out daily (Sundays excepted) between B.S.T. 20.00-23.30. The studio would appear to be at Tetuan to which city all reports of reception should be sent. The news bulletin is issued by the Insurgent party and deals with events now taking place on the Madrid and Bilbao fronts.

## Extra Broadcasts from Brazil

According to French listeners, PPQ, Sepetiba (Rio de Janeiro), has started a regular daily transmission of musical programmes on 25.71 m. (11.67 mc/s) between B.S.T. 01.45-02.15. So far this 5 kilowatt station has been solely used for a radiotelephony service with Europe or for relays to foreign countries; its interval signal, which is frequently heard during the day, consists of 4 notes (oscillating valves), G. B. D. G.

## Another Portuguese Station?

On 41.10 m. (7.296 mc/s), namely at the top of the amateur transmitter's band, listeners report having heard a broadcast at B.S.T. 21.30, with the announcement *Frente Popular portuguesa a Lisboa*. The studio transmits news from various Spanish government sources. No further details have been collected and there is a possibility that this station may have been mistaken for a transmitter, PSUI, at Bar-

celona, working on 41.15 m. (7.29 mc/s), which gives out an English news bulletin every night at B.S.T. 21.50.

## Log a Canadian Newcomer

If you still possess the condenser dial readings of the OER2, Vienna, channel of 49.42 m. (6.07 mc/s), turn to this wavelength between B.S.T. 15.00-16.00 to log a broadcast from CFRX, Toronto, Ontario (Canada). The transmissions have been received in London at good strength, although the plant is stated to be of lower power. The call is: *This is short-wave station CFRX, Ontario, Canada, operating on 6.07 megacycles*. The studio closes down with the playing of *God Save the King*.

## And a Broadcast from Uruguay

The medium waver, CX6, Montevideo (650 kc/s), has now installed a short-wave transmitter for the purpose of relaying its programmes to listeners overseas. CXA4 operates on 48.98 m. (6.125 mc/s) from B.S.T. 14.00-18.00 and again from 20.00-04.00 daily. In addition to the call-letters announced in Spanish you will also be told that it is the *Estacion Oficial de Montevideo*.

## Italian Stations in Ethiopia

The former Abyssinian transmitters at Akaki, near Addis Ababa, have been entirely reconstructed and have been allotted new call-signs, as follows: IUD (formerly ETA), 16.40 m. (18.27 mc/s); IUG, 19.40 m. (15.45 mc/s); IUC (formerly ETB), 25.1 m. (11.955 mc/s); IUB (formerly ETC), 39.35 m. (7.62 mc/s); IUF, 43.30 m. (6.922 mc/s), and IUA (formerly ETG), 50.99 m. (5.88 mc/s). IUF and IUG are completely new installations and with the others have been recently heard carrying out tests with Rome-Torrenova.

## Captured at the Source

The special broadcasts from Paris P.T.T., which are relayed from the United States of America every Wednesday at B.S.T. 22.30, may be picked up direct through WME, Lawrenceville (N.J.), on 20.73 m. (14.47 mc/s) which is used as an aerial link.

## WAVE-CHANGE SWITCHING

(Continued from page 225)

central position all of the contacts are open. Thus, with the connections shown in Fig. 1, medium-wave working is obtained by turning the knob to the left, long-wave by turning it to the right, and the set is switched off by setting the knob to its midway position. This kind of switch can be obtained with a knob having a window behind which a scale can be placed when mounting to show the different settings.

## Multi-circuit Switching

Although it is not proposed to go fully into the question of using a single switch for a multiplicity of purposes other than wave-changing, it should be mentioned that by using the multi-unit rotary pattern, it is an easy matter to provide for switching on the receiver, turning to any one of three wavelength ranges and also for bringing a gramophone pick-up into circuit by using a suitable number of units attached to a common spindle. The simple example given in Fig. 8, will show how it is easily possible to combine a three-band wave-change switching system with an on-off and radio-gram switch. It would be convenient to use one of the S.153 units. Of the two sections, one short-circuits the portions of the tuning coils not required and brings a gramophone pick-up into circuit, and the other switches the set off when none of the wave-ranges is in use and when the pick-up is not required.

It would be an easy matter to elaborate the theme of this article, but even then it would be impossible to deal with every possible variation. It must, therefore, be left to the reader to build up his own switching schemes from the general information supplied.

# Practical Television

May 22nd, 1937 Vol. 3. No. 51.

## Receiving Aerial Design

IN those situations where the reception of the B.B.C. television signals is not a perfectly straightforward matter, many interesting experiments are being undertaken by both set users and manufacturing concerns on the question of modified aerial design. The standard arrangement is a common dipole for both sound and vision whose length is, as a general rule, approximately half the vision wavelength of 6.67 metres. Sometimes this dipole is split at the centre for feeder connection, while in other cases a matching impedance transformer conveys the received energy to the cable passing to the set. On the fringes of the receiving area or in situations close to main road motor-car interference, however, each site has to be treated on its own merits, unless it is possible to erect a very high aerial, which has the double advantage of improving the strength of the received signal and removing the energy collector outside the field of interfering electrical signals. The fitting of reflectors behind the dipole aerial, either one quarter or one eighth of a wavelength away, may be a somewhat more cumbersome structure to accommodate on a mast, but in nearly every case material benefits ensue. These are greatest when the interfering signals come from the opposite direction to the television signals, but even when the former is at right angles

to be met for both equipment and programme material. This is sure to bring about a measure of substantial business for, naturally, it is more economical to establish stations with apparatus which can be seen working under varying conditions than to conduct long periods of research into problems which have already been solved elsewhere. It is known that some orders for equipment have already been placed

with English companies, and the latest to come within this field is Scopphony, Ltd. The Soviet government have purchased samples of their 2ft. and 5ft. receivers which are as yet not available through normal commercial radio channels.

## "Canvas to Cover Us"

PEOPLE who fold up their tents like Arabs, though rather more quickly, will be televised in the afternoon programme on May 26th, when members of the Camping Club of Great Britain and Ireland give a twenty-minute demonstration in Alexandra Park. Viewers will first see an over-night camp set up by two cyclists; then a motorist's camp, with trailer caravan, will be shown; and finally a pedestrian will demonstrate just how incredibly light modern camping equipment can be.

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**EVERYTHING RADIO—CASH C.O.D. or EASY TERMS**

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### BELMONT ALL-WAVE 6-valve ALL-MAINS SUPERHET

LIST PRICE £10:17:6 Allowance on Your Old Set £3:13:6 **YOU PAY ONLY £7:4:0**

Amazing world-wide reception—America, Australia, Africa—with wonderful tone, adequate volume, outstanding sensitivity and selectivity, even on a short aerial with this amazing receiver! Secure yours to-day.

\* 18.5—50, 190—560, 930—2,100 metres. \* Illuminated station named wide vision dial. \* Latest 6-valve All-wave Superhet circuit comprising Variable Mu Frequency Changer, Variable Mu I.F. Amplifier, Double-diode triode output pentode, rectifier and clorostat mains stabiliser valves. \* Separate tone and volume controls. \* Automatic volume control. \* Large Field Energised moving-coil speaker. \* Simple to tune. \* Pleasing modern cabinet with walnut veneers. 15 1/2 in. high; 12 1/2 in. wide; 7 1/2 in. deep. \* For A.C. or D.C. Mains 100-260 volts. \* FULLY GUARANTEED. \* Tested before dispatch. \* 7/6 down secures, balance in 18 monthly payments of 8/6.



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It's cheaper to buy from Peto-Scott! Dealing direct with you, Peto-Scott are able to offer a remarkable range of Broadcast and All-Wave Receivers at sensationally low prices and on the easiest terms. Below are two typical examples of wonderful value from the Peto-Scott range of Reliable Receivers.

### Peto-Scott S.G. BATTERY 3



Waverange 200-2,100 metres. Concert-Grand Moving-coil Speaker. New-type No-trouble Switch. Complete with Valves, less Battery and Accumulator. MODEL 7021 will bring you British and Foreign programmes with remarkable fidelity and volume. 3 British Valves of guaranteed life: new screened-grid high-frequency, high-efficiency detector, and Pentode output. Latest improved components. Steel Chassis.

Slow-motion tuning. Illuminated wavelength scale. Beautiful walnut-veneered cabinet. 19 1/2" high, 14" wide, 10" deep. Cash or C.O.D. £4:4:0 or 5/- down and 18 monthly payments of 5/-. Console Model 7021A, less batteries, 25:6:0.

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14-31, 98-62, 200-550, 900-2,100 metres. Variable Mu H.F. Pentode, High Efficiency Detector, Harries Distortionless Output Pentode Valves. Double-Ratio 8 to 1 and 100 to 1 Slow-Motion Drive. Air-plane Colour-Coded Dial. Beautiful Walnut-Veneered Cabinet illustrated. MODEL 7034.—This magnificent Peto-Scott all-wave technical triumph will bring you stations galore from every part of the world. Screened coils. "Tone-compensated" moving-coil speaker. Provision for external speaker with 3 British valves and cabinet. Complete on 8/6 batteries. Cash or C.O.D. £7:15:0 or 8/6 down and 18 monthly payments of 9/8.

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MODEL 375. Amazing reproduction provided by new magnet and exponential moulded cone. Microtone matching device. Cash or C.O.D. Carr. Paid £22/0, or 2/6 down and 11 monthly payments of 4/-. MODEL 377. Perfectly matches any receiver as principal or extra speaker. Cash or C.O.D. Carr. Paid £12/6, or 2/6 down and 11 monthly payments of 3/-. MODEL 378. A cabinet instrument giving superb reproduction, with power handling capacity of up to 5 watts undistorted. The turn of a switch adjusts it to match any set made. With volume control. Cash or C.O.D. Carr. Paid £3:3:0, or 5/- down and 11 monthly payments of 5/8.

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 ESTD. 1919.

## SPADEWORK

Mr. C. H. Middleton, the gardening expert, will practise what he preaches on May 22nd when he devotes his afternoon television talk to "Spadework," with the first demonstration in the new television garden in Alexandra Park. It is hoped that by May 22nd the garden will already show signs of cultivation. It will have been flattened, fenced and trenched and probably there will be a little path so that Mr. Middleton can reach the various beds without treading down the new seedlings.

If the weather is kind, the garden will be televised twice a month, and it is hoped that viewers will take an interest in its progress.

to the latter at least a twofold improvement in signal to "noise" ratio is observed. Where a simple reflector fails to produce the desired effect an array can be tried, and according to reports, especially from abroad, really remarkable distances can be covered as long as the contour of the intervening country is of such a nature that high hills do not produce screening effects.

## Interest from Abroad

THOSE foreign countries who are investigating the possibilities of establishing their own high-definition television services are taking advantage of the work now being undertaken in this country by sending parties of engineers and executives here to investigate the nature of the service, difficulties involved, and also form a more concrete idea of the costs which have

## A New 40-Page Booklet—Free



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## RADIO CLUBS AND SOCIETIES

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

### Darenth Valley Radio Club

THIS club has been formed in Dartford, Kent, and those sufficiently interested should apply for an application form and particulars to the Hon. Sec., K. N. Hollands, 14, Highfield Cottages, Wilmington, Dartford, Kent.

### The Portsmouth and District Wireless and Television Society

THERE was a good attendance at the meeting held by the above society at 1a, Hudson Road, when Mr. Cholot, of Lissen Ltd., gave a demonstration of short-wave receivers, components and transmitters. The advantages of dipole aerials for short-wave work were explained, and a novel coil unit which would tune in as low as the television broadcasts from Alexandra Palace and as high as the trawlers on 110 metres was put on test.

By means of lantern slides, diagrams were shown for building up efficient short-wave sets. At the close of the meeting thanks were given to Mr. Cholot, and to Mr. Verry, of the Portsmouth Ciné Club, for lending and operating the lantern.—Harold Leigh, Chairman, 20, King Street, Southsea.

### Radio Society of Northern Ireland: Leonard Trophy Contest

OPEN to all transmitting stations in Ireland, EI and GI, and the rest of the world.

#### DATES OF CONTEST

May 14th, May 16th, May 21st, May 23rd, May 28th, and May 30th, 1937.

#### RULES :

The contest is open to all licensed transmitting stations. Licensed power must be used.

Only one operator allowed at each station; if more than one operator, each operator's score counts separately.

All stations must exchange R.S.T. reports to count for points.

Stations may be worked once only during contest.

All licensed frequencies may be used.

#### METHOD OF SCORING

1 (one) Point for European contacts.

2 (two) Points for African contacts (above Equator).

3 (three) Points for African contacts (below Equator).

3 (three) Points for North American contacts.

4 (four) Points for South American contacts.

4 (four) Points for Oceania contacts.

#### IRISH STATIONS

Score to be multiplied by the number of countries worked.

Districts of America W1 to 9, and Canada VE1 to 5, count as separate countries.

#### AWARDS

For the leading Irish station the Leonard Trophy will be awarded for one year (replica also). For the leading station outside Ireland a Gold Medal. For the second station outside Ireland a Silver Medal. All entries must reach the Hon. Secretary, R.S.N.I, F. A. Robb (GI6TK), 45, Victoria Avenue, Sydenham, Belfast, N. Ireland, not later than July 31st, 1937.

### Southall Radio Society

A DIRECTION-FINDING contest, organised by the above society, has been arranged to take place on Sunday, June 20th. Teams of three from any amateur radio society may enter in competition for the handsome trophy, which will be held for one year. Awards will also be made to the individual members of the teams.

Mr. Douglas Walters, G5CV, will operate the transmitter on a 7 mc/s frequency. Experiments by members have shown that the use of this band is quite practicable for D.F. work, although other views have been expressed.

A copy of the rules can be obtained from Mr. H. F. Reeve, 26, Green Drive, Southall.

### Newcastle Radio Society

THIS newly formed club holds meetings on Sundays, 6 to 9.30 p.m., and Thursdays, 7 to 10 p.m., at their temporary quarters, 10, Henry Street, Gosforth, Newcastle-on-Tyne. The club has decided to make a drive for more members. Various schemes were discussed at the fourth meeting on April 29th, one of which is to ask dealers to display on their counters a notice of the forming of this club. In the meantime, funds are being collected by a weekly subscription of 6d. per member, which, with an entrance fee of 1s., will enable the club to obtain the necessary gear when it is decided to have new clubrooms. At previous meetings, the forming of rules, discussions on sets and testing apparatus have afforded enjoyable evenings. Readers may be interested to know that another radio club is shortly to be organised in Gateshead district by Geoffrey Wilkins, 4, Ravensdale Crescent, Low Fell, Gateshead-on-Tyne. The Newcastle Radio Society welcome anyone interested, and a card to the Hon. Sec., G. C. Castle, 10, Henry Street, Gosforth, Newcastle-on-Tyne, 3, will bring a prompt reply.

### Proposed Club for the Potteries

A FEW enthusiasts in the Stoke-on-Trent area are anxious to form a Radio and Experimental Club, and interested readers in the locality are invited to get in touch with Mr. H. Churton, 26, Victoria Street, Smallthorne, Stoke-on-Trent, Staffs.

### A Radio Club for Redhill

READERS residing in Redhill and district, and who are interested in the formation of a radio club, are invited to write for particulars to Mr. H. Cartwright, Radio House, Victoria Road, Horley, Surrey.

### Dollis Hill Radio Communication Society

AT a recent meeting of this society, held at the Braint-Croft School, an interesting lecture on aerials was given by Mr. C. J. Search. Anyone interested in short-wave work would be welcomed as a member. Further particulars of the society can be obtained from the Hon. Secretary, J. R. Hodgkyns, 102, Crest Road, Cricklewood, London, N.W.2.

## LATHE-WORK FOR AMATEURS

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# BRITISH LONG DISTANCE LISTENERS' CLUB

## Directional Aerial Systems

IN a recent issue we gave some details of the results obtained when a directional aerial was used and asked whether members could let us have reports of their experience. Mr. A. W. Mann, whose articles are familiar to readers in these pages, and who is the inventor and patentee of a novel form of directional aerial, has sent the following details, which will be found of great interest amongst long-distance listeners and amateur transmitters.

"I read with interest the paragraph headed 'Directional Aerials' in January 23rd issue of PRACTICAL AND AMATEUR WIRELESS under B.L.D.L.C. and note that members were asked to report their experiences with directional aerials. As my own patented system was mentioned, a few observations and experiences may be of interest. I am convinced that the advantages of directional S.W. reception are not as fully appreciated as they should and undoubtedly will be in the future. My experiments in this sphere cover a period of over three years, using various types of receiving apparatus in conjunction with Variable Directional Aerials, and I have become convinced that unsatisfactory S.W. reception with good receiving apparatus is in many instances not entirely due to unsuitable locations, but to unsuitable aerial systems.

"One of my receivers is a powerful loudspeaker job of high sensitivity, and in addition I have the O-v-2 which I described in the Short-Wave Section some years ago. I also have various experimental outfits which in the usual way have at least a twelve months test life before being dismantled. The usual precautions are taken to ensure that selectivity and volume are all that may reasonably be expected, after which, time and attention is paid to increasing sensitivity. There is, however, a limit depending on and defined by the type of circuit and layout used, but by attention to aerial requirements further improvement is obtainable, i.e., further gain in sensitivity and volume.

## Interference

"A recent paragraph in PRACTICAL AND AMATEUR WIRELESS pointed out that interference due to an oscillating receiver used with a beam aerial on 5 metres had been traced in the U.S.A. This is quite possible on the S.W. bands also. I found two years ago that after a transmission on any S.W. band had been tuned in and the receiver functioning at maximum sensitivity with aerial offset directionally, i.e., out of true directional phase, it was possible by readjustment of aerial to spill over and put a regenerative receiver into oscillation, due to increased sensitivity obtained at true directional setting.

"I have always advised that a set be tuned very slightly below maximum sensitivity, aerial adjusted, and set slightly returned to maximum sensitivity, thus enabling exactly the same amount of gain to be obtained without radiated interference. Further experiments carried out with an AC TRF receiver, non-A.V.C., and a modulated oscillator and output meter, made matters clear. It was found that using 27 volts on plate of oscillator set at a distance of 100yds., a 25 per cent. gain was obtainable by directional adjustment. On an unmodulated signal, a gradual

change in pitch was obtainable, according to the degree of offsetting directionally.

## Proof of Efficiency

"On actual transmissions, especially VK2ME, who on his present wave has rarely been as good as desired at this location using standard aerials, a noticeable gain of 2½ to 3R strength has been obtained at intervals during average receiving conditions, whilst other listeners in the immediate neighbourhood with whom I am in contact have never heard 2ME. With regard to powerful Europeans such as DJA, PCJ, EAQ, 2RO, ORK, LKJI on the 29-31 metres bands, I found that, due to swamp signals and heavy modulation, an accurate aerial setting was difficult to define. After careful observation it was noticeable that modulation effects were deeper. In fact, by revolving the aerial, speech could be made quite woofy, as pro-

duced by over modulation. This impresses me in one particular way. For example, accurately to measure modulation percentage or give a definite idea is, under average circumstances, very difficult and certainly but a compromise. Does the aerial system used at the receiving end, together with its directional properties, play a part? If so, I personally have never read anything concerning it. From my own experiments it appears to do so; in fact, with this system it does so definitely.

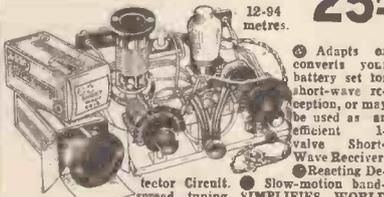
"Relative to observations on directional effects taking all bands in turn (49m. and 31m.), it is found that S.W. phenomena as might be expected play a part. During one night we find it possible to obtain strong directional signal increases on all receivable Europeans out of all proportion to expectations, including Moscow, Zeesen group, Denmark, etc. Twenty-four hours later shows a definite reverse.

## MORE SHORT WAVE BARGAINS!

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Adaptor-Converter-Receiver

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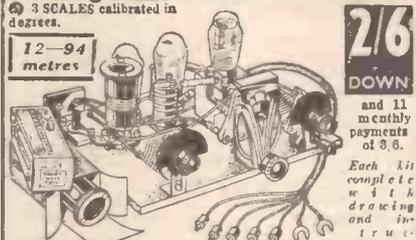
The N.T.S. "3-in-1" Short-Wave Kit is entirely unique in short-wave technique. This amazing combined Adaptor-Converter-Receiver is offered you for the first time... at an astonishingly low price. KIT "1" comprises every part for assembly, including 3 4-pin coils, wiring and assembly instructions, less valve only. Cash or C.O.D. Carr. Pd. 2/6. Kit "2" with British valve, £1/8/9, or 2/8 down and 11 monthly payments 2/8.

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Det. and 2 L.F. Resistance and Transformer Pentode Output Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Efficient reaction condenser. Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 SCALES calibrated in degrees.

Each kit complete with drawing and instructions.

\* Send for Free Booklet describing above and 3 other amazing N.T.S. Bargain Short-Wave Kits \*

### 6-valve ALL-WAVE ALL-MAINS SUPERHET CHASSIS

With Valves and Field-Energised Speaker LIST PRICE £10:17:6



WONDERFUL WORLD-WIDE RECEPTION: 18.5-50, 190-500, 930-2,100 metres. Illuminated station named wide vision dial. Latest 6-valve All-wave Superhet circuit, comprising Variable-Mu Frequency Changer, Variable-Mu I.F. Amplifier, Double Diode Triode, Output Pentode, half-wave rectifier and Clorostat mains stabiliser valves. Separate tone and volume controls. Automatic volume control. Simple to tune. Complete with 6 valves, Field-energised moving-coil speaker, all knobs, leads and plug. Ready to play. For A.C. or D.C. Mains 100-280 volts. Ready for instant world-wide reception—America, Australia, Africa—with wonderful purity of tone, splendid volume, outstanding sensitivity and selectivity... stations simply roll in. Send your order for this amazing All-waver to-day. Overall size: 7" high; 10½" wide; 6" deep.

**OUR PRICE**

**£6:19:6**

Or Yours for

**7/6**

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and 18 monthly payments of 8/8

### B.T.S. SHORT-ADAPTOR WAVE

LIST PRICE £2:12:6 BARGAIN **39/6**



Brand New and Ready for Instant Use. Nothing to Assemble

America Direct on your Present Receiver! This amazing unit simply plugs into your battery or A.C. Mains set. No alterations necessary. 100-1 ratio aerial tuning and slow-motion reaction: for use either as Plug-in or Superhet Adaptor. Walnut finished Cabinet (illustrated). With 2 plug-in coils, 12-26, 22-47 metres. Ready assembled. Yours for 2/8 down and 10 monthly payments of 4/-.

### CLASS "B" 4 RECEIVER

with Valves, Speaker, Cabinet and Batteries—ready to play.

LIST PRICE £8:18:6 BARGAIN **£4:19:6**



4 BRITISH VALVES of guaranteed life. Single knob tuning. Circular Airplane Dial. Amazing performance rivaling that of powerful all-mains models. Wide choice of foreign stations. Moving-coil Speaker. Slow-motion tuning, bronzed escutcheon. New type switch. Waverance 200 2,100 metres. Oldman Long-life 120-volt H.T. and 2-volt L.T. Accumulator and G.E. Batteries. Output 1½ watts at 120 volts. Walnut Veneered Cabinet illustrated. Absolutely complete, ready to play. Yours for 5/- down and 12 monthly payments of 8/9.

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0-30	"
0-120	"
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0-6	volts.
0-12	"
0-120	"
0-240	"
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	ohms
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**HEADPHONES**, with cords, 2,000 and 4,000 ohms, 4/6. Single high res. earpieces, 2/6. Sullivan 120 ohms, 2/9.

**WHY NOT LEARN MORSE?** Cheap home learner's set, complete with battery and buzzer, on walnut base, 4/6. Large range of Keys, Buzzers, Sounders and Recorders.

**X-RAY TUBES.** As illus. previous issues. Brand-new W.O. Hospital Surplus, 7" dia. bulb, big tungsten electrodes. Full emission. Cost £5. Sale 10/-. Packing, 2/6.

**PHOTO CELLS.** R.C.A. UX867. Talkie model, 25/-; few Osram C.M.G., 35/-. Selenium Cells, 5/-, 7/6 & 10/-. Raycraft, 21/-. Photonic self-gen. cells, 25/-. **ALL-WAVE CRYSTAL SETS** for plug-in coils, 2 tuning condensers, semi-perm. Detector, 5/6. Why bother to make one when cheaper to buy ours?

**BELL PUSHES** in porcelain and brass. Big Stock, all types, from 6d. English Bells, 2/-. This **BATTERY SUPERSEDER** provides H.T. from your L.T. 2-volt battery, rectified and smoothed. 3 tappings. A boon to those who are not on the mains. Reduced from £3 15s. New and Guaranteed, 37/6.

**SPARK COILS.**—1 in., 1 in. and 1 in. gap, with condensers, 10/6. Short wave spark transmitters for boat model control, 17/-. **SPRINKERS and MIKES** cheap.

*"Radio Electrical" Scientific Illus. List "N." Free.*

## ELECTRADIX RADIOS

218, Upper Thames Street, London, E.C.4.  
*Phone: Central 4611.*

When writing to Advertisers please mention "Practical and Amateur Wireless"

# Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

### Hunt Analyser Price Increase

THE Capacitor Analyser produced by Messrs. A. H. Hunt, Ltd., has now been increased to 11 guineas. This increase is due in part to the rising price of raw materials, and to the fact that the makers have now introduced some slight improvements to the unit which is now supplied with a special jig enabling more accurate readings to be obtained when low-capacity condensers with short wire end leads are being tested.

### Mazda Valve Changes

ONE or two changes in design are announced by the Ediswan Company in respect of the NU2 rectifier and the model 10H cathode-ray tube. In the former component the filament rating has been increased from 1 to 2.4 amps. with the same voltage rating, namely, 2. The cathode-ray tube heater is now rated at 1.5 instead of 1 volt, and the maximum anode voltage has been raised to 6,000 volts.

### Grampian M.C. Microphone

A NEW moving-coil microphone produced by Grampian Reproducers has several novel features. Its high sensitivity renders it unnecessary to use a pre-amplifier with this particular model, and a very light cone with a self-supporting speech coil is incorporated. A special nickel-aluminium magnet with high flux density is employed, and the output impedance is of the order of 20 ohms. The entire assembly is weatherproof, and it is possible to use long unscreened leads without serious loss. The price is 6 guineas.

### Runbaken Arc Solderer

A NOVEL soldering device is shortly to be introduced by the Runbaken Electrical Company, and it consists in effect of a miniature spot welding machine. Two models will be obtainable, one designed for use from a 6- or 12-volt accumulator, and the other for mains operation. A special carbon electrode is employed and no current flows until actual work commences. In effect, the device forms one pole of a miniature arc source and a wire is attached to the work which then becomes the other pole, and when the soldering point is brought within a short distance a discharge takes place and the intensity is such that fine solder may be melted and a satisfactory joint made. It is also possible to use this device for brazing and welding. The battery model costs 12s. 6d., and a special mains model is available at 50s. Further details may be obtained on application to the makers at 280, Deansgate, Manchester, 3.

### Johnson "Q" Aerial

THE accompanying illustration shows a special aerial designed primarily for the use of transmitters. It consists of a special quarter-wave tube transformer, accurately matched to the feeder and aerial impedance and thus provides the maximum transfer of power without losses, even when a long feeder is employed. Owing to the special form of construction and the high efficiency which is obtained, the radiation is increased to nearly double. It is available for 10-metre and for 20-metre operation, and the price is 26s. 6d. and 39s. 6d., respectively. Full instructions and other relative data are supplied with each one. The address of the suppliers is Raymart Manufacturing Co., 44, Holloway Head, Birmingham 1.

### Change of Address

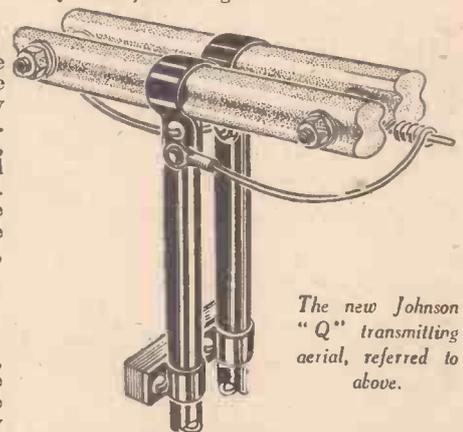
WE are informed that L. Ormond Sparks, the Constructor's Consultant, has changed his address and all communications should in future be sent to 196, Coombe Lane, West Wimbledon, S.W.20.

### The Wayfarer Portable

ARRANGEMENTS have been made for the range of Wayfarer portable receivers to be manufactured in future by Gambrell Radio Communications, Ltd. There are now only two models available, the Major and the Grand, the Junior and Senior models having been discontinued. All communications relating to these receivers should, therefore, be sent to the Gambrell company at Broomhill Road, Wandsworth, S.W.18.

### "Simplat" Recording

THE V.G. Manufacturing Co., Ltd., have now issued their new catalogue and instructional booklet relating to the Simplat method of recording, and this may be obtained, price 6d., from the company at Gorst Road, Park Royal, N.W.10. There are six chapters devoted to the details of recording by this system, and instructions are given for making and playing back the Simplat discs, together with a chapter on the reasons for unsatisfactory results.



The new Johnson "Q" transmitting aerial, referred to above.

**NEWNES' TELEVISION AND SHORTWAVE HANDBOOK**

By F. J. CAMM

3/6, or 4/- post free 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).

## Our Free Service

SIR,—I sent an enquiry a short time ago regarding the reproduction of my set, and received from you a letter suggesting modifications. I have carried out those suggestions, and am very pleased with the results.

I must now take the opportunity of thanking you most sincerely, and must admit that constructors (myself included) are inclined to take that unique free service of yours as granted, but nevertheless you are to be congratulated on the way in which these queries are answered with 100 per cent. correctness that has made your paper famous among the constructing public. Wishing your excellent paper the success it deserves.—C. J. ROBINSON (Leighton Buzzard).

## Advanced Radio Theory

SIR,—With reference to Mr. A. M. Wilding's letter in PRACTICAL AND AMATEUR WIRELESS, dated May 8th, I think his suggestion is an excellent one.

The journal always has an article for beginners, and a page or so of advanced work, data, formulae, etc., would surely be welcomed by those who would like to go more deeply into this interesting hobby.

I should think you would find that members of go-ahead radio clubs, constructors who like to design their own circuits, and service men would be amongst those who would turn to such articles with pleasure. The journal then could really be said to cater for all.—B. A. F. CHALMERS (Chelsea).

[We have received a number of letters on this subject and are giving the matter our careful consideration.—Ed.]

## "Local Station Quality Sets"

SIR,—Having read the article "Local Station Quality Sets" in your issue dated May 1st, I feel that I must point out a few questionable statements contained therein.

First, your contributor states that for quality reception in the home, 6 watts undistorted A.C. output is necessary. He does not state definitely the loudspeaker into which this output is to be fed.

With any modern loudspeaker this output is unnecessary, although it is certainly useful to have power in hand. The disadvantages of a large output stage are the output transformer and power pack, which must, as your contributor states, be very generously designed.

The Western Electric High Fidelity Cinema equipment designed for medium-sized provincial cinemas gives a maximum undistorted output of some 2½ watts, feeding 3 large highly-sensitive horn speakers. The effect on loud passages is overpowering; and the quality is very much above the average.

Using two "Magnavox" "66" loudspeakers, with an input of about 4 watts

max., the writer has obtained very passable results in a hall containing 500 people.

Your contributor states that the "tone" of the announcer's voice appears to be different at different volume levels. This should not occur with a compensated volume control, and a good loudspeaker mounted on an adequately thick baffle.

It is stated that a quality receiver must have a flat response between 30 and 15,000 c.p.s. Since the B.B.C. only transmit frequencies between 50 and 9,000 c.p.s., this range seems somewhat unnecessary in this country.

Your contributor advocates the use of intervalve transformer coupling. A transformer having a flat response between 50 and 9,000 cycles is a very expensive item; even if it were obtainable, it would have to be parallel-fed, for a transformer having a sufficiently large core to preserve a level output at 50 c.p.s. would have too large a self-capacity to preserve the same output at 9,000 c.p.s. It seems to have been generally recognised by such eminent quality experts as Messrs. Voigt, Hartley-Turner and Sound Sales, that for home quality use the "paraphase" circuit is the best.

Your contributor recommends leaky-grid rectification. This has definitely been proved to introduce distortion. The modern tendency in quality designs is to use a straight circuit with one or more R.F. stages, a diode detector, and correction in the audio stages for the top attenuation.—R. F. HILL (Alton, Hants).

CUT THIS OUT EACH WEEK.

## Do you know

—THAT when trying a mains unit on a receiver designed for battery use, instability is often experienced.

—THAT this is generally found to be due to the fact that two anode circuits are joined to a common point.

—THAT the remedy in such a case is to decouple one of them.

—THAT when using a D.C. mains unit it is often desirable to connect fixed condensers in both aerial and earth leads.

—THAT the response of a loudspeaker will be modified if the diaphragm is changed or modified in any way.

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 Neveles, 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.



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# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		
	Date of Issue.	No. of Blueprint.
<b>CRYSTAL SETS</b>		
Blueprint, 6d.		
1937 Crystal Receiver	0.1.37	PW71
<b>STRAIGHT SETS. Battery Operated.</b>		
One-valve: Blueprint, 1s.		
All-wave Unipen (Pentode)		PW31A
Two-valve: Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW30B
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, 2LF (RC & Trans))		PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF, Pen, D (Pen), Pen)	22.9.34	PW30
Hall-Mark Three (SG, D, Pow)		PW41
Hall-Mark Cadet (D, LF, Pen (RC))	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))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))		PW55
The Monitor (HF Pen, D, Pen)		PW61
The Tutor Three (HF Pen, D, Pen)	21.3.30	PW62
The Centaur Three (SG, D, P)		PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.30	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.30	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.30	PW72
<b>Four-valve: Blueprints, 1s. each.</b>		
Sonotone Four (SG, D, L.F, 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 "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.30	PW67
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)		PW18
A.C.-D.C. Two (SG, Pow)		PW31
Selectone A.C. Radiogram Two (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)	7.4.34	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)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)		PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.30	PW70
<b>Four-valve: Blueprints, 1s. each.</b>		
A.C. Fury Four (SG, SG, D, Pen)		PW20
A.C. Fury Four Super (SG, SG, D, Pen)		PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)		PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
<b>SUPERHETS.</b>		
Battery Sets: Blueprints, 1s. each.		
£5 Superhet (Three-valve)		PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet		PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
<b>Mains Sets: Blueprints, 1s. each.</b>		
A.C. £5 Superhet (Three-valver)		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		PW59
F. J. Camm's Universal £4 Superhet 4		PW60
"Qualitone" Universal Four	10.1.37	PW73
<b>SHORT-WAVE SETS.</b>		
Two-valve: Blueprint, 1s.		
Midget Short-wave Two (D, Pen)		PW38A

Three-valve: Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)		PW30A
The Prefect 3 (D, 2 LF (RC and Trans))		PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.30	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
<b>PORTABLES.</b>		
Three-valve: Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	16.5.30	PW65
Four-valve: Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
<b>MISCELLANEOUS.</b>		
S.W. Converter-Adapter (1 valve)		PW48A
<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.</b>		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.30	AW427
1934 Crystal Set		AW444
150-mile Crystal Set		AW450
<b>STRAIGHT SETS. Battery Operated.</b>		
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
B.B.C. National Two with Lucerne Coil (D, Trans)		AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)		AW388A
Lucerne Minor (D, Pen)		AW426
A Modern Two-valver		WM409
Three-valve: Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)		AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW304
Home-built Coil Three (SG, D, Trans)		AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)		AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)		AW419
Lucerne Ranger (SG, D, Trans)		AW422
Coscor Melody Maker with Lucerne Coils		AW423
Mullard Master Three with Lucerne Coils		AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	10.5.34	AW435
Lucerne Straight Three (D, RC, Trans)		AW437
All-Britain Three (HF Pen, D, Pen)		AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)		WM271
£6 6s. Radiogram (D, RC, Trans)		WM318
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
Iron-core Band-pass Three (SG, D, QP 21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)		WM371
PTP Three (Pen, D, Pen)	June '35	WM398
Certainty Three (SG, D, Pen)		WM398
Minute Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM400
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
65s. Four (SG, D, RC, Trans)		AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen)		AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
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, 2LF)		WM381
The H.K. Four (SG, SG, D, Pen)	Mar. '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	April '36	WM404
<b>Five-valve: Blueprints, 1s. 6d. each.</b>		
Super-quality Five (2HF, D, RC, Trans)	May '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	Dec. '33	WM344
New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.		AW403
Economy A.C. Two (D, Trans) A.C.		WM280
Unicorn A.C.-D.C. Two (D, Pen)		WM394

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. " "

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

Three-valve: Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.		AW383
S.G. Three (SG, D, Pen) A.C.		AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.		WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386
<b>SUPERHETS.</b>		
Battery Sets: Blueprints, 1s. 6d. each.		
Modern Super Senior		WM375
Varsity Four	Oct. '35	WM395
The Request All-Waver	June '36	WM407
1935 Super Five Battery (Superhet)		WM370
<b>Mains Sets: Blueprints, 1s. 6d. each.</b>		
1934 A.C. Century Super A.C.		AW425
Heptode Super Three A.C.	May '34	WM355
"W.M." Radiogram Super A.C.		WM366
1935 A.C. Stenode.	Apr. '35	WM385
<b>PORTABLES.</b>		
Four-valve: Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)		WM307
<b>SHORT-WAVE SETS—Battery Operated.</b>		
One-valve: Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)		AW329
S.W. One-valver for America	23.1.37	AW429
Rome Short-Waver		AW452
Two-valve: Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)		AW440
Three-valve: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)		AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	Jan. 10, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
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.		WM397
Simplified Short-waver Super	Nov. '35	WM397
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.		AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.		WM368
"W.M." Long-wave Converter		WM380
Three-valve: 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
<b>MISCELLANEOUS.</b>		
Enthusiast's Power Amplifier (1/6)	June '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)		WM392
Radio Unit (2v.) for WM392	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram (1/-)	Mar. '36	WM403
New Style Short-Waver Adapter (1/-)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter (1/-)	Dec. 1, '34	AW456
Superhet Converter (1/-)	Dec. 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	May '36	WM405
Wilson Tone Master (1/-)	June '36	WM406
The W.M.A.C. Short-Wave Converter (1/-)		WM408



# QUERIES and ENQUIRIES

## Telsen W.349 Coils

"I have a Telsen iron-core coil type W.349 but, unfortunately, I have no connecting details. I have tested the windings and find that terminals 1, 2, 3 and 4 are connected internally, and that terminals 5 and 6 are connected together. Is this right? I should like to know the external connections for the coil, or if you have no details, where I could obtain them."—A. D. (Stoke Poges).

YOU have presumably made a test with 'phones (or meter) and battery in series and have merely found that the terminals referred to are inter-connected. Your test has not therefore indicated the resistances between the points and has thus not enabled you to identify the type of winding which is connected to these points. The grid winding is joined between terminals 1 and 3, an ordinary on-off switch being externally connected between terminals 2 and 3 for wave-change purposes. Terminal 1 is the grid end of the coil. Terminals 6 and 5 are joined to the primary winding, used in the aerial circuit or in the anode circuit if the coil is used as an H.F. transformer, and terminal 5 is joined to earth or H.T. positive. Terminal 4 is the reaction winding, the other end of which is joined to the earthed end of the grid winding inside the coil, and thus the reaction condenser must be joined between the anode and terminal 4. We used two of these coils in the A.C. Three receiver described in our issue dated September 9th, 1933, Blueprint PW.29.

## Charger Difficulty

"Reading in your query service recently I saw some details for a tantalum charger. I obtained the tantalum and lead and placed them in a jar of acid as described, but I found that the cell does not rectify the A.C. to D.C. Could you please tell me where I have gone wrong, or have omitted anything?"—W. C. (W'ton).

THE sketch which you send with your letter shows that the arrangement is correctly fitted up and nothing wrong can be identified from this. We think that you have probably overlooked the fact that by utilising a single cell in this manner you are only employing half-wave rectification, and thus the output will consist of a pulsating D.C. supply. If a sensitive type of meter is employed to measure the output, therefore, the needle will kick, giving the effect of an A.C. supply applied to it. A moving-iron type of meter, however, would give a more or less steady reading. To obtain complete rectification you must use more cells, preferably four arranged in a bridge circuit. A diagram and details for this will be found in our handbook on Accumulators.

## Directional Reception

"I have made up the sound section of my television equipment, and have just finished erecting a dipole aerial. This is made on the lines recently given in your paper, but

I have met a rather peculiar effect. When I put the aerial up I did not make the fixing very secure, and although vertical when I left it, I found when I looked at it after

listening for some time, that it had swung round. I had not noticed any alteration in volume so I tried the effect of having the aerial turned whilst I listened to the signals and I found it could be at right angles without any ill-effect. I should like to know how this can be explained, as I understood that transmitting aerials were polarised in a vertical direction."—G. R. E. (Finchley, N.).

ALTHOUGH it is true that the aerial is polarised, it has been found that the horizontal component is not completely removed. Thus, within a fairly wide range of the transmitter it is possible to rotate the aerial without ill-effect. We have, in fact, during experimental work found that this may be used as quite a good volume control where a very sensitive receiver is

### 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.

Please note also, that queries must be limited to two per reader, and 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 different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. 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.

being used in some parts of London, and as the distance increases so the effect of moving the aerial becomes more noticeable. At these offices the aerial can be arranged at right angles and a good signal still obtained with our test receiver.

## Replacing Condenser

"I have a mains set which has developed a fault that I have now identified as being due to a fractured electrolytic smoothing condenser on the H.T. side. This is a small waxed cardboard box with three leads coming from it, two red and one black, and the wax has run and I have tested the H.T. and find none there. I am going to replace the condenser but am not certain which lead is which, and as I want to use a wet electrolytic condenser in place of these cardboard items I should like to know how to identify the leads."—G. Y. I. (Manchester).

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THE condenser block obviously consists of two condensers, and these are joined together inside the casing with a single lead from the two negative poles. This lead is the black one. The positive side of each condenser is provided with a red lead. Therefore, when replacing this unit by two ordinary electrolytics they should be mounted so that the case of each is in contact with the chassis (or the H.T.—line) and the centre terminal points on the condensers should be joined to the point to which the red leads are now connected.

## Metal Rectifier Temperature

"I have built a small mains set in which I am using an H.T. metal rectifier. I am running this right at its limit I know, but I do not think I am exceeding it. The trouble is that it seems to get much too hot and I am afraid of damaging it. The receiver is very similar to your A.C. Hall-Mark, and is built practically identical except for the valve types and some component values."—F. R. (Newcastle).

THE rectifier will get fairly warm if run to the limit, although it should not be too hot to touch. There is a possibility that you are using a defective by-pass or smoothing condenser which is putting an undue load upon the rectifier, or it is so arranged on the chassis that adequate ventilation does not take place. If you have the component screwed direct on the chassis, it may be found worth while to mount it on two strips of wood so that it stands up clear of the surface of the chassis and this will provide better ventilation. You should, however, take steps first to measure the total current of the receiver and make quite certain that the unit is not being overloaded.

## Reaction Control

"The receiver I am using employs an S.G. valve in the detector stage and I control reaction by means of a volume control component connected between H.T. positive and negative, with the arm joined to the screening grid. This is a 100,000 ohm potentiometer, and I find it very difficult to get smooth control. I have tried different condensers from the arm of the control to earth, but nothing seems to enable me to go into smooth oscillation, which I understood was the main feature of this type of reaction. Can you suggest how to improve it?"—D. F. A. (Cardiff).

ALTHOUGH the circuit may be quite correctly arranged and wired, the trouble may be due to the value of the control. If the reaction comes suddenly, and you cannot get a point where there is a smooth build-up, the resistance value is probably too high. You have probably used 100,000 ohms in order to reduce the H.T. consumption as it is joined direct across H.T., and therefore we suggest that you split this into two parts, say, a 50,000 ohm fixed resistance in series with a 50,000 ohm control. This will give a more gradual effect as it will spread out the effective movement of the control. You may even find it worth while to use a 30,000 ohm variable and make up the remainder of the value by means of fixed resistors in series. To find the correct value, adjust the component now in use to the point where the set bursts into oscillation, and then measure the value of resistance which is in circuit. This will give you the total value of the resistance to obtain for the purpose.

The coupon on Cover iii must be attached to every query.

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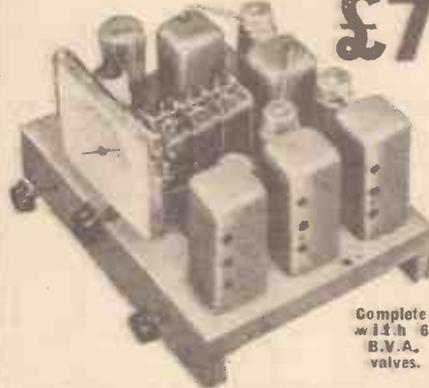
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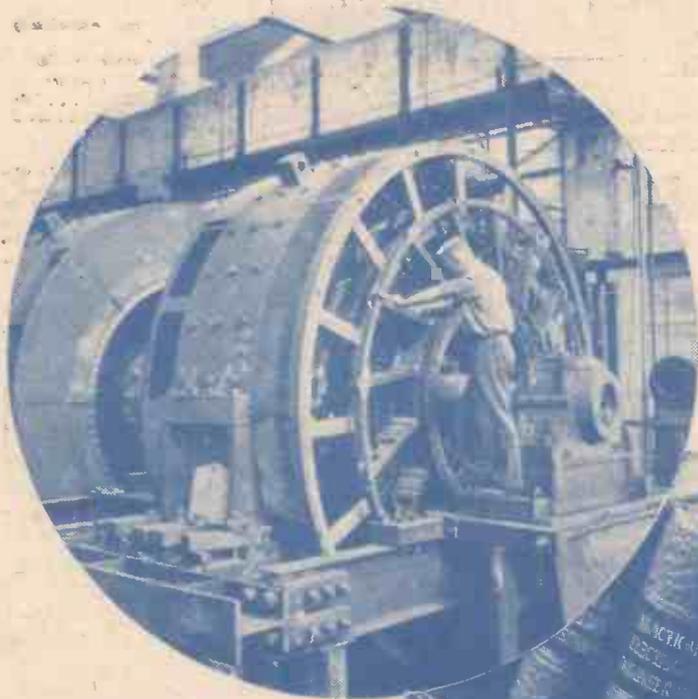
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**SMALL P.A. AMPLIFIERS**—See Page 250.

# Practical and Amateur Wireless

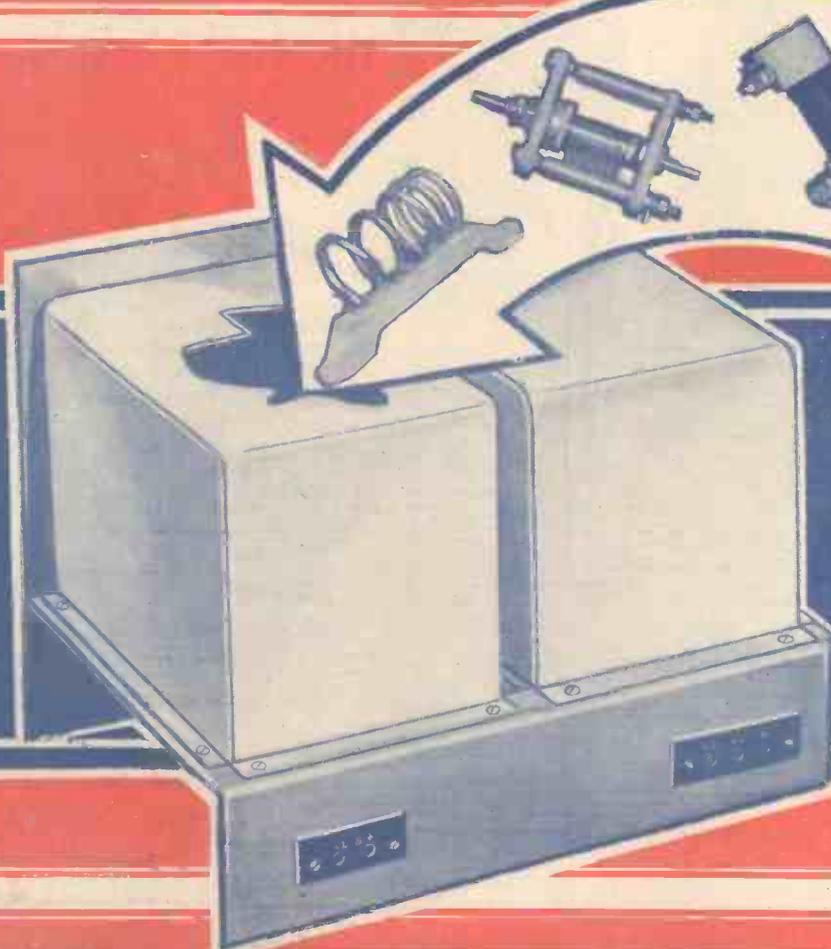
**3<sup>d</sup>**  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 10. No. 245.  
May 29th, 1937.

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# REPLACING YOUR VALVES—See page 243



# 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. X. No. 245. May 29th, 1937.

## ROUND *the* WORLD of WIRELESS

### Improving the S.W. Set

WE have repeatedly received reports from amateurs who have carried out the most remarkable long-range reception with the simplest of short-wave receivers. In many cases this type of receiver is built as an adjunct to the normal broadcast set, and is more often than not made from spare parts or junk. In spite of this, the results are well worth the time spent in assembling the parts, but many listeners who attempt to follow this example meet with disappointment. The layout is as important (if not more so) as the circuit which is employed. There are many short-wave sets now in use which could be improved beyond belief, simply by modifying the layout or adopting some different scheme of wiring, without the use of any more valves or components. It is also possible to improve even a well-tried receiver by some sort of rearrangement of the components, or by modifying the circuit slightly. The main principles of such modifications are dealt with fully in our short-wave section this week, and all those listeners who are interested in short-wave work will find this article of great value. It is at this time of the year that an improvement in the short-wave receiver is warranted in order to make up for the longer hours of daylight, and therefore some of the suggestions made in this article should be adopted without delay.

### Radio on Trains

ALTHOUGH tests have been carried out in this country with radio as an added comfort for the traveller, we do not think it has been installed as a regular feature on any line. In France they are also carrying out tests with a view to giving radio as an added luxury, but have gone a step further in providing on one line a special coach fitted with loudspeakers and provided with a polished floor for dancing purposes. A train so fitted is to be placed at the disposal of organised parties of excursionists.

### Call to Prayer

RADIO is now being used in Singapore in order to call the faithful to prayer. Formerly a gong was sounded, and as time went on a small microphone and amplifier was installed. This has now grown into a large public-address outfit, giving audibility over a considerable range.

### P.A. in the Abbey

TO improve conditions in Westminster Abbey during the Coronation service an elaborate public-address system was installed by Standard Telephones and Cables. Unlike the usual P.A. system, horn speakers were not employed. Instead, dynamic speakers were used, in which a small auxiliary stiff cone attached to the

### Jazzonata

IN the Welsh programme on May 31st a novel pianoforte recital will be given by Leonard Morris. This will be a combination of modern jazz tunes presented in a manner similar to a sonata recital. The various movements consisting of well-known dance tunes will be written in sonata form.

### Coloured Radio

A WELL-KNOWN American firm is now making a big feature of coloured radio cabinets. The most popular receivers made by this firm are now available in seven different cabinets, incorporating ivory, ivory and gold, Chinese red, black and chrome, etc. These are designed to harmonise with domestic furnishings.

### Broadcasting House Extension

IT is proposed to extend the present B.B.C. headquarters to the site now occupied by Nos. 10-22, Portland Place. The B.B.C. announces that Messrs. Val Myer and Watson-Hart, and Messrs. Wimperis, Simpson and Guthrie have been appointed architects in association with the B.B.C.'s civil engineer for the purpose. Lt.-Col. G. Val Myer was the architect for the existing building, and the other architects have been concerned with the B.B.C. in the design of the elevation of a number of the Regional stations, notably Brookmans Park, Lisnagarvey, and Burghhead.

### Rochdale's Contribution

MISS GRACIE FIELDS was the central figure on May 19th in the interesting ceremony at Rochdale, her home town, when she was presented with the Freedom of Rochdale. The occasion was indicative not only of Rochdale's pride in Miss Fields as a citizen, but also of the achievement in the world of theatre, music, the cinema, and the radio.

Another Rochdale citizen who has made his mark in the music and radio spheres is Norman Allin, premier bass vocalist.

### Binding Cases and Indexes

BINDING cases and indexes for volume 9 of PRACTICAL AND AMATEUR WIRELESS are now available. The binding case, complete with title page and index, costs 3s. 6d., and the index alone 7d. by post.

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main diaphragm improved the upper frequencies, and a number of tubes projecting from the front surface into the body of the cabinet improved the radiation at lower frequencies. The microphones employed fed both the public-address equipment and the B.B.C. amplifiers for the broadcast.

### Invisible Ray

IT is stated that a Japanese radio expert has succeeded in rendering an object invisible by subjecting it to bombardment from a special ultra-short-wave oscillator. The object used is also "tuned" by means of some form of high-frequency oscillator to a similar frequency to the transmitter, and the received oscillation causes a cancelling-out which renders the light rays invisible and thus the object disappears. We wonder!

# ROUND the WORLD of WIRELESS (Continued)

## Beam Wireless Station for Outer Hebrides

WE are informed that the Post Office plan to link up the Outer Hebrides to the mainland by the use of a short-wave beam wireless station. This will obviate the need for expensive submarine cables. At present a telephone subscriber in Scotland can speak to America or India, but he can't speak to Lochmaddy, or Lochboisdale, in the Western Islands. There is at present a cable to Lewis, but a wireless station is also to be erected there to improve reception.

## "Responsibilities of Empire"

THE sixth talk in the "Responsibilities of Empire" series will be broadcast on May 28th in the National programme by the Right Honourable W. Ormsby-Gore, Secretary of State for the Colonies.

## Organ Recital from Exeter

ON June 2nd, Harold Stringer will broadcast a recital at the organ of the New Savoy Theatre, Exeter.

## Mid-week Variety

LISTENERS to the London Regional on May 26th will hear a good programme of mid-week variety. The cast includes Aileen Stanley, America's gramophone girl, who scored a great success in the early days of the Kit Kat Club and who is visiting this country again.

This bill also brings the third broadcast of Gus Chevalier and his partner, and listeners will also hear Issy Bonn, now an established Jewish comedian act; Mamie Soutter; and the Southern Sisters.

## Summer Broadcasts

THE North's Summer Outside Broadcast Scheme—that "peculiar institution" which provides a regular service of concert party and light orchestral broadcasts from the seaside resorts and inland spas—has no official opening date, but listeners will find that it has come into force towards the end of May. Frank A. Terry's "Pleasure on Parade" Concert Party is, for example, to broadcast from the Floral Pavilion, New Brighton, on May 26th, and on the following afternoon listeners will hear the Whitby Municipal Orchestra, directed by Frank Gomez, broadcasting from the Spa, Whitby.

## Organ Music from Glasgow

ON June 3rd, Frank Olsen will play on the organ of the New Cinerama, Glasgow: Selection, "Wild Violets"; "Petite Suite de Concert"—"Le Caprice de Nannette," "Demande et Reponse," and "Un Sonnet d'Amour"; "A Little Kiss each Morning"; and a Popular Medley.

## Fire-engine Radio

IT is reported that the latest use to which wireless has been put in Cape Town is to enable fire-engines to keep in direct

## INTERESTING and TOPICAL NEWS and NOTES.

touch with headquarters so that they can report the extent of fires attended, and so enable the authorities to determine whether



His Majesty King George VI at the microphone at Buckingham Palace broadcasting his historic message on Coronation Day.

engines from other depots should be sent to help. The apparatus is operated from a motor generator, driven from a storage battery.

## Operatic Broadcasts

DURING the week, broadcasts from the following operas will be given: Glyndebourne, "The Magic Flute" (Act 1) on May 27th (National), and "Figaro" (Act 3) on June 3rd (Regional); and from Covent Garden, "Carmen" (Act 3) on May 29th (National), "Götterdämmerung" (Act 3) on June 1st (National), and Verdi's "Falstaff" (Act 3) on June 8th (National). The performance of "Götterdämmerung" on June 1st will be the last of the second cycle of the Ring, conducted by Furtwängler.

## B.B.C. Scottish Orchestra

ON June 1st the B.B.C. Scottish Orchestra, conducted by Ian Whyte, will play: Overture, "The Marriage of Figaro," by Mozart; "Symphony No. 1 in C Major," Op. 21, by Beethoven; and "Antiche danze ed arie" (lute dances and airs of the olden times, arranged for orchestra), by Respighi.

## Variety from Plymouth

IN the series entitled "Theatres of Variety," a programme will be broadcast from the stage of the Palace Theatre, Plymouth, on June 3rd.

## Clifton Light Orchestra

THE augmented string section of the Clifton Light Orchestra, conducted by Reginald Redman, will give a concert from the Western studio on May 31st.

## Concert from Torquay

JEANNE DUSSEAU (soprano) will be the vocalist at the concert by the Torquay Municipal Orchestra, conducted by Ernest W. Goss, to be broadcast from the Pavilion, Torquay, on June 1st.

## The Derby

THE arrangements for the broadcast of the Derby follow exactly those of last year. An "effects" microphone will be positioned at Tattenham Corner, arranged so that the hoof beats of the approaching horses will be clearly heard, gradually working up to a crescendo where they sweep round the bend, and an observer will call out, as far as possible, the names of the leading horses. This is a very important time in the race, as position after Tattenham Corner means a great deal to a non-stayer.

Listeners will hear the commentator on the Grandstand cry the "off," and it is but a minute or so before the microphone at Tattenham Corner begins to pick up the thud of the approaching hooves.

The two B.B.C. commentators, whose positions on the course have not yet been settled, will then assist each other in describing this most difficult race.

## SOLVE THIS!

### PROBLEM No. 245

Parsons found that the fuse in the mains input lead of his A.C. all-mains receiver blew as soon as the earth lead was plugged into the earth socket of the set. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your solutions 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. 245 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, May 31st, 1937.

### Solution to Problem No. 244

There was a short-circuit from the G.B. terminal of the L.F. transformer to the earth line. When the G.B. lead was connected to the G.B. battery the latter was therefore short-circuited. No correct solutions have been received to Problem No. 243, and therefore no books are being awarded.

# Replacing Your Valves

"Professional" Valve-testing Equipment : Simple Tests Which the Constructor Can Make : Indications of Faulty Valves.  
By FRANK PRESTON

**R**IGHT from the early days of "dull-emitter" valves, the problem of deciding when they should be replaced has faced the constructor. The "bright-emitters," used prior to about 1923, had a plain tungsten filament, which simply burnt-out when the valve had been in use for about 1,000 hours. The "dull-emitter," which includes the majority of valves in use to-day, has a coated filament which rarely burns out. In consequence, although a valve might be little more than useless, it will usually continue to operate after a fashion. Of course, reception is much poorer than it should be; signal strength is comparatively low, and the quality of reproduction not nearly as good as when the valve was new.

It is because of the facts just pointed out that many valve manufacturers have recently devised special test panels for use by radio dealers when testing used valves. These test-sets are of various external forms, but all have the same effect, which is to indicate the mutual conductance of valves inserted into one of the sockets provided. In some cases, a reading is obtained which is actually a measure of mutual conductance, but in other instances, a scale gives the reading: "good," "fair," or "replace." This type of indication is more satisfactory to the non-technical wireless user, for it gives him a perfectly straightforward report on the valve under test.

## There Is No "Catch"

It should be understood that these test panels are extremely accurate devices, and are certainly not issued by the valve makers for the purpose of persuading people to buy new valves before the old ones have given a long period of service. If the tester gave a wrong interpretation of the condition of the valve, it would scarcely be to the good of the makers, whose new

Nearly every good radio dealer is to-day equipped with one of these testers, and readers are advised occasionally to take their valves along to their local dealer so that their condition can be checked. A charge of a few coppers only is made for the test, and even this is not levied for a valve which is replaced.

## Anode-current Tests

Those who prefer to carry out their own tests can do so, although rarely with the same degree of accuracy unless a good deal

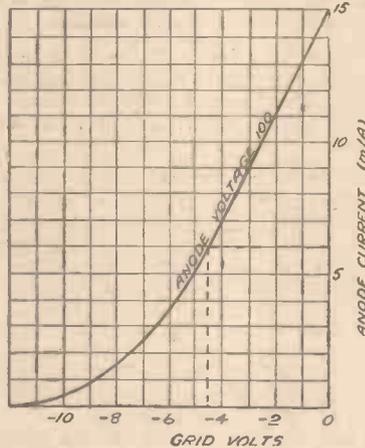
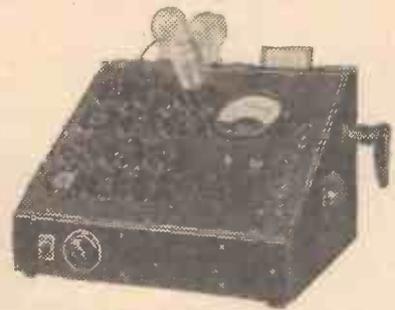


Fig. 2.—A typical grid volts-anode current curve by means of which the readings obtained as shown in Figs 1 and 3 can be checked and compared with the values applying to a new valve. (Broken lines show that the valve represented should pass 6 mA anode current when the anode voltage is 100 and the grid bias  $4\frac{1}{2}$  volts.)

of test gear is available. One of the simplest methods of checking is by means of a milliammeter and a split-anode adapter, as shown in Fig. 1. The adapter is simply a counterpart of the valve base, but it is provided with sockets in place of the glass envelope and electrodes. All except the anode socket are in direct contact with the pins. The anode socket is connected to a terminal on the side of the adapter, the corresponding pin being attached to a second terminal. Thus, all the valve pins, with the exception of that joined to the anode, are connected, through the adapter, to the same points as when the adapter is not used. By connecting a milliammeter to the two terminals on the adapter, the anode current to the valve must flow through the meter, which gives an indication of the amount of current flowing.

These adapters can be obtained to suit most kinds of valve—four, five and seven-pin—and are inexpensive. They simplify the taking of measurements, for if an adapter were not used it would be necessary to disconnect at least one wire inside the receiver. It is important, however, that the wires between the adapter and the meter be kept short, whilst it is desirable to connect a fixed condenser of not less than .1 mfd. between the adapter terminals. This acts as an H.F. by-pass for the meter and prevents undesirable instability, which is sometimes experienced due to the comparatively high meter resistance.



The Mullard valve and set tester.

## Current and Voltage

It might be argued that the current reading does not give any very clear indication of the condition of the valve; if the anode voltage is not known, or if the current passed when the valve was new is unknown, the indication might not be very helpful. But if, with a new H.T. battery, it is found that a detector valve passes, say, 2 mA when new, and only 1.2 mA after the valve has been in use for a couple of years (also when using a new H.T. battery of the same voltage as before), it will be quite certain that the valve is losing its efficiency. Alternatively, if the voltage applied to the anode is known, it is possible to determine the current reading, which should be obtained by referring to the characteristic curves issued by the valve makers.

For example, if a voltage of 100 is obtained when a high-resistance moving-coil voltmeter is connected, as shown in Fig. 1, and if the grid-bias voltage applied to the small power valve under test is known to be  $4\frac{1}{2}$ , it can be seen from the anode current-grid volts curve in Fig. 2 that the anode current should be approximately 6 mA. If the reading were 4 mA or less it would be fairly safe to assume that the valve was beginning to lose efficiency, and that it would be worth while to replace it. The trouble is, however, that a valve in that condition would probably not have ceased to operate, and the falling-off in signal strength and gradual development of distortion would have been so slow that it might not have been appreciated. Results

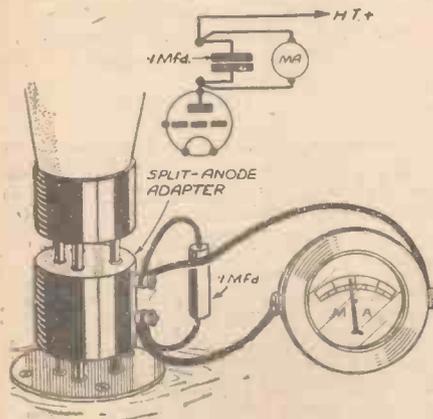


Fig. 1.—A simple method of checking the anode current by using a split-anode adapter in conjunction with a milliammeter.

valves would appear on test to be below par! Another point which should be borne in mind is that the test instrument might cost anything between ten and twenty pounds to the dealer—and he would not pay that for an unsound piece of apparatus.

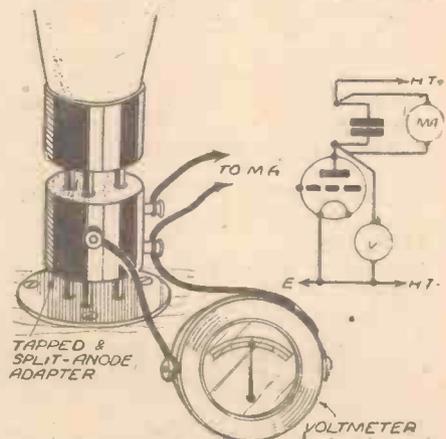


Fig. 3.—A more accurate check can be obtained by measuring the anode current and anode voltage at the same time.

would be considerably better, though, as soon as a new valve was fitted.

It will have been noticed in Fig. 3 that the adapter shown differs from that in Fig. 1, for there are terminals which are in contact with the filament pins, in addition to the "split-anode" terminals. This type of

(Continued overleaf)

## REPLACING YOUR VALVES

(Continued from previous page)

adapter is generally referred to as being "tapped and split"; it is certainly a useful addition to the constructor's test equipment.

## Mutual Conductance

The most accurate indication of a valve's efficiency is given by the figure applying to its mutual conductance. Stated briefly, the mutual conductance of a valve is the ratio between a small change in anode current and a small change in grid voltage which produces it. Thus, if a valve with 100 volts on its anode passes 10 mA with a grid voltage of zero, and the current falls to 7 mA when the grid is biased to the extent of 1 volt negative, the mutual conductance would be 3 mA per volt. The mutual conductance of the average small battery power valve is about 2.25 mA per volt, but certain "high-slope" power valves have a figure as high as 4 mA per volt. A mains pentode, on the other hand, might have a mutual conductance or slope of 7 mA per volt, and a figure for the normal battery-operated general-purpose valve is about 1.5 mA per volt.

It is the usual custom to measure the mutual conductance with an anode voltage of 100 and a grid voltage of zero (initially), the voltage applied to the screening grid of a pentode being 100, or the same as the anode. One method of finding the mutual conductance would be as shown in Fig. 4, where two high-resistance moving-coil voltmeters are used in conjunction with a moving-coil milliammeter and a 100-volt battery. Such an arrangement would be too costly for the average constructor, and is, in fact, generally unnecessary. Additionally, the results given are not perfectly accurate due to the G.B. potentiometer and grid voltmeter being in parallel.

## A Simpler Test

A simpler method of procedure is by using the connections shown in Fig. 2. The grid-bias voltage would probably require to be moved in  $1\frac{1}{2}$ -volt steps, but if the anode-

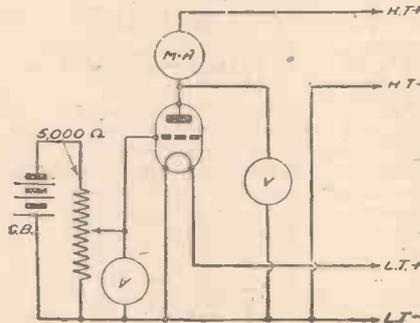


Fig. 4.—A method of measuring the mutual conductance of a valve in a fairly accurate manner. The voltmeters must be of high grade and of the highest possible internal resistance.

current readings obtained when adjustments are made correspond with those suggested by the makers' characteristic curve, it can be concluded that there is little wrong with the valve.

## Indications of Faults

There are many indications of failing valves, which can be observed without instruments. For example, if it is found that the reaction condenser has to be advanced further than before in order to obtain oscillation, it will generally be a fairly clear sign that the valve is losing its emission. This, of course, is on the assumption that the H.T. and L.T. voltages are correct. In the case of a battery-operated power valve, a falling-off in efficiency is at once indicated when the grid-bias voltage has to be reduced in order to maintain

signal strength. Alternatively, if reproduction is of better quality when using a lower G.B. voltage it is a certain sign that the valve is not as it should be.

A failing H.F. valve is not as easy to detect, although it will generally cause a falling-off in signal strength of more distant stations, whilst tuning might appear abnormally critical. In the case of a variable- $\mu$  valve, the V.M. volume control will have less effect than was previously the case.

When it is the frequency-changer of a superhet which is becoming "weak," there are all kinds of effects which might be noticed. One of the first, however, will probably be that the receiver appears to be "dead" at certain parts of the tuning range. It might also be found that there is a peculiar form of distortion when a powerful signal is tuned in. Also, signals might fade or become spasmodic. In other instances it might be impossible to receive other than extremely feeble signals, although the usual "background" noises originating in the receiver will be only slightly less noticeable than usual. A.V.C., when used, will not have as much effect as it should, or otherwise it might "choke" the set on strong signals.

No reference has been made above to the rectifying valve in a mains set. This is not a valve in the usually-accepted sense, although it is correctly designated as such. If it is losing its emission the result will be lack of signal strength on all stations, and probably a good deal of distortion. It might also be found that a longer "warming-up" period is required after the set is switched on. A simple method of checking the valve is by measuring the voltage between the H.T. positive and negative points; before taking this as conclusive, however, it should be ascertained that the H.T. current consumption is not appreciably greater than normal.

# Important Broadcasts of the Week

## NATIONAL

Wednesday, May 26th.—London Music Festival, 1937, organised by the British Broadcasting Corporation: First Concert, from the Queen's Hall, London.

Thursday, May 27th.—Magic Flute (Mozart), Act 1, from Glyndebourne.

Friday, May 28th.—Concert Party programme.

Saturday, May 29th.—Variety programme.

## REGIONAL

Wednesday, May 26th.—Louisa Wants a Bicycle, or The Fight for Women's Freedom, a rapid retrospect, by Irene Clephane.

Thursday, May 27th.—Gallery Goddess, a romantic comedy of the theatre, by Joyce Lustgarten.

Friday, May 28th.—London Music Festival, 1937, organised by the British Broadcasting Corporation: Second Concert, from the Queen's Hall, London.

Saturday, May 29th.—Concert Party programme.

## MIDLAND

Wednesday, May 26th.—English Country Dances; Orchestral programme.

Thursday, May 27th.—The Adventures of Jack and Jill—1, Jack and Jill go up the Hill, a revue.

Friday, May 28th.—Paste and Paper, an examination of personal scrapbooks carried out by Harold Nicolson.

Saturday, May 29th.—Malvern Lawn Tennis Tournament, an eye-witness account.

## WESTERN AND WELSH

Wednesday, May 26th.—Variety programme.

Thursday, May 27th.—Show Asides: An extra-ordinary meeting of the Federation of West Country Farmers from the Show Ground of the Bath and West Agricultural Show at Trowbridge.

Friday, May 28th.—Town Tour, Bournemouth, by John Betjeman.

Saturday, May 29th.—Choral and orchestral programme, from the Colston Hall, Bristol.

## NORTHERN

Wednesday, May 26th.—Concert Party programme, from New Brighton.

Thursday, May 27th.—Gallery Goddess, a romantic comedy of the theatre, by Joyce Lustgarten.

Friday, May 28th.—Anglers Arms, a discussion on fish and fishing on the Wharfe.

Saturday, May 29th.—Itinerant Cooking, a talk on the peculiarities in Preparing Meals on the Move.

## SCOTTISH

Wednesday, May 26th.—Recital of Madrigals.

Thursday, May 27th.—Concert Party programme, from Aberdeen.

Friday, May 28th.—Scots Songs.

Saturday, May 29th.—Scottish Dance Music.

## NORTHERN IRELAND

Wednesday, May 26th.—The Workhouse Ward, a comedy, and The Rising of the Moon, a play, both by Lady Gregory.

Thursday, May 27th.—Orchestral programme.

Friday, May 28th.—Stop Dancing, seventh programme of very light music.

Saturday, May 29th.—Houses of Ulster, Aughentaine Castle, County Tyrone, a talk.

# Constructional Details of "Practical Wireless" Receivers-6

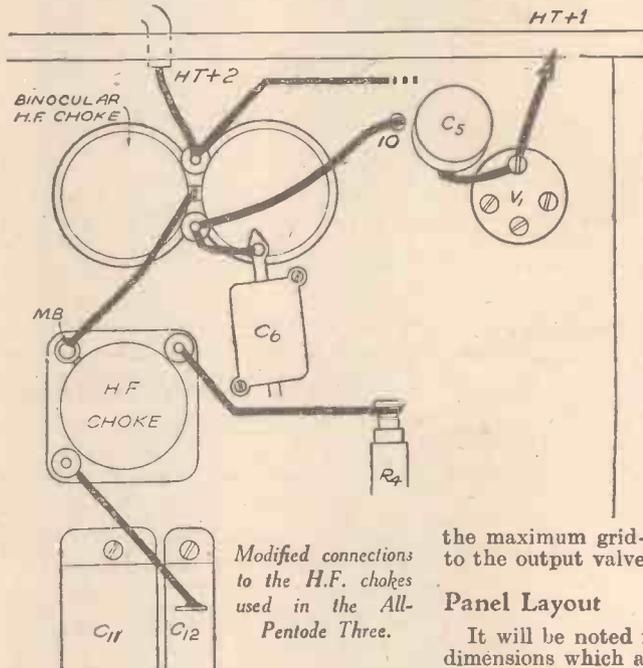
IN an endeavour to obtain the maximum volume from three valves in a straight circuit, we employed three pentodes in a conventional H.F., Detector, L.F. receiver in 1934. This All-Pentode Three also included the novel feature of being housed in a cabinet with loudspeaker, but without the conventional speaker grille. Instead, the speaker was mounted underneath the lid which was raised from the remainder of the cabinet an inch or so, and thus the sound percolated through the slot thereby left round the cabinet top. The circuit used in this novel receiver is reproduced below, with one slight modification rendered necessary by the increased efficiency of the modern valves. This is merely a wandering H.T. lead applied to the screening grid of the H.F. valve in place of the fixed voltage formerly used at that point. This now enables the user to find the most effective voltage for the particular individual circumstances and valve in use, and thus a higher output may be expected from the receiver.

### The Circuit

The first valve is a variable-mu H.F. pentode, the second a straight H.F. pentode, and the output valve an L.F. pentode. A three-gang coil unit of Colvern make is employed, and the only components originally specified which are no longer obtainable are the two H.F. chokes. One of these was of the single type and the other a double or binocular component, but fortunately there will be found in the Graham Farish range two very similar items which may be placed in the receiver without the slightest difficulty. The accompanying sketch shows the connections which are made to these two components, which are known as the L.M.S. and the H.M.S. models. This illustration also shows how the lead from the screening grid terminal of V1, which is shown in

The All-Pentode Three, as its Name Implies, Utilises Three Pentodes. It is the Subject of Blueprint P.W.39

the blueprint connected to the resistor R2, is now removed, and a flexible lead attached to the terminal for insertion into the H.T.



Modified connections to the H.F. chokes used in the All-Pentode Three.

battery. The fixed condenser C5 is left connected as shown in the original design. There are thus practically no alterations to be made to this receiver, which may be relied upon to provide the maximum performance with a minimum of three valves.

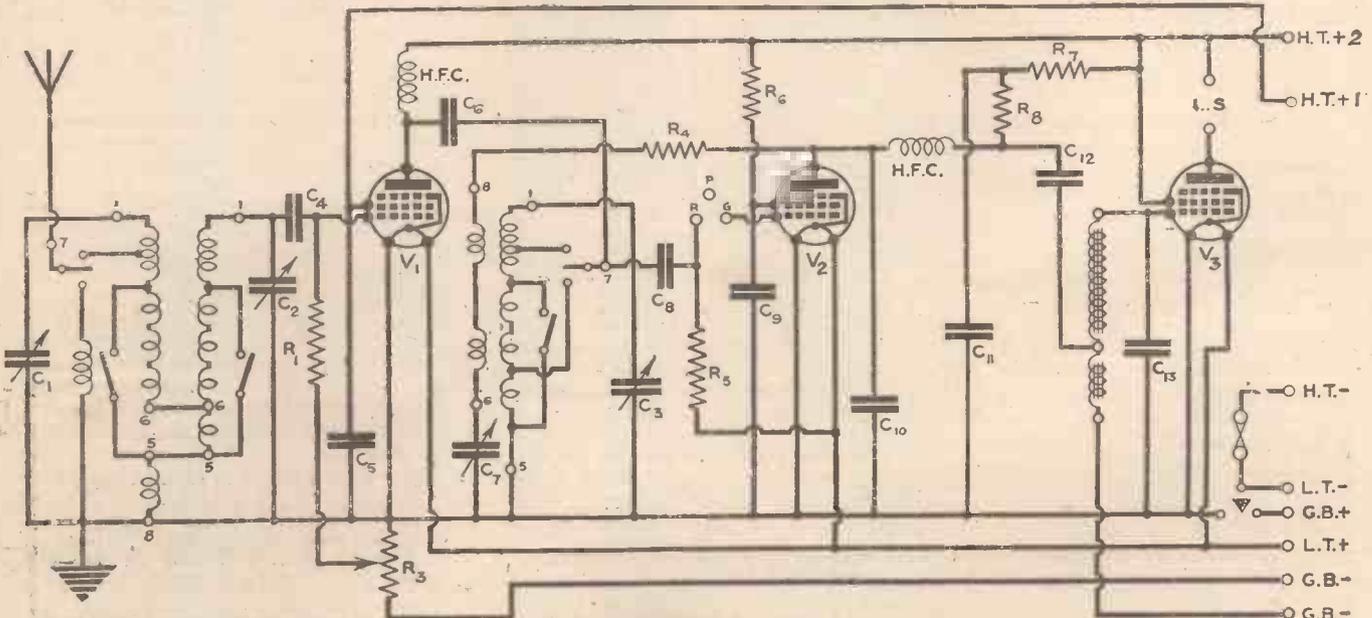
### Performance

The range is adequate to provide a large selection of stations, and the selectivity in view of the fact that a band-pass input tuner is employed, will ensure that a reasonable number of stations may be tuned in without interference. The high gain of the detector and output stages, coupled with the fact that a high step-up is employed between these stages, will guarantee good volume on the majority of the worth-while continental programmes. The H.T. consumption is sufficiently low to enable a standard capacity H.T. battery to be employed, although naturally a super-type of battery will provide a longer life. To keep the consumption down, the maximum grid-bias should be applied to the output valve.

### Panel Layout

It will be noted from the panel-drilling dimensions which are here given that the

(Continued on next page)



Modified theoretical circuit of the All-Pentode Three.

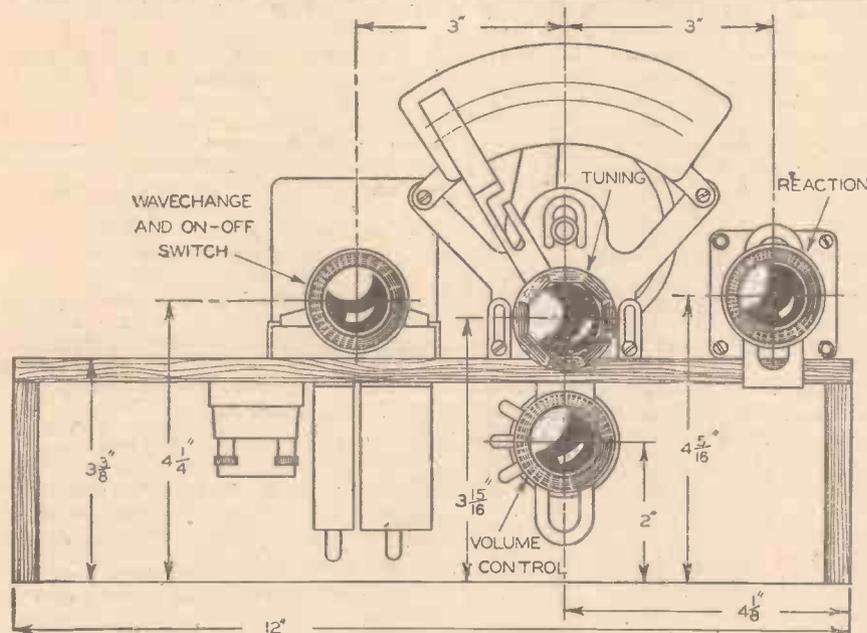
### CONSTRUCTIONAL DETAILS OF "PRACTICAL WIRELESS" RECEIVERS.

(Continued from previous page)

controls are situated to one side of the chassis. This enables the chassis to be placed in the centre of the cabinet specified for the receiver, and leaves adequate room on the right for the H.T., L.T., and

G.B. batteries, with the speaker suspended centrally above them.

### COMING SHORTLY! A NEW PORTABLE



Drilling dimensions for panel or cabinet front.

### LIST OF COMPONENTS FOR THE ALL-PENTODE THREE.

- One Ferrocart ganged coil assembly, type G1, 2 and 3 (Colvern).
- One Baby 3-gang condenser (Jackson Bros.).
- One Arcuate drive (Jackson Bros.).
- One .00015 mfd. reaction condenser, C7 (Graham Farish).
- One .0001 mfd. fixed condenser, type M, C8 (T.C.C.).
- One .0002 mfd. fixed condenser, type M, C10 (T.C.C.).
- One .001 mfd. fixed condenser, type M, C4 (T.C.C.).
- Two .0003 mfd. fixed condensers, type M, C6 and C13 (T.C.C.).
- One .1 mfd. fixed condenser, type 65, C12 (T.C.C.).
- One 2 mfd. fixed condenser, type 65, C11 (T.C.C.).
- Two .1 mfd. tubular condensers, C5 and C9 (T.M.C.).
- One 500 ohm ohmite resistor, R4 (Graham Farish).
- One 10,000 ohm ohmite resistor, R7 (Graham Farish).
- One 80,000 ohm ohmite resistor, R8 (Graham Farish).
- One 150,000 ohm ohmite resistor, R6 (Graham Farish).
- Two .5 megohm ohmite resistors, R1 and R5 (Graham Farish).
- One 50,000 ohm volume control, R3 (Ferranti).
- One screened binocular choke, type L.M.S. (Graham Farish).
- One Max. transformer (Graham Farish).
- Two 4-pin valveholders (Clix).
- One 5-pin valveholder (Clix).
- Two component brackets (2 1/2 in.) (B.R.G.).
- Two socket strips (A, E, and L.S.) (Belling-Lee).
- One G.B. battery clip (Bulgin).
- One 4-way battery cord with Wanderfuse (Belling-Lee).
- Three Bowspring wander plugs, G.B., G.B.-1, G.B.-2 (Belling-Lee).
- One Metaplex chassis, 12 in. by 8 in., with 3 in. runners (Peto-Scott).
- One Cosor 210 VPT valve.
- One Cosor 210 SPT valve.
- One Cosor 220 HPT valve.
- One Stentorian standard speaker (PMS2) (W.B.).
- One "All-Pentode Three" cabinet (Peto-Scott).
- Wire for connections, screws, flex, etc.
- One 120-volt Full O'Power H.T. battery (Siemens).
- One 2-volt L.T. accumulator.
- One 9-volt G.B. battery (Siemens).

### Reginald Stead and His Orchestra

REGINALD STEAD and his Orchestra will broadcast from the Pier Pavilion, Colwyn Bay, on May 31st. The ensemble consists of ten musicians nearly all of whom play two or more instruments, and some of whom are members of the Hallé Orchestra, and the Northern Philharmonic. Many visitors to Colwyn Bay have heard this orchestra previously as it was engaged at the Pier Pavilion in 1934 and 1935. The orchestra has also broadcast on the National and Regional wavelengths. During 1936 Reginald Stead spent a year studying with Carl Flesch in Belgium.

### Women's Cricket Match Broadcast

THE B.B.C. is sending observers to the Belfast Athletic Meeting and to the Women's Cricket Test Match to be held at Northampton.

This Test Match is between the Ladies of Australia and the Ladies of England. Marjorie Pollard, the well-known hockey international, will describe the match for the B.B.C.

### Saint-Saëns Programme

LESLIE HEWARD will conduct the B.B.C. Midland Orchestra in a Saint-Saëns programme on June 1st, which will include the Symphony No. 2 in A, "A Night in Lisbon," and "Rigaudon."

### Special Broadcast from South Africa

ON May 30th, listeners to the National programme will hear the broadcast of a tour by Lieut.-Col. J. Stevenson-Hamilton, Warden of the Game Reserve, of Kruger Park, situated close to Johannesburg. This lovely park is a sanctuary for all time for every form of wild life, from the elephant, hippopotamus, rhinoceros, etc., to guinea-fowl, owls, hornbills and a host of other varieties. A stretch of land on the

### PROGRAMME NOTES

Transvaal border of Portuguese West Africa, the park is about 220 miles long and 40 miles wide, covering nearly 9,000 square miles.

It is hoped that listeners will hear over the microphone some of the animals themselves, for rounding a bend in a car, the Game Warden will come upon groups without fear of man lazily sunning themselves. Farther down the road the microphone may discover a fresh kill with an African leopard signalling his defiance.

The car, with the microphone and commentators, will travel round while time permits. All must reach the rest camp within half an hour after sunset, for the animals have the park to themselves during the hours of darkness. This should prove a most interesting natural history broadcast and may be compared with those given from our own zoos at home, with the difference that this one comes from the wilds of the veldt.

### Vaughan Williams' Songs

IN the English Song Writers series from the Midland Regional the next subject on June 2nd will be Dr. Vaughan Williams, who was born in Gloucestershire. Dorothy Richards (mezzo-soprano) and Stanley Pope (baritone) will be the vocalists. Shakespeare songs, old ballads, and some of the "Songs of Travel" will be included in the programme. Miss Richards was a violinist in the Isle of Wight Symphony Orchestra before she came to the Midlands.

### The Dover Road

A. A. MILNE'S comedy "The Dover Road" will be performed by the Oxford Repertory Company in a studio,

Owen Reed producing. The cast will include Thea Holme and Phyllis Konstam in the two women's parts, and Stanford Holme and Eugene Leahy among the men. The Company's home is the Playhouse, which was originally a big-game museum and was converted into a theatre eleven years ago. Stanford Holme has been the director for about six years and is also the producer. His wife, Thea Holme, is a well-known actress; she was in the Dunsany play in London this spring. Phyllis Konstam is the wife of Austin, the lawn tennis player. This broadcast will be given in the Midland Regional programme on May 30th.

### The Rothesay Entertainers

THE ROTHESAY ENTERTAINERS will broadcast from the Winter Gardens, Rothesay, on June 3rd. The cast will include: Martin and Holbein, Peter Sinclair, Ike Freedman, Helen Glen Campbell, Jeannette Adie, Katherine Gibson, Herbert Cave, Agnes Campbell and her Caledonian Dancers, and James Burns and his Orchestra. The entertainment will be produced by Sandy Connor.

### Paste and Paper

THE third of the talks in the "Paste and Paper" series will be broadcast on June 4th. These are given by the Hon. Harold Nicolson, M.P. for West Leicester, and consist of extracts and comments from personal scrapbooks which have been lent to him. One of such books is dealt with in each talk.

Ideal for the Beginner

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# On Your Wavelength

By THERMION



is a funny hobby, but why not? After all, people collect rats and mice! This

when he broadcast "to listeners on the National wavelength."

## Voting by Radio

FROM the land of origin of all things crazy, including jazz and crooning (you were expecting me to say something about crooning anyway, so I thought I would get that in quickly), comes the latest barmy notion—an invention which it is claimed will revolutionise radio advertising. This invention is a radio recorder, and it is claimed that it will enable listeners to vote yea or nay to any question asked over the mike, or to register applause. It can also

particular crooner was discovered by Carrol Levis and as a result he broadcast in the "Discoveries Hour." He was a great success and Joe Loss offered him a job in his band, an offer which was refused. "I have decided to make singing just a hobby," he said, "instead of risking professional success. In my present job I know I can support my mother, crooning will have to be a side-line." I wish there were more like him. I doff my chapeau again.

From a Member of the Clan Gordon  
A MEMBER of the Clan Gordon, who hails from the salubrious district of Manyamba, Southern Rhodesia, writes:—

"Some little time ago you spoke of the population of Scotland as compared with that of London. I don't suppose you are aware that Scotland has given to the Empire nearly two million of her sons during the last fifty years; in fact, the Empire practically belongs to the Scots. Emigration from Scotland far exceeds that from England. The spirit of adventure is lacking in the latter



The Radio "Bird."

be used to register the number of those listening to any particular programme, and it is hoped that it will be a standard accessory for radio sets.

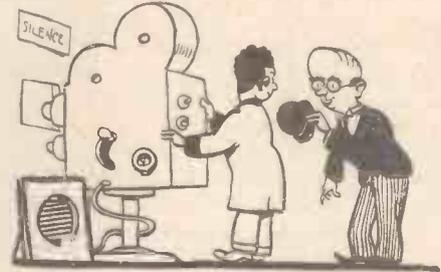
This reminds me of the invention of a friend of mine, in which a heavy weight is suspended over the performer's head by a trip-hook attached to a small crane. The weight is held in place by a wire attached to an electro-magnet. As the listeners switched off their sets so the energy in the magnet grew less, so that if the majority of listeners switched off the weight fell. I believe that the Society for the Prevention of Cruelty to Crooners stole the plans and had the working model destroyed. I am so sorry about that; it had such possibilities.

## I Raise My Tile

I LIFT my chapeau to a Leeds cinema operator who amuses himself by crooning. Now crooning

RUDY VALLEE had three thousand pounds to spend for an hour's broadcast to America. All the leading English stars were in the cast as well as Richard Tauber, Charles Laughton and his wife, Elsa Lanchester, Stanley Holloway, Will Fyffe, Van Phillips, Binnie Hale and others, and yet I found the broadcast disappointing (I heard it on the short waves), all of which goes to prove that stage and screen artists are not necessarily the best for the broadcast studio.

Rudy Vallee compered the show and used an entirely new word. Listeners are variously called "listeners-in," "listeners," and even "listener-ins," but it was the first time that I had ever heard them called "Toonerinners." It takes real pluck to put a word like that over the B.B.C., for he used the word again



My hat off to Arthur Stalker.

country. Don't crack any jokes about emigrating to London."

He appends the following list of epoch-making and world-shattering "events" for which Scots were responsible, and asks if I know that:

"Abide With Me" was composed by a Scot.

That "Rule, Britannia!" was composed by a Scot.

That "Ye Mariners of England" was composed by a Scot.

That the sobriquet "John Bull" was invented by a Scot.

That the Bank of England was founded by a Scot.

That the first woman medical graduate in Great Britain was a Scotswoman.

That the Royal Society was founded by a Scot.

That three Scotsmen have occupied the Archiepiscopal See of Canterbury.



Rudy Vallee uses a new word.

That James Watt, a Scot, made possible the wealth of modern Britain.

That the father of political economy in Great Britain was a Scot.

That coal gas was first used for illuminating purposes by William Murdoch, a Scot.

That the telephone was invented by a Scot.

That the inventor of the steamboat was a Scot.

That the first iron ships were built by Scots.

That the bicycle was invented by a Scot.

That eight of Great Britain's Prime Ministers have been Scots.

That the British Board of Agriculture was founded by a Scot.

That the reaper and threshing-machine were invented by Scots.

Victoria Falls was discovered and named by a Scot.

These are but a few items culled from the bright roll of fame on which are inscribed the names of Englishmen, Scotsmen, Welshmen, Irishmen who have made the name of Britain "loved at home, revered abroad."

Isn't this list absurd? For every one of those songs composed by a Scot I could compile a list of hundreds composed by Englishmen, and I expect there are quite a number of others composed by Scots. This is not a national achievement, for it applies to every race. Watt did not make possible the wealth of Britain. Every intelligent Scot knows that Watt was a rogue, who invented nothing, but filched the ideas of others. He has been exposed several times. Eight of Britain's Prime Ministers have been Scots! And a sorry mess they left the country in. But really, this list is too trifling for words. I could make up a wonderful list of inventions produced by neither Englishmen nor Scotsmen. Every nation has its achievements.

#### Modulated Oscillators

ENGINEERS and service engineers will be interested in a new decision which has been taken by the Postal authorities concerning the special licences issued for the use of special test apparatus (modulated oscillators). The new decision permits the use of a modulated oscillator transmitting gramophone records over the user's premises under his ordinary broadcast licence, with the proviso that the oscillator must be so screened and connected to the apparatus used to receive the output from it that no appreciable radiation will take place. This latter point may occasion heart-aches in some quarters, but is not really difficult. A suitable screened lead, adequately earthed, and the



## Notes from the Test Bench

#### Six-pin or Four-pin Coils?

SOME short-wave receivers are wired for four-pin coils, whereas others use the six-pin type. We are often asked why the four-pin type cannot be standardised and used in all sets. The six-pin coil has the advantage of reducing aerial-earth effect to a minimum, however, and is therefore more suitable than a four-pin coil in the aerial stage. If an untuned S.G. stage precedes the detector there is not much gained by using a six-pin coil and therefore receivers of this type generally employ a four-pin coil with choke or tuned-anode coupling. If a four-pin coil is used in the aerial circuit a variable condenser having a very low maximum capacity should be connected between the grid end of the coil and the aerial lead. Unless this condenser is added the damping effect of the aerial will be excessive and the detector will not oscillate. When a six-pin coil is used this condenser can be omitted unless a very long aerial is used.

#### Electrolytic Condensers

ELECTROLYTIC condensers are very commonly used in commercial receivers nowadays, but there are several precautions which the home-constructor should take when using this type of condenser. Most of them are not reversible and therefore it must be decided which is the positive of the two points to which the condenser is to be connected. For this reason electrolytic condensers should not be used in D.C. receivers not fitted with a rectifier, as accidental reversal of the mains plug can cause damage. Many electrolytics have a very low voltage rating, and are designed for connection across bias resistances. Great care should therefore be taken to ascertain that the actual working voltage across the condenser is not higher than its voltage rating, as specified by the manufacturers.

#### Trickle Chargers

WE receive many queries from readers concerning the use of trickle chargers for supplying the required filament current for battery type valves. If a resistance is connected in the output lead from the charger so that the current passing through the filament circuit is limited to the exact value required, the charger may be used without an accumulator. It is generally found, however, that this method of supply produces excessive hum. The correct method of using the charger is to connect it to the accumulator when the latter is not in use. If the accumulator is on charge when supplying filament current the valves can be damaged.

building of the oscillator in a good earthed screening box should prevent the trouble, but you may find that there is still a leak. Incidentally, the special oscillator licence costs 10s., and enables the licensee to use any number of oscillators at a fixed address.

#### More Outside Television Relays

THE efficiency of the O.B. television vans has now been proved, and it is stated that they will be put into regular use by the B.B.C. as soon as one or two slight modifications have been made. This does not necessarily mean that we shall now see the Derby or the Boat Race, but there are dozens of interesting outdoor events which render themselves ideal for television broadcasting, and the B.B.C. will make arrangements to develop the outside broadcasts to the full. Incidentally, I see that at a recent company meeting it was stated that the projection type of television receiver was now "practically perfect." This gives a picture 24in. by 22in., and is known as the Senior Home Receiver. It is stated that it will be ready by late autumn for public release. A second model, to be known as the Medium-Screen Receiver, provides a picture 5ft. by 4ft., and these two models were recently acquired by the Soviet authorities for their Government station. I have so far been unsuccessful in seeing a demonstration of this system.

#### A Shocking Bridge

MOTORISTS passing over the Sydney Harbour Bridge have been complaining that when paying the toll they have been shocked. This does not refer to the amount of the toll, but to an electric phenomenon, resulting in a physical shock as they touched the metal at the toll-gate. It is stated that it is probably due to the fact that as the bridge is so high it induces a charge of static electricity in the car which is insulated from the metal bridge by its rubber tyres. When the driver touches the metalwork of the bridge the static discharges through him and he consequently receives a shock. It is even claimed that by touching the toll-collector a shock may be felt, as the collector, standing on the bridge, is at the same potential.

### THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

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# ABOUT MAINS UNITS

This Article Will Help You to Choose the Correct Type of Mains Unit for Your Receiver - - - - - By IDRIS EVANS

It is commonly agreed that the valves are the vital components in a receiver. If these are to function efficiently they must be supplied with the correct value of H.T. and L.T. voltage, however, and therefore, if the mains unit supplying the voltages is unsuitable, good reception cannot be expected. Common troubles due to the use of an unsuitable mains unit are hum, instability, and poor quality of reproduction.

### Battery Eliminators

The type of mains unit used for supplying H.T. to a battery type receiver is commonly known as a battery eliminator, because it dispenses with the H.T. battery. It is often found, however, that the receiver does not work as well when the H.T. battery has been replaced by an eliminator, but in most cases this is due to the use of an unsuitable unit. Many things have to be taken into consideration when choosing the unit, the most important being the current consumption of the receiver valves. Most battery type valves take a maximum anode voltage of 150 volts, and therefore, the voltage output of the unit should be between 120 and 150 volts. There is a considerable difference between the current consumption of various valve types, however. A power pentode consumes approxi-

employs two valves in parallel or in push-pull the eliminator must be capable of supplying twice the current taken by one of the output valves, plus that taken by

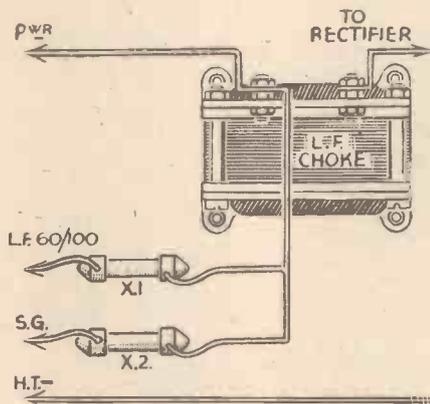


Fig. 1.—Part of battery eliminator showing the resistances which govern the voltage at the tappings.

the other valves in the receiver. For example, a receiver employing one H.F. pentode, a triode detector, and two small power valves in push-pull will have a total consumption of approximately 18 mA; the eliminator should, therefore, have a rating of approximately 120 volts at 20 mA. Some receivers have a Class B or a Q.P.P. output stage, and in these the current consumption varies with a variation of volume, the consumption being at maximum when the volume is maximum. An eliminator suitable for supplying receivers of this type must, therefore, have a steady voltage output with varying current output. Some rectifiers have a sufficiently steady voltage output for this purpose, and if the eliminator is required for supplying Q.P.P. or Class B valves, a type specially designed for supplying these valves should be obtained.

### Low Voltage Tappings

Most eliminators are fitted with an S.G. and a 60 to 100 volt tapping. It is emphasised, however, that the actual voltage obtained from these tappings will be governed to a great extent by the current taken. For example, the S.G. tapping will supply

approximately 60 volts when connected to the screening grid of an S.G. or H.F. pentode valve. If this tapping were used to supply the anode of the detector or L.F. valve, however, the voltage would be much lower than 60, as the current passing through the resistance attached internally to the tapping would be greater than in the case of the S.G. valve. In the same way, the tapping marked "Det. or L.F. 60 to 100 volts" would supply a voltage in excess of 100 volts if it were connected to the screening grid of an H.F. valve.

### A.C. Mains Unit

When designing a mains unit for a receiver using A.C. mains valves, three important items have to be considered—the current consumption of the valves, the maximum voltage required, and the current taken by potentiometers or speaker windings connected across the output circuit of the rectifier. The approximate total current consumption of the valves used can be calculated from the valve manufacturers' leaflets, and the current taken by potentiometers can be calculated by applying Ohm's Law. A rectifier and mains transformer must then be chosen that are rated to supply a maximum current slightly in excess of the receiver requirements. For example, the normal type of three or four-valve receiver using a power pentode output valve consumes about 55 mA at 250 volts, and, therefore, a rectifier rated at 250 volts 60 mA may be used together with a mains transformer designed to provide an output of 250-0-250 volts at 60 mA.

It is a common practice to energise a moving-coil speaker by means of the current taken by the receiver valves, the field winding being connected between the output + lead of the rectifier and the common H.T.+ line of the receiver. The result of this addition is a large drop in voltage between the rectifier and the H.T.+ line, and, therefore, a mains transformer and rectifier capable of supplying a voltage greatly in excess of the receiver requirements must be used. If the field winding of the speaker has a resistance of 2,000 ohms and the normal receiver consumption is 50 mA, a voltage drop of 100 volts will occur across the winding. The rectifier must, therefore, be capable of supplying

(Continued on page 259)

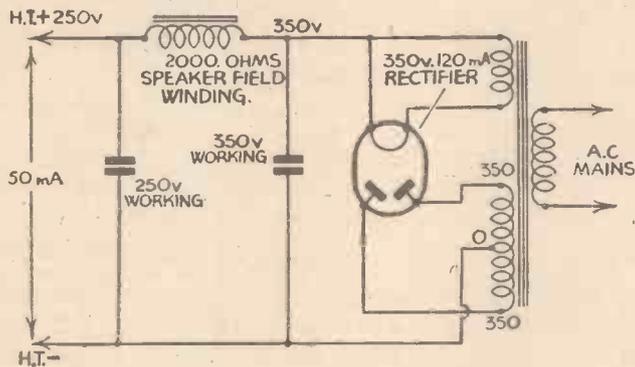


Fig. 2.—An A.C. mains unit, indicating position of speaker field winding.

mately 18 mA when the anode voltage is 120, whereas an economy pentode has a consumption of only 6 mA at the same anode voltage. It will, therefore, be realised that an eliminator having a rating of 120 volts at 12 mA must not be used if the output valve in the receiver is of the power pentode type. Assuming that the other valves in the receiver have a consumption of 6 mA, the correct type to use in this case would have a rated output of approximately 120 volts at 25 mA. The 12 mA type is intended for use in conjunction with receivers having an economy pentode or a small power valve in the output stage.

### Push-pull Valves

When valves are connected in push-pull or in parallel and the normal bias voltage is applied to each valve, the consumption of the two will be double that of one of the valves. If the output stage of the receiver

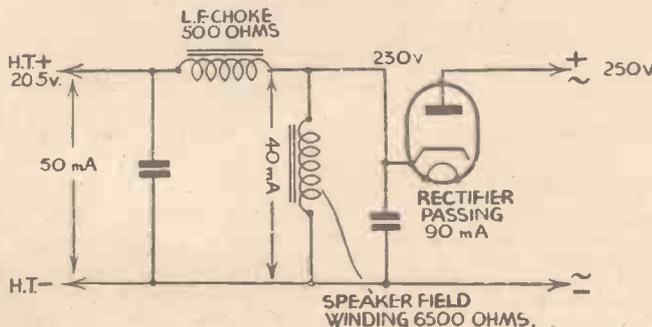


Fig. 3.—Showing the correct wiring of the speaker field winding in an A.C./D.C. receiver.

# Small P.A. Amplifiers

Interesting Details of Design for a Sectional Unit for Dance Band and Other Forms of Amplification  
By W. J. DELANEY

**M**ANY amateurs are interested in the design of small public address equipments suitable for use at concerts and other functions, and write

voltage to be obtained to feed a good substantial output stage. Probably the best form of construction to adopt is that wherein the various sections of the amplifier

are split. Thus, the mains unit and valves will be built on a single chassis, whilst the input and output circuits are built into separate smaller units fitted with plugs so that these may be changed as conditions dictate. Fig. 1 shows in pictorial form a unit of this type, and it may be built to be accommodated in a carrying case to one side of which a moving-coil speaker may be fitted for use in a hall, with separate speaker connected to the output box as desired. The principal features of this design are as follows. The mains section and all the high-voltage points are arranged on one side of the chassis, thus enabling a rapid voltmeter test to be made should a breakdown occur. To protect the user against shocks from these points, a metal covering is held in position over them, and this is removed by loosening a nut. The valves are arranged "in line" at the front of the chassis, with the input socket and output socket on the same side, and with the output socket, mains input and on/off switch at the opposite side. A tone control and volume control are essential, and are mounted between the input and output sockets.

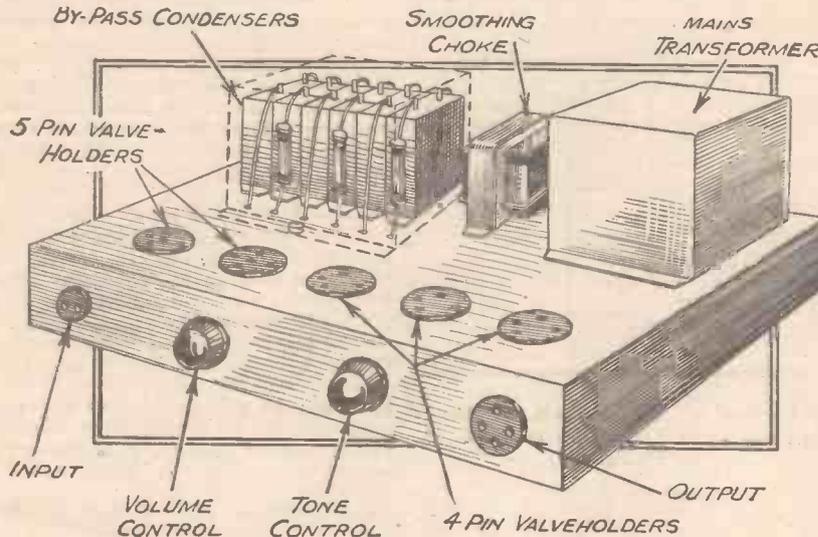


Fig. 1.—Suggested layout for a P.A. amplifier.

to us for suitable blueprints and designs. So far we have not published a design of a unit which can be used for general purpose work of this nature, although we have issued blueprints of two or three high-quality amplifiers. The requirements of concert parties and dance bands are rather particular, and there are several points to be watched in designing a unit which may have general application. One very important point is that facilities should be available in the unit for a very rapid test in the event of breakdown, and in the ordinary type of construction this is not too easy. Some form of rigid chassis is essential, as the unit will undoubtedly have to be carried about, and thus any distortion of the chassis would probably result in a short circuit or broken lead. Furthermore, the unit should be made so that it may be used with various microphones or with pick-ups, and provision should also be made for the use of two or more speakers, which introduces the difficulty of obtaining correct matching.

### A.C. or D.C. ?

The problem of the supply is not easy of solution. Some prefer the Universal type of unit which may be used on either A.C. or D.C. mains, but the efficiency is generally lower than a unit designed especially for A.C. use. As the majority of mains are A.C., and all will be of this type one day, it is desirable to use the A.C. circuit, as this enables a higher

### Input and Output Units

Small boxes, made from thin ply or sheet metal as desired, house the input mixer circuits and the output transformer, and this is of the multi-ratio type with sockets on one side of the box connected to the output terminals on the unit. By using a suitable transformer any number of speakers may be used without difficulty. The input mixer may consist of separate volume controls across the pick-up or microphone sockets, or one of the combined "fader" controls may be used. The connecting cable from this unit should

(Continued on page 252)

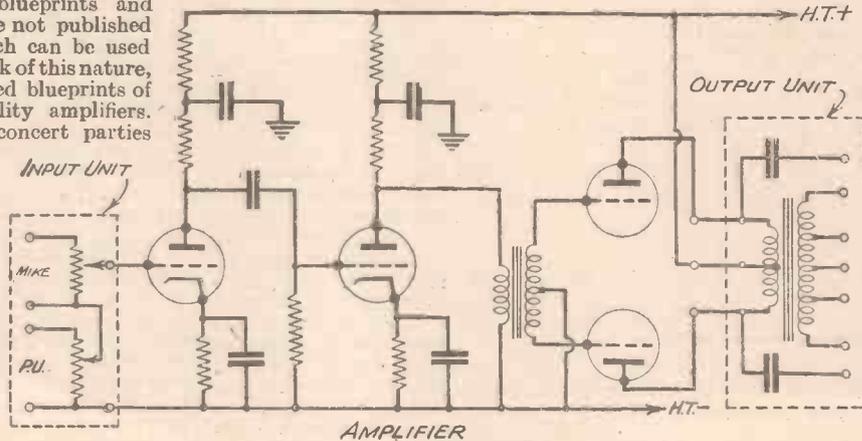


Fig. 2.—Basic theoretical circuit for public address work.

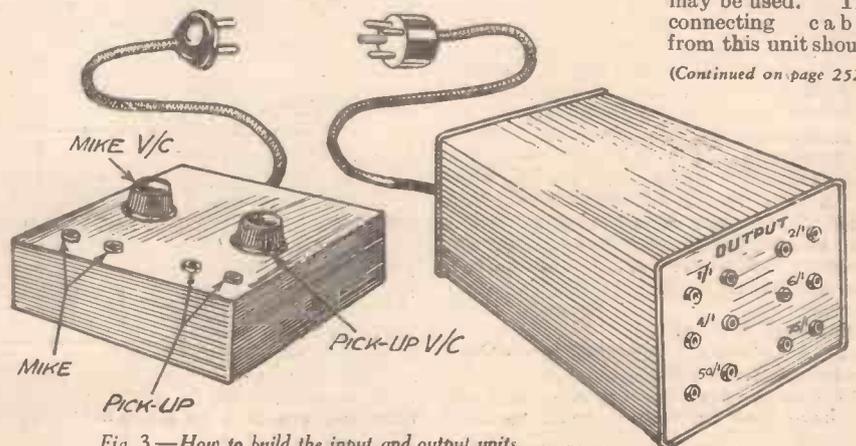


Fig. 3.—How to build the input and output units.

# RADIO FAULT TRACING—2

Continuing the Series of Articles on Trouble Tracking  
We Deal This Week with Further Preliminary Tests

**P**ARTS connected in any way to the positive H.T. lines of the receiver are more likely to develop defects than those in grid circuits, or low potential tuning circuits, for the reason that the former parts are subjected to greater stresses. A short-circuit across H.T. can be ruled out now because a fault of this nature would necessarily have forced attention upon itself at the commencement of the proceedings. It must be remembered that we have made the rule to get "life" in the output stage as one of the first moves, and any fault leading to absence of H.T. (or L.T., for that matter) would come up for investigation at once. It is high time now to make a voltage test between anode and chassis as an open circuit in any transformer winding, choke winding, or resistance connected in series with the anode circuit will then be shown up. If the valve is of the indirectly-heated type a voltage test should also be made between anode and cathode to check up on the possibility of a break between cathode and chassis. If the valve is of the screen-grid or pentode type, the screen to chassis voltage should be checked as well.

If the fault still does not show up, a grid circuit break should be considered as a possibility, and tested for.

If the fault is still elusive the most likely possibilities are: a short-circuit across the anode load, a short-circuit across the grid circuit, or, if one is in use, an open-circuited grid condenser. As regards the anode load matter, think of the case of the primary circuit of an I.F. transformer with a trimmer condenser across the winding. If there happened to be a short-circuit through the latter it would have the effect of preventing any amplified I.F. oscillations being developed in the anode circuit and there would be no input available for the next valve. When the anode load is of high resistance type, as with resistance-capacity coupling, a short-circuit across the load should have been noticed with the anode voltage test.

When a short-circuit across a winding of comparatively low D.C. resistance is the fault, the occasion calls for a test with an ohmmeter that will give low resistance indications. If the ohmmeter available is of the type that does not give readable indications for low resistances the position may be a little difficult. In a later article, however, the writer will suggest an improvised arrangement that could overcome the difficulty.

An open-circuited grid condenser can easily be checked up by using another condenser on a shunt test.

It is to be hoped that by now the fault will have been found, but should the case

still be obstinate it may pay to consider the possibility of an open circuit, or very high resistance contact, between a valve-holder terminal, or socket, and the valve pin. A milliammeter test in the anode circuit should prove useful, as a fault of the above type will generally show up if the milliamps are measured. It is to be pointed out, however, that any fault affecting anode current is a fault that must incidentally affect the actual anode voltage. As to whether this would be noticed at the time an anode voltage test is being made depends not only upon the extent of the voltage discrepancy (which may in some cases only be very slight) but also upon the alertness of the tester.

## "Diary" of a No Signal Case

Receiver: A mains superhet of typical modern design. Report: No signals.

Receiver switched on and dial lights up. No signals obtainable on either of the two wavebands provided. Sound of mush heard in speaker. Output stage is live, then, and probably I.F. stages working.

Jump aerial lead forward to signal grid of frequency changer. No result.

Decide to check I.F. stages. Apply modulated test oscillations at I.F. frequency to signal grid circuit. These signals come through well. Case beginning to look like a dead oscillator one. Switch out modulation of testing oscillator and adjust for signal frequencies. Connect aerial to normal receiver terminal, and search for signals, using tuning controls of both testing oscillator and receiver. Signals come rolling in. Sure that receiver oscillator is dead now.

Try new frequency changer valve. Nothing doing. Wonder if there is any H.T. on oscillator anode? Try with voltmeter. There isn't. On the track now.

Take chassis out of cabinet. Notice that directly connected to oscillator anode socket is a 50,000 ohm resistance and a .002 mfd. condenser. Resistance obviously in H.T. feed line, so switch on receiver and test for volts at each end of resistance. Get voltage reading at end of resistance remote from valveholder. Surely fault is an open resistance! Switch off receiver and make ohmmeter test of resistance. Get a jolt, for resistance is in order. (Ought to have taken closer notice of the voltage reading just now.) Try ohmmeter test from oscillator anode to chassis. Low reading obtained. Notice that condenser connects from oscillator anode to the oscillator coil assembly. Evidently it is a reaction feed condenser. Think it must be shorting through. Disconnect one end of condenser and test. Got the trouble now—condenser is shorting through.

Replace condenser with similar type. Try receiver. Everything seems O.K., but don't like making any changes in an oscillator circuit without checking the trimming.

Hardly seems necessary here but decide to make sure. Connect up ganging gear and find that the oscillator trimming condenser can do with a slight alteration. Make the necessary adjustment.

## Weak Reception

When the trouble is that the receiver as a whole is below its normal standard of sensitivity there are two checks which should be made at the outset: (1) on the valves, (2) on the valve operating voltages.

Once the valves have been proved to be satisfactory, and each to be working at its proper voltages, it will be advisable to ascertain whether there is any lack of amplification on the L.F. side of the receiver, and a test with a gram. pick-up or an L.F. oscillator should be made. When it is definitely known as to whether the trouble is on the L.F. side, or on the H.F. side (or on both), the best scheme is to consider possible types of fault, and to carry out a series of elimination tests.

Dealing with L.F. trouble first: the speaker should be regarded with suspicion at the start and a test with a substitution speaker should be made. If the speaker does prove to be faulty some of the possible faults are:

Shorting speech-coil turns.

High resistance in speech-coil circuit.

Weak magnet (in permanent magnet type).

With a mains-energised type of speaker there may be shorting turns in the field winding. If the field winding is used for smoothing this fault would, however, probably draw attention to itself at an earlier stage of the proceedings.

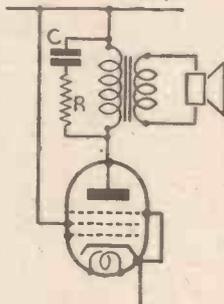
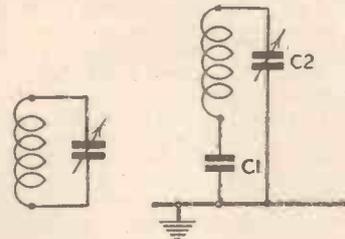


Fig. 1.—A tone control circuit which can create difficulty when trying to locate a fault.



Figs. 2 and 3.—A normal tuned circuit and a modification in common use which is referred to on page 252.

With a moving armature type of speaker there may be shorting turns or a weak magnet. The output transformer, if one is in use, should be tested for shorting primary or secondary turns, and for high resistance in the secondary. If there is choke-capacity feed to the speaker the choke should be tested for shorting turns, and the condenser for low capacity.

Where field, transformer and choke windings are concerned one should always be on the look-out for shunt condensers which may be shorting through, or have low leakage resistance, and may quite possibly cause suspicion to be wrongly directed to the windings. In the case illustrated in Fig. 1, for example, a short-circuit through C will throw the D.C. resistance of R across the primary of the output transformer. If R or C are not disconnected before making an ohmmeter test of the primary resistance the reading obtained will be somewhat lower than the actual primary resistance value.

Having cleared the speaker and any

## RADIO FAULT TRACING

(Continued from previous page)

speaker coupling system it is advisable to work back, circuit by circuit, towards the detector. It is to be anticipated that the coupling between two L.F. valves, or between the detector and an L.F. valve, will be one of the following types: resistance-capacity, choke-capacity, transformer, shunt-fed transformer, or shunt-fed choke, and faults in such systems are not usually difficult to trace. Test for shorting turns, resistances of too low values, shunt leakage resistances, and also check up on coupling condensers.

### The H.F. Stage

The high-frequency side of the receiver is not such an easy proposition if the fault happens to reside there. Remembering that the valves and their operating voltages have already been covered it is necessary to view all tuned circuits with suspicion.

The possibility of the group of tuned circuits contained on the H.F. side of the receiver being out of alignment (i.e., faulty ganging) must be considered and the adjustments of the various trimming condensers should be checked for correctness. Incidentally, the results obtained on the tests involved in a ganging check may very possibly reveal the location of the fault even though it may not be a fault of ganging adjustment. If it is found that the adjusting of any trimming condenser fails to have any effect on the output of the receiver, or if no definite optimum adjustment can be found, then the circuit concerned should receive very thorough examination.

Any H.F. tuned circuit forming part of the amplifying chain in the receiver contributes something to the over-all amplification, provided that the circuit is in the resonant condition. As far as the tuned circuit itself is concerned its quota of amplification arises in the sense that the voltage built up by the oscillations in the circuit exceeds the value of the E.M.F. that is exciting these oscillations. This "circuit amplification" is greater the lower the effective H.F. resistance of the circuit. Thus, if the amplification of any particular circuit is below normal it may either be that the circuit is mistuned or that there is excessive H.F. resistance. All this may seem to be very elementary but the point is that a number of fault possibilities become apparent if consideration is given to the above.

Taking the first reason for lack of

amplification (circuit mistuned), some of the faults to look out for are:—

Disconnected tuning or trimming condenser.

Wrong adjustment of the condenser.

Incorrect capacity of any fixed condenser involved.

In connection with the latter it is to be noted that although the simplest form of tuned circuit is as shown in Fig. 2, a large number of cases will be found in radio receivers where the circuit is of the character shown in Fig. 3, the circuit containing a fixed condenser in addition to the variable condenser. From the diagram it is easy to appreciate that C1 is part and parcel of the tuned circuit, but anybody not especially alert might be liable temporarily to overlook the fact when exploring round an unfamiliar chassis. Any defect in C1 will naturally affect the behaviour of the tuned circuit and, should the latter prove to be faulty, C1 should receive as much attention as any other part of the circuit.

### H.F. Resistance

Dealing with the second reason for lack of amplification (excessive H.F. resistance) some of the commonest faults are:—

High resistance joint.

Shorting coil turns.

Leakage resistance through trimming condenser.

Shunt leakage resistance of any kind.

There is rather a "snag" where shorting coil turns are concerned. Shorting turns will give a reduced D.C. resistance to a coil and the fault will probably be located by a careful ohmmeter test; but the actual effect of the fault in the radio sense is to increase the effective H.F. resistance of the circuit. Of course, another effect of shorting turns is to give mistuning, but as to whether this aspect will lead to the location of the fault will depend upon the particular testing methods that are being employed.

As usual, any grid coupling condensers must come up for investigation, and also any condenser that forms the coupling unit of a capacity-coupled band-pass system. One item that is rather more important than is sometimes appreciated is the anode by-pass condenser that is used in many receivers employing a triode or pentode detector. Where diode detector circuits are in use any H.F. by-pass condensers across the diode loads should not be ignored. By-pass condensers joined across bias resistances connected between

cathodes and chassis are not to be exempted from suspicion, until proved to be in order, as an open circuit will lower the amplification of the stage concerned. This is a case where shunt testing with another condenser may save time.

There are degrees of weak reception, and the cases of receivers that give exceedingly weak reception (say, faint traces of local stations only) are to be regarded as very possibly containing faults of the kind that were dealt with in the previous article dealing with "dead" receivers. Some receivers will give a trace of signals with faults which in other receivers would lead to complete absence of reception.

### Broken Grid Connection

The following is given as an actual example of a case involving very weak reception. It will serve also to illustrate a rule of importance, namely, to be on the look out for any special features or peculiarities of the fault symptoms with the object of taking advantage of any short cuts that may be indicated. The case was that of an all-wave superhet of modern design with which only faint sounds of local broadcasts could be heard. It was observed that the volume control had no effect upon these signals. From the fault-tracing point of view the matter of immediate importance was the failure of the volume control action, and no attempt was made to carry out general faulty stage localising tests. All that mattered at the moment was that there was some fault either in the volume control or at some point not far after it.

The receiver contained a double diode triode, functioning as second detector, A.V.C. detector and L.F. amplifier. The element of the volume control formed part of the signal diode load, and the grid of the valve was fed from the volume control through a resistance and a condenser. An ohmmeter test was made of the volume control and this was found to be in order. The next test was a continuity test from the grid to the condenser mentioned above and the fault was at once discovered. The lead from grid to condenser was a screened lead, and the wire had broken inside the sleeving. The volume control feature of the symptoms gave the clue, however. It should perhaps be mentioned that the weak trace of signals that could be heard while the fault existed were to be heard by virtue of stray coupling.

## SMALL P.A. AMPLIFIERS

(Continued from page 250)

be of the metal-screened type and the screening should be earthed. The mains input may be made by means of a standard power plug, but a heavy rubber-covered cable should be employed and an adequate length of this material should be carried, as it often happens that the nearest power or lighting point is at some distance from the most convenient point for housing the amplifier. The output leads need not be screened in the majority of cases.

### The Circuit

For most purposes three stages of amplification will be adequate, consisting of the input valve, one intermediate stage of L.F. amplification feeding into a push-pull stage. This means that, with the rectifier, there will be five valves in all along the front of the chassis, and these may be accommodated in quite a reasonable space. The smoothing choke and various smoothing and decoupling condensers should be

arranged in line at the rear, but care should be taken to keep the resistors from coming into contact with the earthed metal cases of these, and high-quality insulating sleeving should be slipped over the wires where they pass through the chassis. Vibration may otherwise result in the sleeving being worn through and a short circuit will result.

A skeleton circuit is given in Fig. 2, showing the wiring arrangements for the input and output boxes and the main amplifier. The mains section is not included as this may be modified by the builder to suit particular conditions. For instance, it may be built to deliver 250 volts only, with normal smoothing and medium-power valves in the amplifier, or a larger scheme may be adopted. By employing an output of 350 volts larger valves may be used, or a more powerful choke may be fitted to ensure more adequate smoothing and freedom from hum. Alternatively, a 500-volt output with super-power valves of the 400-volt type may be used. This will, however, only be

required when a very large volume is needed.

### Avoiding Feed-back

One of the greatest difficulties met with by the amateur when using apparatus of this type is microphonic feed-back, but in the majority of cases this may be avoided by placing the speaker to one side of the stage or in some equivalent position where the sound waves are directed away from the microphone. Screening the leads to the microphone is almost always a necessity, but must not be carried out if a condenser microphone is employed. The most effective type of instrument is the moving coil, as apart from its robustness, it is directional and when placed on a stage will be in the most favourable position to avoid pick-up from the speaker whilst offering maximum pick-up to the band or individual artist. The question of microphone transformer, tone-control and other incidentals must be left to the individual tastes of the user of the apparatus, and to the recommendations of the makers of the microphone.

A PAGE OF PRACTICAL HINTS

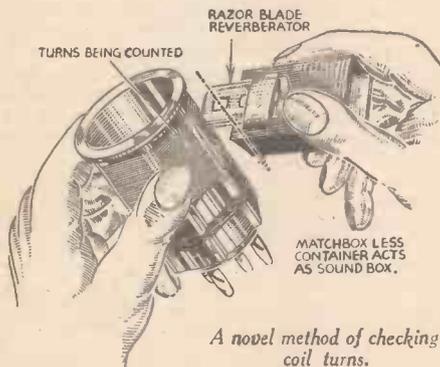
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Checking Number of Coil Turns

THE accompanying drawing illustrates a method I have been employing to facilitate the checking of single layer coils, and owing to its simplicity and negligible

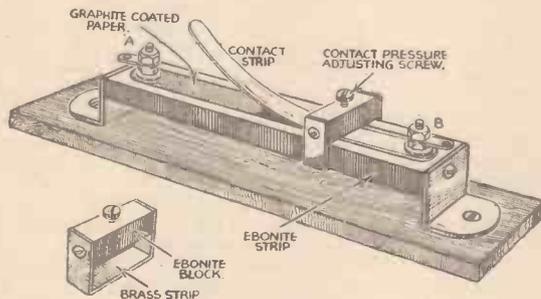


A novel method of checking coil turns.

cost I thought it might be of interest to other readers. Two slots are made in a matchbox casing, as shown, and an ordinary razor blade is fitted to act as a reverberator. The clicks given to the razor blade are amplified by the simple soundbox thus formed.—R. L. CLARKSON (Wolverhampton).

Effective Volume Control

I RECENTLY required a volume control in an experimental circuit, but could not find in the junk box a suitable value.



A simple volume control.

The shops were closed and I had to try to make up a temporary component. The arrangement finally adopted was so effective that I afterwards made it in a more substantial form and the accompanying illustrations show the general arrangement in details of the moving part. As will be seen a strip of ebonite forms a body, supported at each end by metal brackets. Affixed to the top of this body is a strip of graphite-coated paper, two terminals with large washers making firm contact at the ends. The graphite may be obtained from commercial blacklead such as is used for cleaning stoves, or from some other source. Clamped over one end of the element strip is a strip of thin, springy brass, bent so that

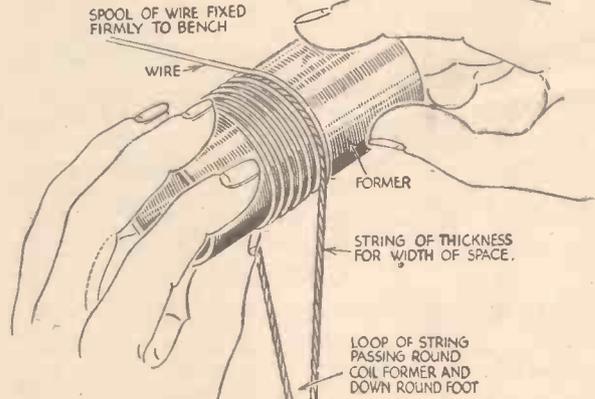
THAT DODGE OF YOURS!

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it normally stands clear of the element throughout its length. Sliding over all is a block of ebonite strapped by means of a strip of brass, and fitted with an adjusting screw in the top. This is shown in the small detail drawing. It will be seen that as this part of the control is slid along it depresses the brass arm and this gives a variation in the resistance between the two terminals which is frictionless and will not wear out the element. It is also quite noiseless in operation. The element may be adjusted for various values by cutting the sides of the paper strip away as found by trial.—E. C. ADAMS (Rhydyfelin).

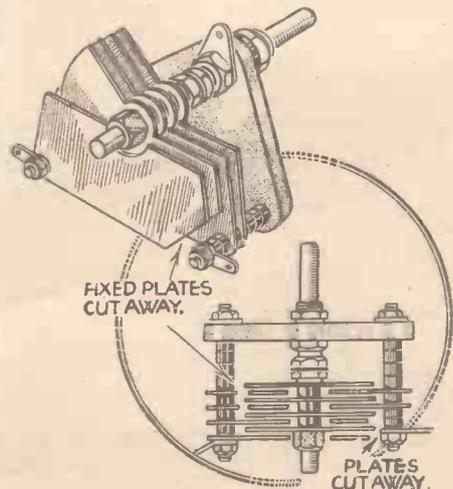
A Coil-winding Dodge

THE accompanying sketch shows an idea of mine for coil winding which saves time and patience. Having had a good deal of trouble with the spacing of turns, I found that by using a piece of string the width of the space and long enough to make a loop to go round the coil former, and also round my foot, and fixing the spool of wire tightly enough to need a slight drag to uncoil it, I can wind my coils now quite



A coil-winding dodge for accurately spacing turns.

transmitting apparatus. For the latter, high insulation is essential.—L. KNIGHT (Letchworth).



Adapting a midget condenser to one of the split-stator type.

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# TRANSMITTING TOPICS

## Station Layout, Keying, and Keying Circuits are Dealt With in this Article - - - - By L. ORMOND SPARKS

**M**ANY beginners are so anxious to carry out tests, as soon as they have completed the assembly of the essential apparatus of a transmitting station, that they do not stop to give the actual planning of the station any consideration, with the result that they are often disappointed with their initial tests and the absence of contact reports.

While fully appreciating that all of us are subject to such impatience, it is a procedure that should not be encouraged, as apart from the question of loss of

efficiency there is also the question of risk to the operator and, of course, other people in the house, so if hook-up tests are made, always make quite sure that everything is left well protected, and all mains gear rendered absolutely dead, as soon as the tests are completed. The best way, and the one which should be adopted right from the start, is to plan the station before commencing any constructional work.

is any tendency in that direction, it is quite an easy matter to make "duck boards" to stand on, thus reducing the possibility of nasty shocks from the H.T. and mains gear. Ample light is also another very desirable feature, while a good lock should always be fitted to the door. The supply mains should be connected to a small "iron clad" double-pole/double-throw switch, equipped with fuses, close to the point where they enter the shed, thus allowing a master control to be provided for all electrical wiring (mains) used for the installation. Do not on any account allow the wiring to be of the "hook-up" style; use conduit or lead-covered twin wire, and see that a proper job is made of all fittings and switches. If the apparatus has to be housed indoors, there are many spots which can be quite easily converted into a comfortable "den"; for

sole use of a room for one's activities everything is simplified considerably, providing that it is not situated so that annoyance will be caused to other members of the household when the station is operating during the late hours of the night, and the early hours of the morning.

### Station Layout

It is not possible to lay down any hard and fast rules concerning this, but the fact should not be overlooked that many hours will be spent "on duty" and it is essential, for that reason, that adequate light and ventilation are provided, while some means of controlling the temperature, both winter and summer, are equally vital. If it is a question of choosing between space and the comforts mentioned above, then I think that the latter should receive the deciding vote, as it is impossible to concentrate and do serious work under uncomfortable conditions.

Although there are no very definite rules concerning the layout and arrangement of all the gear, as so much depends on facilities available and general conditions, therefore, I have outlined only those points which should receive chief consideration.

### The Transmitter

The actual location of the transmitter proper will be governed by the position of the feeder lines, but it is advisable to fix it up on a stout shelf within reach, if possible, of the operating table or desk.

### Power Equipment

The mains unit is best housed in a stout metal case or cover and placed well away from the transmitter, speech amplifier and "mike" equipment. It should be in a readily accessible spot and yet out of harm's way. A very good idea is to stand it on a firm stand about a foot off the floor and to one side of the operating table.

### Operating Table or Desk

This should consist of a stout table, shelf or desk to which can be fixed the operating key, control switches and pilot lamps, and on which can rest the receiver, monitor, measuring instruments, log book,

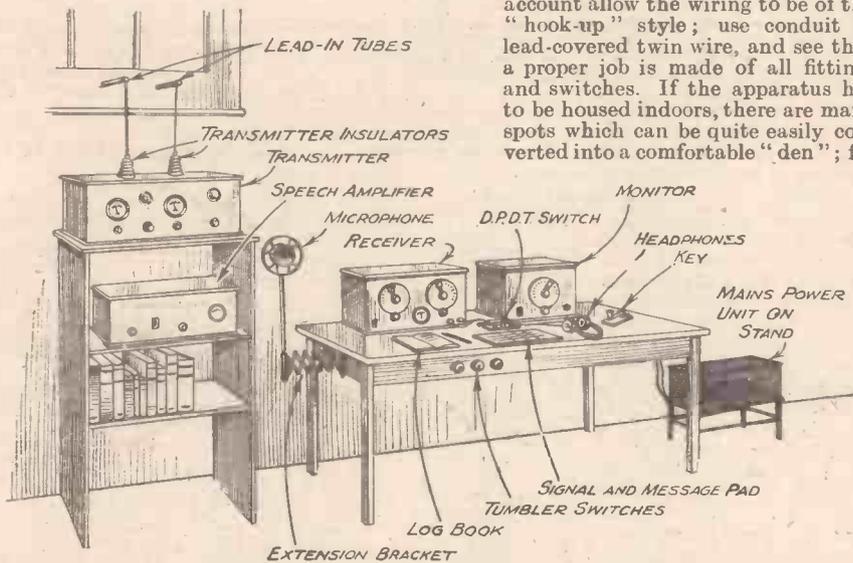


Fig. 1.—Suggested arrangement of the amateur transmitter's "den" to provide efficiency and comfort.

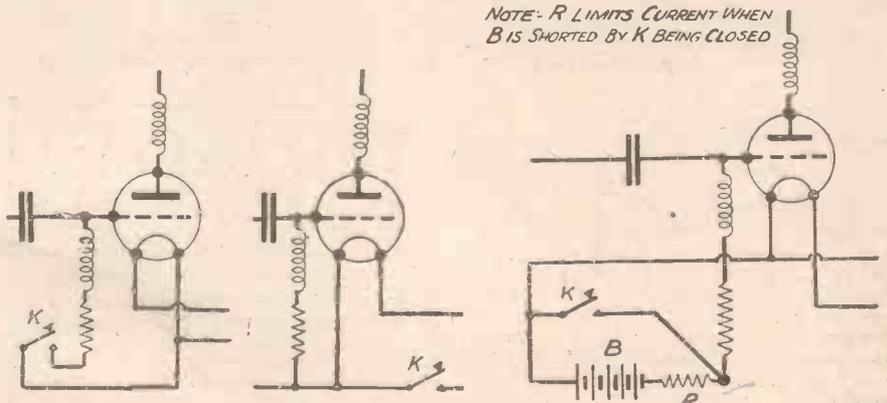
example, quite a lot of serious work can be carried out in a loft, old lumber room, attic, or large cupboard, while certain cellars and basements must not be overlooked as a last resource. With flat dwellers the position is not always so easy, as space is often the controlling factor. However, where there is a will there is usually a way, and some existing piece of furniture, say, a cabinet, desk, or cupboard can usually be found to house the gear.

Of course, where conditions permit the

### Location of Gear

One of the first things to be settled is where is the apparatus going to be used.

If one is not already the fortunate possessor of a private spot wherein all radio work can be carried out without disturbing the rest of the household, it will be necessary to start looking round the house or garden for a suitable spot which can be commandeered without causing trouble in the domestic sphere. Many stations are housed in a shed, shack or workshop in the garden and such an arrangement is often highly satisfactory, assuming that the structure is perfectly weatherproof, fitted with mains supply and provided with some form of heating. It is, of course, a great asset if the shed is so placed that the aerial feeders can be taken in without difficulty or obstruction. There are one or two points to watch with such accommodation. See that the floor is of such a nature that it is not damp; if there



Figs. 2, 3 and 4.—Suggestions for keying under varying battery circuit conditions.

pads, and headphones or speaker. An ordinary white wood kitchen table, with the top covered with plain brown or green lino is very satisfactory, as one is then not afraid of using holding down screws where necessary.

It is essential that the key is placed to allow ample rest room for the arm, while space must also be allowed for the unrestricted use of the log book and signal pads.

The diagram, Fig. 1, shows the idea, and the suggested position of the switches, one of which should be for the control of mains supply. The others will depend on circuit requirements, but it is a good idea to embody a D.P./D.T. type for changing the headphone over from receiver to monitor, while another will be necessary for microphone and/or key.

**Full or A.A. Licence**

It might be thought that all these details apply only to a "full" licence station, but that is not the case, as it is equally, if not more so, important for the beginner or A.A. man to take a good deal of trouble over the layout and methodical operation of his equipment, otherwise he will never get the full benefit of his licence. After all, it does not matter whether the output is 1 or 100 watts, the main interest and pursuit is the same, namely, to obtain the maximum efficiency from the gear in use, and that applies to each individual part of the station from the power switch to the aerial and its supports.

**Keying and Keying Circuits**

Perfect keying is a pleasure to listen to, and a station very soon becomes known for perfect telegraphic transmissions; in fact, it might be said, and quite rightly, that the hall-mark of a station is the manner in which the key is handled, and the quality of transmission.

If Morse signals are going to be radiated, then it is essential for the operator to concentrate on becoming key perfect. Such a happy state can only be reached by several months of steady, consistent practice, and I would suggest that it is one item which should receive prime consideration of the A.A. licence holder.

For the first month or two, forget all about speed work, and concentrate on clean-cut signals, proper spacing and correct periods of contact for both dot and dash. Once these items have been mastered, speed will come much more easily, and your signals will be readable.

**Object of Keying**

It is obvious that if telegraphic information is to be transmitted, some means must be provided whereby the aerial H.F. currents can be interrupted according to any pre-arranged code, for example, the Morse Code, and it is usual, with the types of transmitters under consideration, to use a hand operated key for the purpose.

While it would seem quite an easy matter to insert a key or switch to break the H.F. currents, there are certain requirements which must be considered, otherwise, variation in the frequency of the transmission will be produced; severe interference will be caused to nearby receivers; the possibility of shock to the operator and the oxidising of the key contacts by arcing.

One of the simplest ways of connecting the key is as shown in Fig. 2, where it will be seen that it is in series with the negative H.T. leads. Such an arrangement is quite

satisfactory for low-powered outfits, but it must be appreciated that there is always a possibility of shock if contact is made between the two sides of the key.

More widely used methods are those shown in Figs. 3, 4, and 5, which operate on the system of controlling the anode current by the application of correct bias when the key is in each position, i.e., open and closed.

It will be noted that these methods eliminate the possibility of shock,

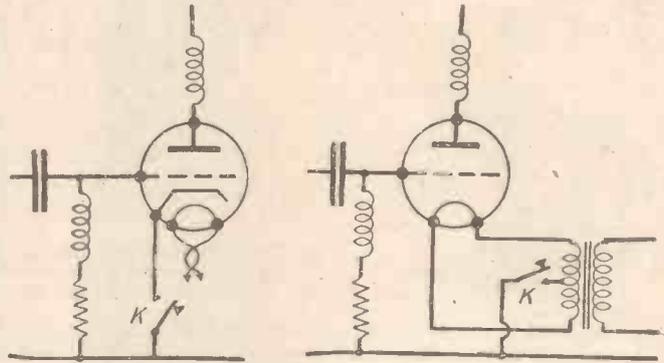


Fig. 5.—How to arrange for keying with mains-operated valves.

therefore, they can be used on high-powered transmitters.

**PETO-SCOTT EVERYTHING RADIO — CASH C.O.D. or EASY TERMS**

**NEW 7-watt HIGH-FIDELITY 8 valve ALL-WAVE A.C. MAINS SUPERHET**  
 4 WAVEBANDS: 10-21, 20-53, 200-550, 800-1,000 metres. **12 Months' Guarantee**

The first British Octal Valve Superhet! Another triumph for Peto-Scott Engineers, embodying an entirely new form of chassis building, with amazing sensitivity and selectivity on every wave-band.

- Screened R.F. and I.F. valves. ● 7-watt undistorted high-fidelity output.
  - Large dial calibrated stations and metres. ● Volume and tone control for radio and grammo. ● Rationalised tri-unit construction.
- Circuit comprises 8 octal-base British valves, pre-I.F. selector, ratio frequency amplifier, octal triode-hexode frequency changer, I.F. amplifier (465 kc.), double diode triode, providing rectification, automatic volume control and low frequency amplification following phase reversing valve, 2 I.F. power pentodes, providing 7 watts undistorted fidelity output. Highest grade components. Every chassis rigidly tested on actual broadcast-line. Size: 10 1/2 ins. high; 10 ins. wide; 3 1/2 ins. deep. For A.C. mains 200/250 volts, 40/80 cycles. Cash or C.O.D. with 8 British Octal Valves. £9/17/6, or £1 down and 11 monthly payments 17/3.

**£9:17:6** **£1 DOWN**



**9-VALVE MODEL.** As illustrated above, but with an additional 465 kc. intermediate frequency stage. Cash or C.O.D. £11/19/6, or 39/6 down and 11 monthly payments 11/.

Special Peto-Scott High-Fidelity field energised speaker built to our specification, specially designed for use with the 8 or 9-v. Chassis. 1,200-ohms field with push-pull output transformer £2:7/6, or add 5/- to deposit and 4/3 to each monthly payment

**PUBLIC ADDRESS APPARATUS**

**\* HIGH-FIDELITY \* AMPLIFIER \* HIGH-FIDELITY \* MICROPHONE**



**£4:10:0** with valves **7/6 DOWN**

- 4 valves: triode, resistance transformer coupled to 2 triple grid power amplifier valves, in push-pull, full-wave rectifier. ● Designed to eliminate parasitic oscillation in output stage.
- Fixed tone balance. ● Tapped and screened mains transformer. Electrolytic condensers. Volume control. Mains consumption approx. 60 watts. Output 6 watts undistorted. With microphone, speech reproduction easily heard at distance of over 500 feet.

**MODEL A.C.67.** For A.C. mains. 200-250 volts. Ready to connect to microphone or pick-up. Size 7 1/2 ins. high, 4 1/2 ins. wide, 10 ins. long. Cash or C.O.D. £4/10/0, or 7/6 down and 11 monthly payments 8/6.

**£2:2:0** **2/6 DOWN**

A scientifically designed Carbon Microphone for home entertainment and all Public Address purposes. Transverse current type, giving excellent response at all frequencies. Employs Carbon electrodes and finely graded carbon granules. Diaphragm of finest grade white mica, protected by metal grill. The microphone is housed in a bakelite moulding of attractive design. The whole microphone assembly is supported on 4 sensitive springs attached to a chromium plated ring, supported on a black moulded base. Microphone connections are made to two terminals on back. On-off switch. The 30-1 Transformer is housed with bias battery in separate bakelite moulding, permitting greater efficiency free from parasitic noise. Including 25ft. braided and twisted flex.

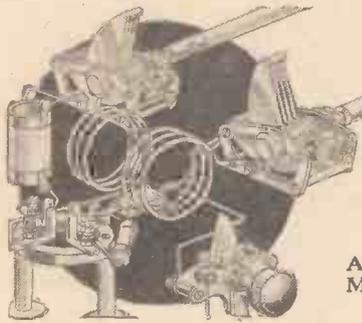
**Height of Microphone Assembly 10 1/2" Size of Transformer 3 1/2" high; 5 1/2" wide; 2 3/4" deep.**

**2/6 DOWN** Cash or C.O.D. £2:2:0, or 2/6 down and 11 monthly payments 4/-

**Field Energised SPEAKER**  
 Model G25, for use with above. 10" diam. cone. Resistance 1,250 ohms. Electro-magnet of special annealed steel. Power handling capacity 6-7 watts. With separate push-pull input transformer. Cash or C.O.D. 25/- or add 2/6 to Amplifier deposit and 2/4 to each monthly payment.

**COMPLETE PUBLIC ADDRESS SYSTEM**  
 Comprising Microphone, Transformer and flex, Amplifier, Speaker, Transformer, and 50 feet 5-way Speaker Lead, as above and on left. Cash or C.O.D. £8:7:6 or 15/- down and 11 monthly payments 15/6.

**15/- DOWN**



# Short Wave Section

## IMPROVING THE SHORT-WAVE RECEIVER.

A Practical Article Pointing Out the Ways and Means Whereby the Experimenter can Improve His Existing Set. By A. W. MANN.

THE experimenter of experience usually has definite ideas concerning short-wave receivers, and can decide for or against any particular design or make, after a careful study of a detailed specification; or alternatively a theoretical circuit diagram. A working knowledge as to the general make up, sequence of valves, type of circuit, etc., together with the benefits

and that amateur methods of construction left much to be desired, results were comparatively good.

Later the introduction of chassis constructional methods enabled us to further improve the performance of standard circuit receivers. The feeling, however, exists in the mind of the experimenter, that further improvement is possible. The real

on commercial lines, and on ultra-short-wave principles.

These statements are best clarified by means of questions and answers:—

1. Examining a commercial short-wave or an all-wave receiver, what features of construction are noticeable at a glance?

Answer. Sound chassis construction, compactness, and efficient interstage screening.

2. Examine an ultra-short-wave receiver, and what is most noticeable?

Answer. Compact layout, short and direct wiring, low-loss components and construction throughout.

Now, in theory, the combining of chassis construction, efficient screening, low-loss components, short and direct wiring and compact layout appear attractive as the lines on which to build the old circuit in new form, and so it will be found to work out in practice, providing care is exercised and attention paid to details during the constructional period.

### Screening Pointers

First we must decide what to screen, and how to carry out the screening. Reverting to Fig. 1, it will be noticed that dotted lines A-B-C-D surround the H.F. stage components. Likewise E-F-G-H is also dotted, surrounding the detector stage components, and in both instances denote separate and distinct screens at earth potential.

Now refer to Fig 2, which shows a plan view, and consists of a metal chassis on which are mounted two metal screening boxes, together with a metal panel. These boxes are bolted to both chassis and panel, making good mechanical and electrical contact in order to avoid crackle and various other troubles. In this instance lids are not fitted to the screening boxes.

The first box contains the H.F. components, the second one the detector stage components, and includes the coupling condenser of .0001 mfd. capacity.

### Arrangement of Screening Boxes

The single stage of low-frequency transformer coupling is arranged on the chassis face alongside of the detector stage screening box. It will be noticed also that provision for aerial and earth, H.T., L.T., and output connections are made at the back of the chassis. The grid-bias battery may be mounted underneath the chassis if desired, although shown on the top in the examples given.

In Fig. 3 a much improved arrangement is shown. Here the respective screening

(Continued on opposite page)

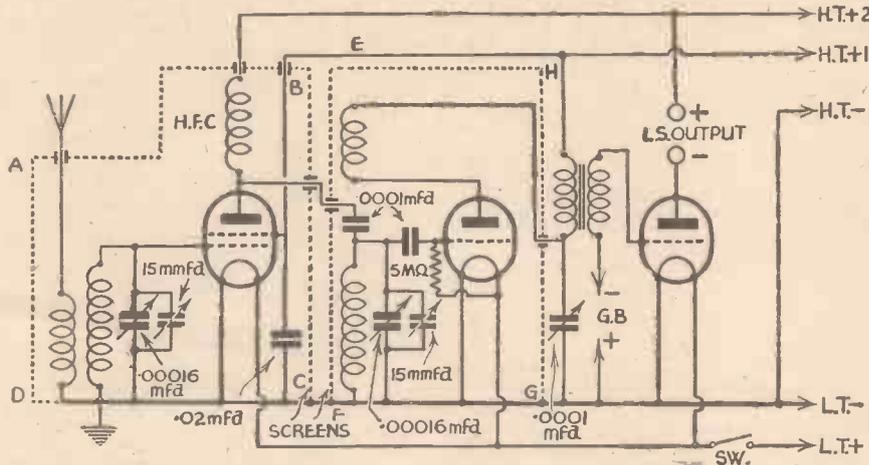


Fig. 1.—How to screen the H.F. and detector stages. A B C D mark the limits of the H.F. screen and E F G H the limits of the detector screen.

only to be derived from practical experience, enables him to form an idea as to what may be expected in the way of performance.

Whatever the theoretical ideal may be, cost is the deciding factor, and the most satisfactory state of affairs is when one can build the best possible receiver within one's means, using only the best makes of components chosen with a view to being able to use them in subsequent designs.

### A Dependable Circuit

Let us refer to Fig. 1, which shows a straightforward three-valve sequence as follows: Tuned S.G. H.F. or radio-frequency stage, capacity coupled to a throttle-controlled regenerative detector followed by a single stage of transformer coupled audio-frequency.

Whilst by no means a new circuit, it is a well-tried and dependable one; a solid foundation upon which to plan and build a first class receiver suitable for S.W. broadcast, amateur 'phone and C.W. reception. Granted, it will not be as selective as a modern superheterodyne, but on the other hand possesses certain advantages not to be found in superhets, but naturally associated with all T.R.F. circuits.

Some years ago, a receiver of this type would have been built on baseboard lines with an aluminium screen, designated as B.C. in the theoretical diagram. The lead between S.G. anode and detector grid being insulated where passing through the screen.

Taking into consideration the fact that specially designed components were few,

problem being how to effect such improvement.

### A Simple Solution

The solution to the problem is by no means as difficult as might first appear. We must, however, formulate a definite plan in order to achieve success. The best possible procedure to adopt is to dismantle the existing receiver and rebuild

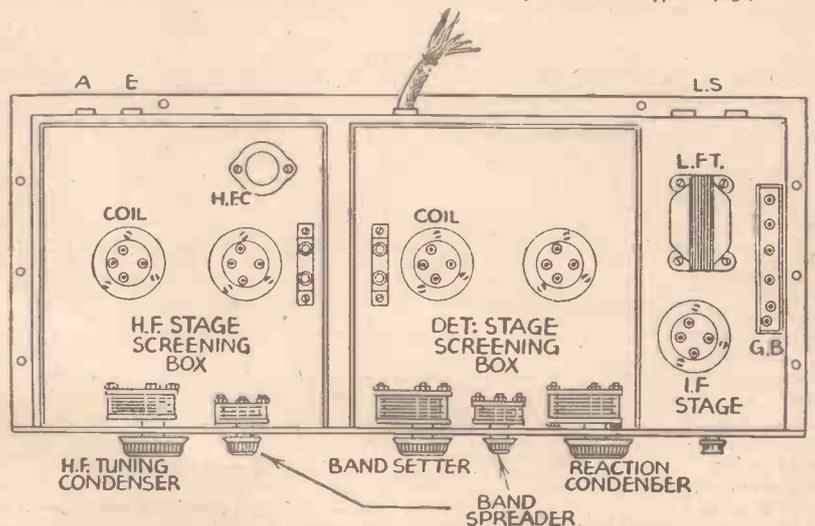


Fig. 2.—Plan of layout to incorporate screening as shown in Fig. 1.

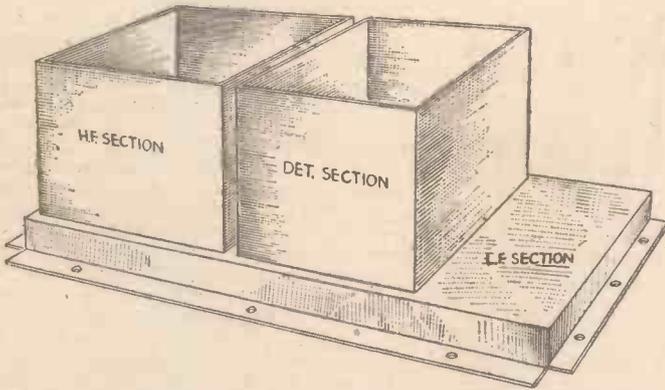


Fig. 4.—How the screens should be mounted on the chassis. Note that no lids are fitted in this particular design.

(Continued from facing page)

boxes are set back from the front panel, and short extension rods are used to couple the tuning condensers to their respective dials or controls.

Now this arrangement has much to recommend it. For example, lids may be fitted to the screening boxes and thus provide total screening of the H.F. and detector stages individually. Another advantage is that in addition to the front metal panel or main panel, we have in effect two sub panels formed by the front faces of the screening boxes.

Fig. 4 shows the general arrangement of chassis and screening boxes. It will be noted that the screening boxes are bonded at one end only: in the first example, Fig. 2, by means of the metal panel, and in the second instance, Fig. 3, by means of a metal strip. Another suggestion is to make one metal box and divide it into two parts by means of a sheet metal partition. This is often done more or less satisfactorily, but in doing so one fact is overlooked.

The partition can, and sometimes does, act as an interstage coupler instead of a screen.

By adopting the individual screening-box system, bonded at one end only, greater screening efficiency is obtained and undesirable coupling effects are avoided.

The foregoing suggestions are presented as the basis of individual experiment. Taking into consideration variations in the dimensions of components, and other factors which differ in the case of individual experimenters, it is impossible to give dimensions which would meet general requirements.

The keen experimenter who can use tools and drawing instruments should try his hand at designing his own receiver and screening system, basing his design on the suggestions given, modifying and adapting

them to suit his own particular requirements.

Now let us again revert to Fig. 1, the theoretical circuit, and study it in conjunction with Fig. 2 and Fig. 3.

**Band-spreading**

In the theoretical circuit diagram, 15 mmfd. band-spreading condensers are incorporated in both the H.F. and detector stages. Now this is correct fundamentally, but as shown in practical form in Figs. 2 and 3, cannot be regarded as good practice, yet I have seen such methods adopted because it enabled the operators to calibrate both tank and band-spreading condensers.

This advantage, however, introduces a very big snag because it complicates operating procedure, and, after all, ease of tuning is the main object.

In this instance, however, we have five tuning controls. The two tank condensers can be set, after which the individual band-spreaders must be adjusted in step. In these circumstances, there are two alternatives, i.e., to apply band-spreading to the detector stage only, and arrange matters so that the H.F. tuning is reasonably flat

to give volume or gain control effect, and in doing so retain the advantages of being able to calibrate band-spread settings.

**Extension Rods**

On the other hand, we may mount two separate band-spreaders at right-angles to the main or tank condensers, and couple them in gang by means of extension rods, controlling them from the left-hand end of the cabinet or screening box. This, whilst not allowing calibration of spreading, is the most satisfactory arrangement, as it simplifies tuning, and provides an easy tuning position. Taking into account that suitable band-spreading condensers are obtainable at about 1s. 4d. each, it is worth considering.

On the other hand, high reduction ratio tuning dials or mechanical band-spreading may be used in both H.F. and detector stages, and sufficient alternatives have been suggested to enable the experimenter to choose the most suitable according to individual requirements, using the forms of construction outlined in Fig. 3 and Fig. 4.

Circuit modifications can be carried out later if desired. For instance, an H.F. pentode may replace the S.G. valve in H.F. stage, an L.F. pentode replace the output power valve, and the detector stage could be modified for S.G. detection.

Taking into account that the cost of aluminium sheet if purchased from hardware stores is comparatively cheap, the outlay of a few shillings will prove to be justified when measured in terms of performance and increased efficiency.

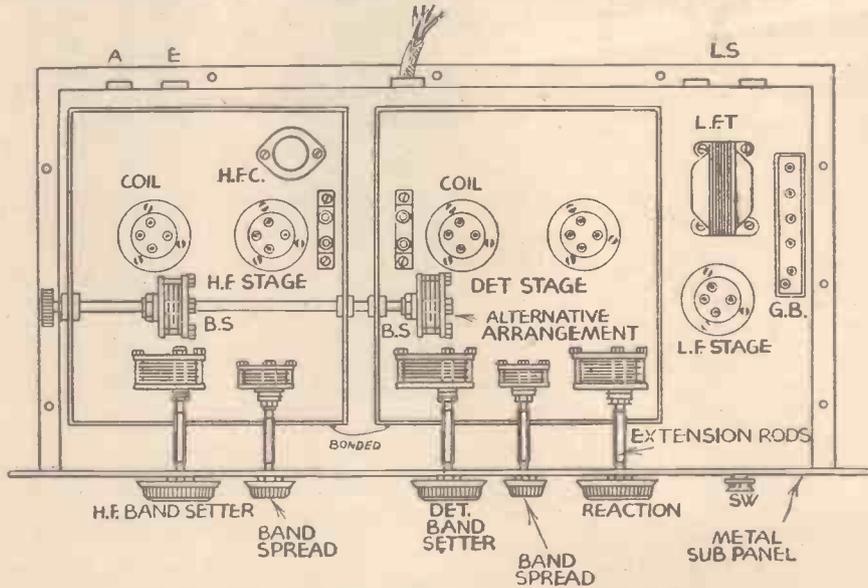


Fig. 3.—For some circuits the modified layout shown here may be employed.

**A Worth-while Catch**

**T**14NRH, Heredia, Costa Rica, one of the pioneer short-wave stations, is back on the ether with a regular daily schedule of programmes, namely, B.S.T. 02.00-04.00 and 05.00-06.00. On special occasions when concerts are dedicated to some DX Radio Club the studio may be heard as late as B.S.T. 08.00 and even 09.00. All announcements are made in English, French and Spanish, the station calling itself *La Voz de Costa Rica*. As a rule transmissions open up with a bugle call reminiscent of the *Reveille* and close down with *The Last Post*. As a slogan Heredia has registered: *The City of Flowers in the Land of Coffee Trees*.

**LEAVES FROM A SHORT-WAVE LOG**

**How Radio Captures Criminals**

The C.I.P.C. (International Commission of Criminal Police) now possesses radio transmitters in Paris (France), Vienna and Salzburg (Austria); Budapest (Hungary); Warsaw (Poland); Bucarest (Romania); Zurich (Switzerland); Bratislava (Czechoslovakia); Berlin and Munich (Germany); Madrid (Spain) and other centres. With the exception of Bratislava, which works on 1,463 m. (205 kc/s) all other stations utilise short-wave channels, namely, 44.17

m. (6.792 mc/s), day wave; 72.03 m. (4.165 mc/s) night wave, and as a reserve, 85.96 m. (3.490 mc/s). Transmissions are in code.

**Radio Morue**

The *Saint Yves*, a floating church installed on a steamer operated by the Newfoundland deep sea fishermen, possesses a wireless transmitter enabling it to remain in constant touch with the units of the fleet trawling off the Grand Banks. It has been styled: *Radio Morue* (Cod) and works on 175 m. (1714.28 kc/s). An experimental amateur F3KJ, frequently secures two-way communication with the operator of the *Saint Yves*.

# Practical Television

May 29th, 1937. Vol. 3. No. 52.

## At the Royal Society

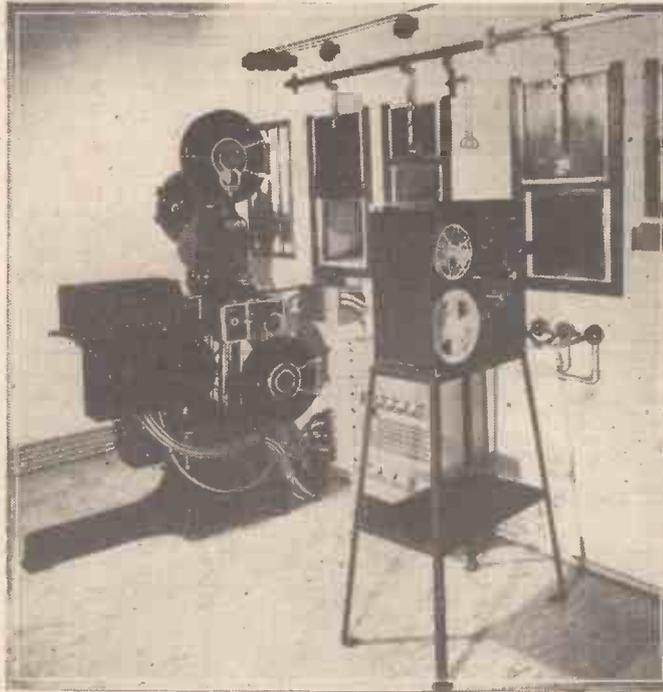
A FEW days ago the Royal Society held a conversazione at Burlington House, and it is interesting to note that this society was incorporated in 1662, the founder being Charles II. A most varied exhibition was staged, and among the items of scientific importance were one or two relating to television. The G.E.C. showed what is termed an electron microscope. This device, although not generally on the market owing to its specialised applications, is an ingenious adaptation of electronic principles. The optical image of the subject under examination is focused on to the surface of a cathode, and the resultant electron image produced is drawn forward to a small fluorescent screen. Focusing is carried out either electrostatically or electro-magnetically, and a perfect image is reproduced on the screen itself. The detail and quality of reproduction are outstandingly good, and by a special shaping of the cathode, "pincushion" distortion is entirely removed. With a cathode of the right type, still or moving subjects can be illuminated with an infra-red light. This is of particular value, for it permits the examination of live and moving specimens of micro-organisms which would otherwise be destroyed when an examination was carried out through special forms of colouring; the invisible infra-red illumination of these organisms is in no way detrimental. The same type of converter can be used for smoke and haze penetration with infra-red filters, and also in infra-red long distance photography. The actual converter tube itself can be made with either a semi-transparent or an opaque photo-electric cathode. The device is simple to operate and requires but little auxiliary apparatus to make it function.

In the same section Baird Television, Ltd., exhibited an electron image camera tube. Under working conditions an optical image of the scene to be televised is focused upon a photo-electric cathode having a very uniform surface of high sensitivity. The resultant electron image so formed in proportion to the degree of light to which the cathode is exposed is then attracted towards the other end of the glass-walled tube, and scanned across a fixed aperture by an ingenious combination of electrostatic and electro-magnetic fields. This electron television signal current is then amplified by means of a secondary emission multiplier, the resultant current constituting the camera's output. Two forms of Baird multiplier photo-electric cells were also shown, these having a primary sensitivity of about 40 microamps per lumen. Diagrams showed how the released primary electrons pass through a chain of electron

permeable grids, which in turn liberate secondaries, and in this way the resultant current gain factor can be as high as one hundred thousand.

## Historic Exhibition

WHAT is appropriately described as the first public exhibition to be devoted solely to the historical development and present attainments of television will be opened at the Science Museum, South Kensington, by Lord Selsdon on June 10th, and will last for approximately three months. All the principal British



The film projection room at the B.B.C.'s Alexandra Palace television station.

## ZOO PROGRAMME.

Coronation visitors from the Empire are being entertained at the Zoological Gardens on May 28th, and Mr. Seth Smith, who gives a special television talk in the evening of that day, is arranging to bring an unusually interesting collection of animals to the studio. Meanwhile, in the new art studio in Regent's Park, the Empire guests, numbering more than five hundred, will watch the display on several television receivers. Instead of choosing animals from one particular section of the Zoo, Mr. Seth Smith will range the Gardens for the best representatives of each "house." The collection will include chimpanzees, penguins, and bear cubs.

television manufacturing firms are co-operating with the Museum authorities as well as the B.B.C. and Radio Manufacturer's Association. Members of the wireless section of the Institution of Electrical Engineers are to be given an opportunity of being present at a private view on the opening day, while the public are to be admitted daily from 10 a.m. to 6 p.m. except on Thursdays, Fridays and Saturdays, when the closing time will be 8 p.m. The primary object of the exhibition is to demonstrate what television really is and to show how it works, for there will be working models to illustrate the different principles of transmission and reception. The display will be fully representative, including many of the mechanical and electrical devices proposed and tried with varying degrees of success by different inventors, and certain historical pieces of apparatus will be seen for the first time. Readers will no doubt recall that one of the earliest suggestions for transmitting pictures and scenes to a distance was made in 1873 when the light sensitive properties of selenium were discovered, but over sixty years has had to elapse before anything approaching an acceptable public service could be furnished. Scanning, light modulation, mechanical receivers, electronic receivers, modern television cameras, and all the various devices which together make this work possible will be assembled under one roof.

## Fearing Competition

CERTAIN sections of the film industry are somewhat disturbed at what they allege is competition arising from the showing of television pictures in licenced houses. Recently the London and Home Counties branch of the Cinematograph Exhibitors' Association asked the Entertainments Committee of the London County Council to receive a deputation and discuss the matter. It has been decided by the L.C.C., however, that for the time being at least no action will be taken. Certain legal aspects arise and it is urged that entertainment licences should be taken out, and supervision undertaken so as to ensure the safety of the public. There is

a wide difference, however, between a crowded public cinema show and a relatively local demonstration of television to a small number of customers in public-houses. No doubt the Performing Rights Society is paying due attention to the matter, and it is known that the B.B.C. have no objection to the public exhibition of their television programmes. In an effort to popularise this new form of entertainment it is essential to demonstrate to as wide an audience as possible, and no doubt an amicable arrangement will be settled eventually which can meet the interests of all concerned without in any way providing difficulties during these early stages of television's development.

## Signal to Noise Ratio

IN ordinary radio and telephony work the expression "signal to noise ratio" is almost self explanatory, for it is a measure of the difference between the level of the signal desired to that brought about by any

electrical effect which introduces a level of unwanted noise into the equipment as exemplified by the mush, hiss or back-ground superimposed on the audio signal reproducer. In multi-stage amplifiers even the valves themselves can set a limit to the degree of amplification achieved, while stray magnetic fields induce effects which can mar an otherwise satisfactory circuit. Although research has been applied to this problem, and certain equipment developed which can give a fairly accurate measure of the ratio, when it comes to television the problems are magnified very considerably. To achieve the required degree of vision signal amplification, and yet retain the wide band of modulation frequencies involved, the vision chassis incorporates a large number of stages of low gain. This tends to complicate any form of measurement that may be devised, and when considered properly it is not a question of noise as far as the picture is concerned, but a visual effect due to any form of interference whether induced from some external source such as motor-car ignition systems, or a fine grain mesh which spreads over the whole of the available picture scan area. In the present state of television's development, the only really satisfactory method is a qualitative one, and not a quantitative scheme. That is to say, engineers who are looking-in daily during the course of their research work, and routine testing, become competent judges by means of the eye as to the degree of unwanted signal which is present in the vision transmission. The amount of visual interference which the human eye will tolerate without bringing about a state of annoyance is relatively low, and concentrated effort is being directed towards increasing the signal to noise ratio to the maximum possible, coupled with schemes which reduce the visual effect of any interfering electrical signal which may arise either occasionally or regularly. Modified forms of A.V.C. have been attempted with devices which turn a light splash into a black spot, so that the eye when observing the received pictures at the correct viewing distance fails to take cognisance of the offending signals.

**Flyback Lines**

WHEN a cathode-ray tube receiving set is switched on during those periods when no television signal is being radiated, the scanning field will be built up from the usual trace lines, and a relatively small number of bright inclined lines. The latter are present as a result of the spot flying back from the bottom of the picture frame at the end of the trace to the top of the frame for the start of the next trace. The period of time occupied by the beam in carrying out this bottom to top movement is, as a rule, merged into the frame synchronising signal, and in consequence the flyback lines are invisible during looking-in periods. The allocation for this is expressed generally as a definite number of picture lines, and for proper operation the time base generator must have a sufficiently small flyback period for it to be less than the time allocated to the frame synchronising pulses. If this is not the case, then the frame flyback lines will show themselves on the screen, and so mar picture reception. Since the B.B.C. have now reduced their frame synchronising period to the scheduled minimum, set designers have had to be careful to ensure that these lines are not visible. By very carefully adjusting the frame speed and frame lock controls, however, the set user, when this effect does occur, can in most cases clear them from the picture area, although under these condi-

tions the picture is liable to jump because the time base generator is just on the "edge" of the picture hold position. Now that the correct conditions for the radiated picture and synchronising signals are being maintained, however, set designers are taking care of this point, and the trouble is of infrequent occurrence.

**Coronation Television**

THE B.B.C. announces that the Coronation procession was seen by television as far away as Brighton, and telegrams and telephone messages of congratulation have poured into Alexandra Palace.

Mr. Westhead, of Brighton, had an audience of sixty people to see the procession on two cathode-ray tubes operated by one receiver. An Ipswich viewer telegraphed that it was an unforgettable experience; both sound and vision were received perfectly.

Mr. Thubrun, of Fleet, Hants., thirty-seven miles away, saw the procession perfectly. From Rochester (Kent) came congratulations and a report of good reception.

A South London report indicated that reception was as perfect as at Alexandra Palace itself and at Broadcasting House.

**ABOUT MAINS UNITS**

*(Continued from page 249)*

300 to 350 volts instead of 250, and the transformer winding must be of the 350-0-350 volt type. Even though the current consumption in this case is only 50 mA, it is permissible to use a rectifier having a rated maximum current output of 120 mA, provided that the voltage output does not rise excessively as the current is reduced—most modern rectifying valves have a good regulation and the rise in output voltage when the current taken is half the rated maximum, is very slight. The choice of smoothing condenser is also of great importance in a mains unit of this type. These condensers must have a rated working voltage equal to, or higher than, the actual voltage across their terminals. In the unit mentioned above, the reservoir condenser should have a working voltage of 350 and the smoothing condenser 250, or higher.

**A.C./D.C. Units**

In A.C./D.C. receivers, it is customary to omit the mains transformer, and connect the rectifier, on the half-wave principle, between one of the mains leads and the smoothing choke. Connected in this manner, the rectifier rectifies A.C. and acts as a low resistance to D.C. The output voltage is, therefore, lower than the mains supply voltage. As this seldom exceeds 240 volts, the smoothing choke in this type of unit should have a low resistance in order that sufficient voltage may be applied to the valve anodes. The method mentioned above, in the case of the A.C. receiver, of energising the speaker by means of the current consumed by the receiver valves, cannot, therefore, be employed in the A.C./D.C. receiver. When an energised type of speaker is used, its field winding should be connected across the output circuit of the rectifier. The normal type of speaker used in this type of set has a field-winding resistance of 6,500 ohms, and, therefore, a current of approximately 40 mA is consumed. Assuming that the consumption of the receiver valves is 50 mA, the rectifier used in the mains unit must be rated to pass a maximum current of 90 mA (50 plus 40 mA), or higher. If the rated output of the rectifier is only

At the Odeon Cinema, Southgate, one hundred people, after seeing the entire procession of one set, stood up and cheered wildly.

**Another Television Hour**

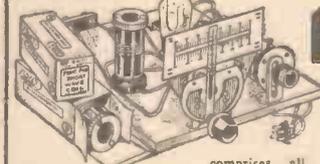
THE B.B.C. announces that, for trade purposes only, an extra period of television, lasting approximately an hour, will shortly be given every weekday morning between 12.30 and 1.30 p.m. A special film, surveying the activities of television since the opening of the service about six months ago, has been produced by the B.B.C. and will be shown every day in the extra hour. The B.B.C. wishes to emphasise that this transmission is intended solely for the benefit of manufacturers and those engaged in the sale of television sets, and not for the entertainment of home viewers.

In order that an overhaul and certain internal adjustments may be carried out at Alexandra Palace, arrangements have been made, with the concurrence of the Television Advisory Committee and the approval of the Postmaster-General, for television transmissions to be suspended for a period of three weeks, beginning on Monday, July 26th.

60 mA, a permanent magnet speaker should be used. If the mains supply is D.C., it is permissible to omit the rectifier, and connect the mains + lead direct to the smoothing choke. One important precaution must be taken when the rectifier is omitted, however—electrolytic condensers must not be used for smoothing unless they are of the reversible type, as they may be damaged if a mains plug is accidentally reversed.

**BARGAINS!**

**N.T.S. Short Wave ADAPTOR**  
LIST PRICE £1 : 10 : 0 **BARGAIN**  
12-94 Metres



**17/6**

comprises all parts: metal sprayed baseboard, 3 variable condensers, 2 4-pin holders, H.F. choke, grid leak. Fixed condenser, adaptor plug, terminal mount, 2 terminals, 3 4-pin plug-in coils, 12/26, 22/47, and 41/94 metres, 1 bracket, slow-motion drive, trimming condenser, connecting wire and diagram. Cash or C.O.D. Carriage Paid, 17/6 or 2/8 down, and 7 monthly payments of 2/6.

**2/6 DOWN**

**A.C. BANDPASS S.G.A. CHASSIS**  
LIST PRICE £6 : 6 : 0 **BARGAIN**



**£3 : 10 : 0**

With 4 British Valves  
Wonderful selectivity and sensitivity. 3 British valves. Screened coils. Slow-motion tuning. Wavelength dial. Gramo pick-up sockets, 21 watts output. Wave range 200-2,000 metres.

For A.C. Mains ONLY 200-250 volts 40/80 Cycles. Cash or C.O.D. £3/10/0 or 5/- down and 12 monthly payments 8/-. Or in beautiful walnut veneered cabinet complete with Celestion Field Energised Moving-coil Speaker and Airplane dial, ready to play. List price £8/8/0. Bargain price £4/12/6 or 5/- down and 12 monthly payments of 8/9.

**5/- DOWN**

**FREE!** Write to-day for free Booklet describing in full, with actual photographs, 5 entirely new N.T.S. Bargain Short-Wave Kits, and range of Short-Wave Components.  
Postal Orders must be crossed and currency registered.  
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# 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).

## Back Numbers Wanted

WE have requests for copies of PRACTICAL AND AMATEUR WIRELESS dated February 23rd, 1935; December 7th, 1935; Amateur Wireless, dated January 28th, 1933; and also for a copy of Wireless Magazine for September, 1935. Will readers having these copies to spare please forward them to our office, address given at the foot of this page.

SIR,—I am in need of PRACTICAL WIRELESS, dated August 19th, 1933, and if any of my fellow readers has the same to spare, I am willing to pay for it, also the postage.—A. JARMAN (Widford).

## Negative Feed-back

SIR,—With reference to Mr. M. G. W. Hine's letter on Negative Feed-back Amplifiers, perhaps my own experiences would be of interest. I have always been a keen quality fan and used two PX 4's when I was on A.C. My mains here, however, are 230v. D.C., and triodes with about 200v. on the anodes are ruled out. Pentodes also suffered with an excess of third harmonic, until I used the above principle and results now are, if anything, better than my PX 4's. I am using Marconi N31's, and the transformers are special ones which I had wound to match the PX 4's. I find it unnecessary to include the resistors mentioned, possibly because my anode load is slightly lower than optimum and the top lift just compensates the I.F. cut. Using an energised speaker with centre aluminium cone for the "highs," results are really high fidelity. One great advantage is that it is much easier and cheaper to remove the hum on the D.C. mains than to get rid of every trace of A.C. ripple, and my own amplifier is so quiet that I have been accused of using batteries!

The system is undoubtedly the best solution for quality enthusiasts on D.C., and is, of course, much cheaper than using A.C. gear with a converter.—K. M. SEWARDS (Brighton).

## Alarm Signal

SIR,—In your issue of April 17th, 1937, you published an article, "An Automatic Radio Alarm." After I had read this article it left me thinking, because somewhere before I had seen a radio alarm similar to the one described by your paper, only you say "Radio science has just made available to American shipowners a new radio device for the protection of life at sea. . . ."

Actually, Marconi's fitted ships with this type of distress signal detector many years ago (exact time I cannot be absolutely sure). It does give us a little satisfaction to know that America is not the birthplace of all the radio advancements.

In closing may I add one or two items

of interest which you may allow to filter their way into your already information-crammed columns:—

(1) The first newspaper to be printed on board a ship was on November 15th, 1899, on the s.s. *St. Paul*. The news was received from a wireless station at the Needles.

(2) The valve was accidentally discovered by Thomas Alva Edison in 1883 when he placed a small plate inside a carbon filament electric lamp to see what happened. The possibilities of this device were later connected with radio by Sir Ambrose Fleming in 1904.

(3) The first radio signal to cross the Atlantic was made by Guglielmo Marconi at noon, December 12th, 1901, and consisted of the letter "S."

(4) The first valve transmitter was built by A. Meissner in Germany in 1913.

(5) In 1915, 500 valves were used to establish telephony communication between Arlington, Virginia, and the Eiffel Tower, Paris, when five words were sent, the large number of valves used by this early transmitter was startling.

(6) The first picture to be sent by radio across the Atlantic was on June 7th, 1922, and was sent from Sanpaolo, in Italy, to Bar Harbour, Maine, U.S.A., by Professor Korn, a German.—J. A. JONES (Ipswich).

CUT THIS OUT EACH WEEK.

## Do you know

—THAT dust can cause a serious leakage of H.F. currents and should therefore be kept clear of the H.F. components.

—THAT in most cases it is quite in order to use a multi-twisted cable for the power supply to mains or battery receivers.

—THAT in cases where the aerial lead must cross the output or speaker leads, a right-angle crossing should be employed with the maximum possible spacing.

—THAT one common cause of poor quality and sometimes instability is the presence of H.F. in the L.F. section of a receiver.

—THAT an accumulator should never be discharged to the point where it is necessary to cut out the dial light in order to obtain signals.

—THAT it is possible to improve the quality of reproduction of a cabinet speaker by including resonators inside the cabinet.

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 Neames, 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.

## 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.

R. H. (Brentford). We have no blueprints of transmitters. You would require a transmitting licence for the purpose mentioned and would have to pass a test before the licence would be issued.

A. S. (W.12). We cannot suggest the trouble unless a component is faulty. We suggest you have the receiver examined by an agent of the makers or a good service engineer. There is no receiver in our blueprint list which would enable you to use the coil mentioned.

R. G. T. (Chelmsford). The receiver should be quite suitable for your purpose. Choke type 1011 is the correct model.

H. J. W. (Sidcup). We cannot trace the valve and it would appear that this is a special model made to some specific requirements. We advise that you get into touch with the makers direct.

R. H. (Whitefield). It would appear that the speaker is faulty, perhaps due to the spider having become broken or distorted. We suggest that you return it to the makers for their examination.

J. T. (Acocks Green). The coil can be any type, but the Wearite Unigen would be admirable for this particular set. The condenser in question should be .01 or .1 mfd. and the H.T. 120 to 150 volts. G.B. will depend upon the output valve which is employed.

A. K. (Blackburn). It is not possible to identify your coil as there were a number produced by the makers of this type. We advise you to send it to the makers or make a careful drawing of it, in order that they may identify it.

C. O'C. (Glenties). A suitable circuit may be found in our issue dated July 4th, 1935 (P.A. Systems for the Amateur), or Blueprint WM392 (5-Watt A.C. Amplifier) might be suitable.

M. H. (Newtown, Southampton). The trouble may be due to H.F. instability and not to the reaction circuit. Try the effect of spacing the H.F. leads and reducing the voltage on the screen.

W. J. F. C. (Christchurch). We cannot recommend a blueprint for your purpose.

T. G. (Manchester). We do not know what type of coil you refer to. See our issue dated May 9th, 1936 (Short-wave Coil Data).

G. H. F. (Forest Gate). We are not familiar with the servicing difficulties of the receiver in question and suggest you communicate with the makers.

A. B. (Bolton). The only suggestion we can make from the brief details given is that the coil unit is wrongly connected. Can you trace out the leads as given in the blueprint and circuit diagram.

F. W. F. (Sparkhill). It would appear that the switch is faulty, and at times does not pass the necessary current to the receiver, thus giving the poor results. When contact is correctly made, the full voltage is applied and thus the maximum volume is obtained.

J. A. C. (Nr. Oxford). Try modifying the L.F. connections (reverse secondary, for instance). If the whistle stops, it is I.F. instability, but if not, then the H.F. stage is unstable, and the voltage applied should be modified and the run of wiring slightly altered.

L. R. C. (Richmond). We are unable to insert your request, but would suggest a small advertisement.

R. A. M. L. (Godalming). We cannot recommend any individual make. We refer you to the design in our issue dated January 9th last.

F. J. G. (Gatterick Camp). There is no call-sign of the type mentioned and we can only suggest that you misheard it, or that some special announcement was being made by the transmitter in which the letters were given for some reference purpose.

P. J. A. F. (Finchley). We regret that we have no details of the coil and cannot trace the makers in our reference files.

R. P. (Wisbech). There were several screened coils produced by the firm in question and we suggest that you write to them for details such as type number, when we may be able to suggest a blueprint.

W. H. D. (N.19). We have not reviewed the receiver in question, and can only suggest that you obtain a model on approval from a good local dealer in order to judge its performance under your own listening conditions.

V. B. M. (Cheltenham). We suggest you try to modify your aerial, as this may be directional to the Droitwich transmitter. The alternative is to use a simple type of wave-trap to cut out the interference.

L. B. (Cardiff). We cannot insert your request, but suggest that you insert a small advertisement for your purpose.

W. O. H. (Exeter). Messrs. Peto-Scott can supply the wire and all other parts required for any of our receivers.

W. B. H. (Bristol 3). We regret that we no longer include station identification as part of our Query service.

J. B. P. (Kidlington). Write to GOMN, Worksop, Notts.

M. C. (Manchester 15). We cannot recommend a blueprint or receiver without knowing the type number of the coil unit.

C. B. (Plymouth). We regret that your request is not clear. We have no blueprints of transmitters.

# RADIO CLUBS AND SOCIETIES

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

## Southall Radio Society

CONTINUING the popular series of lectures to club members on Direction Finding, Mr. H. Rayner gave a talk on "Reading Maps in D.F." Although the map is a very important piece of equipment, many experimenters lose a great deal of their accuracy through faulty use of it, and Mr. Rayner gave a number of useful hints to his audience.

The direction-finding contest on June 20th promises well and present indications are that the biggest entry ever seen in this country will be in the field in competition for the silver trophy. Further enquiries are invited and the Hon. Secretary will be delighted to send a copy of the rules to anyone interested.

The headquarters of the club is at the Three Tuns Hotel, The Green, Southall, and meetings are held each Tuesday at 8.15 p.m. Hon. Secretary, Mr. H. F. Reeve, 26, Green Drive, Southall.

## International Short-wave Club (London)

A VERY interested audience listened to a lecture on Microphone Technique given before the meeting of the London Chapter of the I.S.W.C. at the clubroom, 80, Theobald's Road, W.C.1, on Friday evening, May 14th. The lecture was given by Mr. A. E. Bear, who was assisted by Mr. G. Clements. Several types of microphones were afterwards demonstrated and included the crystal, transverse current and moving coil microphones. It was agreed that the crystal microphones afforded the best example of quality. A microphone was taken outside into the street and passers-by were asked to give their impressions of the Coronation celebrations. We invite readers to attend the meetings of the London Chapter and shall be pleased to forward our programme list on application to: Mr. Arthur E. Bear, 100, Adams Gardens Estate, London, S.E.16.

## Proposed Club for Willesden

WILL all short-wave listeners and amateur transmitters who are interested in forming a short-wave society in Willesden and neighbouring districts, please communicate by letter with the undersigned, or call after 7 p.m. any evening? —S. A. Reeve, 115, Willesden Lane, Kilburn, N.W.6.

## International Short-wave Club (Guernsey Chapter)

THIS club now holds meetings every Tuesday. At the meeting on May 4th, Mr. J. Dowding (G8DO), President of the local chapter, gave an interesting talk to members on "The Electron Theory." This inaugurated a new series of lectures which will cover every aspect of radio. The decision to remain active during the summer has met with approval, and among the summer features is a reception contest for listeners in the Channel Islands; it has also been decided to commence a new series of morse instruction classes, this step being encouraged by the success of the last session of such lessons. The membership continues to expand, and the Guernsey Chapter is supported by voluntary subscriptions. Details of all features may be obtained from the Hon. Secretary, F. S. Le Pavoux (2BTP), 8, Upper Canichiers, St. Peter-Port, Guernsey, C.I.

## Swansea Radio Club

At a meeting of the above club held on May 5th, Mr. K. M. Evans (G5KJ) gave a very interesting lecture on Wave Propagation and Amateur Radio generally. He showed how modulation could be measured with a cathode-ray oscilloscope, and concluded his talk by playing some records of various QSO's on a portable gramophone. This proved a very novel feature in view of the fact that the amateurs present were previously unaware that some of their transmissions (good and otherwise) had been recorded. Also Mr. Evans played some records of 28mc. D.X. tests.

Meetings of this club are held on alternate Wednesdays at 7 p.m. at the Y.M.C.A., Swansea, and interested readers will be welcomed. Hon. Sec., R. J. C. Davies, c/o Watson and Davies, Mansel Lane, Swansea.

## Kidderminster and District Radio Club

A MEETING of the above club was held at Chamberlain's Restaurant, Well Street, on May 3rd, and proved very successful. Mr. S. Longmore presided. It was decided to hold the meetings at "The Railway House," Prospect Hill, two Mondays in the month, the dates for which will be decided later. All who are interested are asked to write to the Hon. Sec., H. A. Brown, 12, Stourport Road, Kidderminster, 3.

## Bradford Short-wave Club

WITH the winter session of the above club ended, arrangements for the summer syllabus are being made. A Field Day will be held on Sunday, June 6th, and anyone who would like to participate, should write to the Secretary for particulars.

Mr. K. Abbott, our morse instructor, has just commenced another course of morse instruction. Classes are held every Friday evening from 9.0 p.m. to 10.0 p.m. The course extends over a period of about twelve weeks. Meetings are still held at Bradford Moor Council School, Leeds Road, Bradford, every Friday evening from 7.30 p.m. to 11.0 p.m. Further particulars may be had from the Secretary, Mr. G. Walker, 33, Napier Road, Thornbury, Bradford, Yorks.

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1937 Crystal Receiver	9.1.37	PW71
<b>STRAIGHT SETS. Battery Operated.</b>		
One-valve: Blueprint, 1s.		
All-wave Unipen (Pentode)		PW31A
Two-valve: Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
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, 2LF (RC & Trans))		PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF, Pen, D, Pen)	29.5.37	PW39
Half-Mark Three (SG, D, Pow)		PW41
Half-Mark Cadet (D, LF, Pen (RC))	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))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	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)		PW64
The Gladiator All-Wave Three (HF Pen, D, Pen)	29.8.36	PW66
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))	5.12.36	PW72
<b>Four-valve: Blueprints, 1s. each.</b>		
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 "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
<b>Mains Operated.</b>		
Two-valve: Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)		PW18
A.C.-D.C. Two (SG, Pow)		PW31
Selectone A.C. Radiogram Two (D, Pow)		PW19
<b>Three-valve: Blueprints, 1s. each.</b>		
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)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	23.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	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
<b>Four-valve: Blueprints, 1s. each.</b>		
A.C. Fury Four (SG, SG, D, Pen)		PW20
A.C. Fury Four Super (SG, SG, D, Pen)		PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)		PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
<b>SUPERHETS.</b>		
<b>Battery Sets: Blueprints, 1s. each.</b>		
£5 Superhet (Three-valve)		PW40
Two-valve		
F. J. Camm's £4 Superhet	18.7.35	PW52
F. J. Camm's "Vitesse" All-Waver (5-valver)		PW58
Mains Sets: Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)		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		PW59
F. J. Camm's Universal £4 Superhet 4		PW60
"Qualitone" Universal Four	16.1.37	PW73
<b>SHORT-WAVE SETS.</b>		
Two-valve: Blueprint, 1s.		
Midget Short-wave Two (D, Pen)		PW33A

<b>Three-valve: Blueprints, 1s. each.</b>		
Experimenter's Short-Wave Three (SG, D, Pow)		PW30A
The Prefect 3 (D, 2 LF (RC and Trans))		PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
<b>PORTABLES.</b>		
<b>Three-valve: Blueprint, 1s.</b>		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	16.5.36	PW65
<b>Four-valve: Blueprint, 1s.</b>		
Featherweight Portable Four (SG, D, LF, Cl. B.)	15.5.37	PW12
<b>MISCELLANEOUS.</b>		
S.W. Converter-Adapter (1 valve)		PW48A
<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
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B.B.C. Special One-valver		AW387
Twenty-station Loudspeaker One-valver (Class B)		AW449
<b>Two-valve: Blueprints, 1s. each.</b>		
Melody Ranger Two (D, Trans)		AW383
Full-volume Two (SG det., Pen)		AW392
B.B.C. National Two with Lucerne Coil (D, Trans)		AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)		AW388A
Lucerne Minor (D, Pen)		AW426
A Modern Two-valver		WM409
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Class B Three (D, Trans, Class B)		AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)		AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)		AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)		AW419
Lucerne Ranger (SG, D, Trans)		AW422
Cosor Melody Maker with Lucerne Coils		AW423
Mullard Master Three with Lucerne Coils		AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	10.5.34	AW435
Lucerne Straight Three (D, RC, Trans)		AW437
All-Britain Three (HF Pen, D, Pen)		AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)		WM271
£6 6s. Radiogram (D, RC, Trans)		WM313
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
Iron-core Band-pass Three (SG, D, QP21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)		WM371
-PTP Three (Pen, D, Pen)	June '35	WM393
Certainty Three (SG, D, Pen)		WM393
Minutube Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM430
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
66s. Four (SG, D, RC, Trans)		AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen)		AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
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, 2LF)	Feb. '35	WM381
The H.K. Four (SG, SG, D, Pen)	Mar. '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	April '36	WM404
<b>Five-valve: Blueprints, 1s. 6d. each.</b>		
Super-quality Five (2HF, D, RC, Trans)	May '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	Dec. '33	WM344
New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
<b>Mains Operated.</b>		
<b>Two-valve: Blueprints, 1s. each.</b>		
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

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 PW refers to PRACTICAL WIRELESS, AW to Amateur Wireless, PM to Practical Mechanics, WM 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., Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

<b>Three-valve: Blueprints, 1s. each.</b>		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.		AW383
S.G. Three (SG, D, Pen) A.C.		AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaguester (HF, Pen, D, Pen) A.C.		AW430
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	23.6.34	AW374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)		WM401
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM396
<b>SUPERHETS.</b>		
<b>Battery Sets: Blueprints, 1s. 6d. each.</b>		
Modern Super Senior		WM375
Varsity Four	Oct. '35	WM395
The Request All-Waver	June '36	WM407
1935 Super Five Battery (Superhet)		WM379
<b>Mains Sets: Blueprints, 1s. 6d. each.</b>		
1934 A.C. Century Super A.C.		AW425
Heptode Super Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.		WM386
1935 A.C. Stenode	Apr. '35	WM385
<b>PORTABLES.</b>		
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	17.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)		WM367
<b>SHORT-WAVE SETS—Battery Operated.</b>		
<b>One-valve: Blueprints, 1s. each.</b>		
S.W. One-valver converter (Price 6d.)		AW329
S.W. One-valver for America	23.1.37	AW429
Rome Short-Waver		AW452
<b>Two-valve: Blueprints, 1s. each.</b>		
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)		AW440
<b>Three-valve: Blueprints, 1s. each.</b>		
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-wave (SG, D, Pen)	Jan. 10, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM300
<b>Four-valve: Blueprints, 1s. 6d. each.</b>		
A.W. Short-Wave World-Beater (HF Pen, D, RC, Trans)		AW436
Empire Short-Waver (SG, D, RC, Trans)		WM313
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383
Superhet: Blueprint, 1s. 6d.		
Simplified Short-waver Super	Nov. '35	WM397
<b>Mains Operated.</b>		
<b>Two-valve: Blueprints, 1s. each.</b>		
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
<b>Three-valve: Blueprint, 1s.</b>		
Emigrator (SG, D, Pen) A.C.		WM352
<b>Four-valve: Blueprint, 1s. 6d.</b>		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	Aug. '35	WM391
<b>MISCELLANEOUS.</b>		
Enthusiast's Power Amplifier (1/6)	June '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)		WM392
Radio Unit (2v.) for WM392	Nov. '35	WM398
Harris Electrogram (Battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New Style Short-Waver Adapter (1/-)	June '35	WM388
Tickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter (1/-)	Dec. 1, '34	AW456
Superhet Converter (1/-)	Dec. 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	May '36	WM405
Wilson Tonic Master (1/-)	June '36	WM406
The W.M.A.C. Short-Wave Converter (1/-)		WM408



# QUERIES and ENQUIRIES

## Mains Energised Speaker

"I am using a mains transformer 350-0-350 at 120 mA and the entire voltage and current is being utilised. I wish to use a mains energised speaker. Is it possible to include this in the H.T.— section of the circuit? If so, what resistance value should I use?"—T. W. D. (Fallowfield).

If you are using the full 350 volts at 120 mA for the receiver, it will not be possible to include the speaker field. The current flowing through this, no matter whether it is in the H.T.— or H.T. positive line will result in a voltage drop, and thus you will not be obtaining the 350 volts for the receiver. Therefore, the only satisfactory way of using such a speaker is to build a small mains unit to operate it, and it will then be independent of the receiver and may be used with any type of set you may build up at some future date without alteration. A rectifier (valve or metal) and a mains transformer are normally all the components that are required, and the transformer may be switched on and off by means of the receiver on-off switch.

## The Radio Heart

"I am anxious to obtain one of the all-wave tuner units mentioned in your December number and would like to know the address of the makers of this tuner."—R. C. W. (Winchester).

THE Radio Heart is not simply an all-wave tuner, but is a complete H.F. radio unit. That is to say, it incorporates all-wave tuning coils, ganged condenser, valveholders, and wiring for H.F. and frequency-changer stages. It is, therefore, only necessary to add the I.F. transformers, I.F. valve and second-detector stages, with the necessary L.F. amplification, in order to complete a superhet receiver. The unit may be obtained from R. A. Rothermel, Ltd., Rothermel House, Canterbury Road, London, N.W.6.

## Using M.C. Speaker

"I have just bought a good moving-coil speaker for my three-valve battery set, but experience a peculiar distortion on certain notes. I thought the speaker was faulty and took it back to the shop, but they tested it and found it worked all right. I tried it again but it was just the same. I have been using a balanced-armature speaker and this is quite all right. Can you tell me the cause of the distortion and how to cure it?"—G. R. A. (Derry).

THE trouble is probably due to the receiver and is a common occurrence when first using a moving-coil speaker. The response from this is generally of such a true character that it reveals faults in reproduction in a receiver which may have been masked by the original type of speaker. For instance, there may be a falling off at some particular frequency due to the poorness of the L.F. coupling, and at that particular frequency there may be a resonance in the moving-iron speaker. Consequently the effect would be balanced out and reproduction would sound good. When using the M.C. speaker, however, without the resonance, the lack of amplification at that frequency would be

### 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.

Please note also, that queries must be limited to two per reader, and 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 different department.

If a postal reply is desired, a stamped addressed envelope must be enclosed. 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.

revealed. The M.C. speaker also reproduces lower frequencies than the armature type, and this may reveal lack of bass. It is also essential that the speaker be correctly matched to the output valve, and this point is of greater importance than with the other type of speaker. You should therefore watch this point and endeavour to improve the L.F. circuits of your set.

## Volume Control

"I have a detector-pentode short-wave set. On 'phones it is often too loud to be comfortable. I have an old rheostat and I would like to know if I could connect this in the filament lead to the pentode for volume control. This is not usual, and I wonder if it would harm the valve in any way."—F. R. (Longdon).

IT would not be advisable to control volume by reducing the filament voltage as you suggest. With certain modern valves the emission would be destroyed if

run for a long time below the maker's recommendations. A better idea is to fit a volume control of suitable value across the secondary of the L.F. transformer feeding the output valve. Generally, a value of about .5 megohms is suitable and each end of this is joined to each of the transformer secondary terminals, whilst the lead to the grid of the output valve is removed from the transformer and connected to the arm of the control (centre terminal). The maker's recommendations should be followed, however, with regard to the value of the control.

## Ultra-short Waves

"I have built your '1-valver for America' and have been getting very good results out of it, although I have not actually received America. I found I could not get lower than 20 metres, and wish to make a set to receive from 2 to 7 metres. I should like to cover this wavelength with one coil, or rather a grid and reaction, mounted direct on the condensers for short wiring. I should like to hear the television with the set—one valve will do."—G. J. P. (Leytonstone).

THERE is a vast difference between a receiver designed for use on 20 metres and 2 metres. If you wish to tune so low, you must design the set for that purpose and then arrange to use larger coils for 20 metres, but the result would not be very efficient. It is hopeless to try to use a set designed for 20 metres on the ultra shorts, and you will therefore have to scrap your present set. Furthermore, you will not be able to go from 2 to 7 metres with one coil, and we have no designs of a set suitable for such a low range. Our Telecent tuned down to approximately 5 metres, but utilises a special multi-coil unit and is designed on low-loss lines.

## Using Mains Pack

"I have the mains pack out of an old commercial set, and I wish to use it on a two-valve set (Detector-L.F.). I have tried it, but there is so much hum that I can hear no signals above it. I can find no smoothing choke actually in the unit, but there was an iron-cored choke in the actual set. Would this be the smoothing choke? If not, could you tell me the best sort of choke to get?"—J. L. P. (Tonbridge).

YOU are up against several difficulties in endeavouring to use a dismantled unit of this type. Firstly, the output may be suitable for mains-type valves and your two-valver may be utilising battery valves. Thus the H.T. is excessive. Secondly, the output may be so high that a mains energised speaker may have been used in the original set, and this would account for the absence of a choke for smoothing. Another point is that the heater winding may not be centre-tapped, and the commercial set may have had a centre-tapped resistor across the heater sockets and this is not now in use.

The coupon on Cover iii must be attached to every query.



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Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

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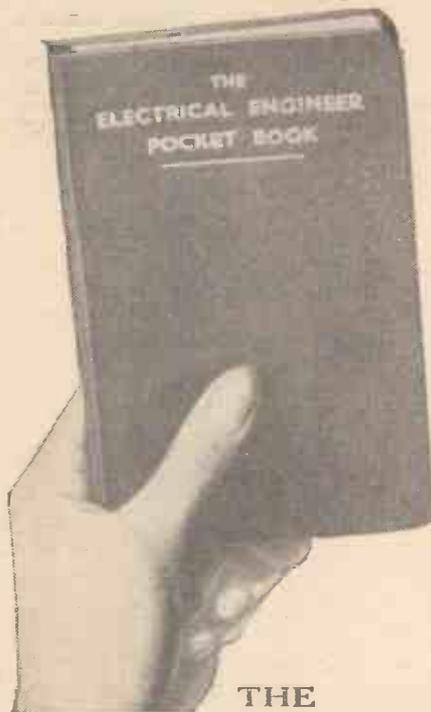
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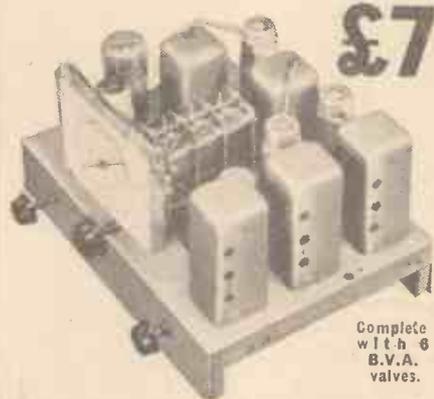
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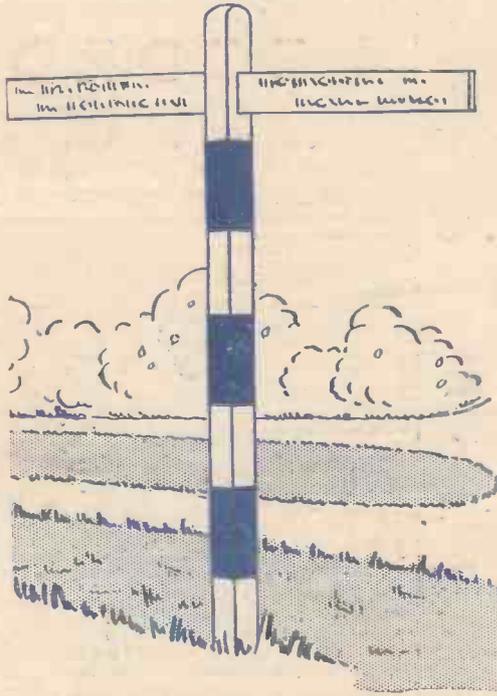
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