

# HINTS FOR S.W. EXPERIMENTERS — See page 296

# Practical and Amateur Wireless

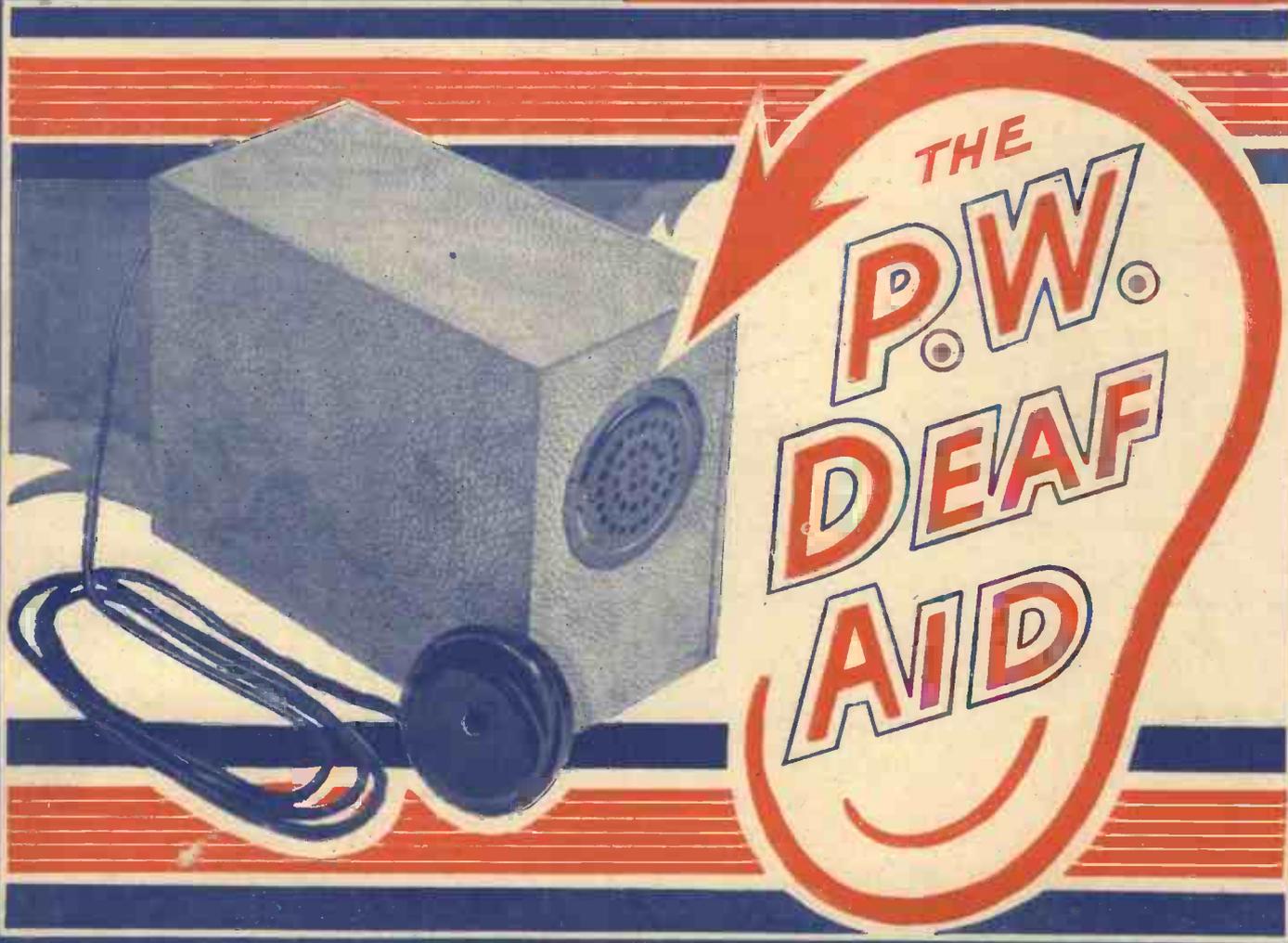
**3<sup>p</sup>**  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

A GEORGE  
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Publication

Vol. 12, No. 298.  
June 4th, 1938.

AND PRACTICAL TELEVISION



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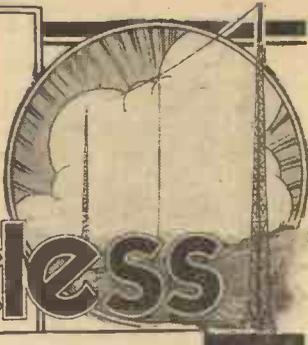
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**SAFETY FACTOR IN RADIO CONSTRUCTION**—See page 283

# Practical and Amateur Wireless

Edited by **F. J. CAMM**

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

VOL. XII. No. 298. June 4th, 1938.

## ROUND *the* WORLD *of* WIRELESS

### Deaf Aids

THERE are various types of hearing aid now available to the partially deaf, the majority consisting of small low-frequency amplifiers with microphone and reproducer. In some types the latter takes the form of a standard telephone earpiece, whilst in others the movements of a diaphragm are transmitted to the bone behind the ear. Unfortunately, deafness can take many forms, and it is often necessary for the deaf person to be examined medically in order that a suitable type of reproducer may be specified. In many homes one member of the family is hard of hearing and as a result it becomes necessary for the radio to be turned up to such a level that it is annoying to other members of the family, and in such cases it will be found that a simple amplifier with microphone may be used to increase the normal volume suitable for the remainder of the family and thus provide the afflicted person with a comfortable volume level. In this issue we describe an aid of this type which will be found very useful in the home, although, as pointed out in the article, no tone controls or other refinements are included. There is a wide field of use for this simple aid, however, and it should provide a long-felt want in spite of the simplicity of the design and the low cost of construction and maintenance.

### German Enterprise

TO celebrate the fifteenth Radio Exhibition to be held in Berlin in August, a week's free holiday and free travel to and from Berlin is being offered to the first hundred German licence-holders. The listeners have to fill in a special form giving details of their licence, listening periods, and other details.

### French Television

TO popularise television in France it is proposed to install a television transmitter and associated equipment in the Palace of Inventions, which will be re-opened. This Palace was a feature of the Paris International Exhibition of 1937.

### Battery-user Aid

AN interesting new type of L.T. battery has been placed on the Australian market. This consists of a moulded case accumulator, and in place of the usual

terminals a special two-pin plug device is employed. This is free from acid spray and fumes and connection to the leads of the set is made by a non-reversible moulded plug. The advantages will be apparent to the user of the present type of accumulator.

### Philips' New Portable

A NEW portable has been introduced by Philips which is claimed to set a new standard in portable design. Measuring

### Mount Everest

WHILST another assault is being made on the hitherto unconquered peak of Everest, a feature programme reviewing all past expeditions will be given in the Regional programmes on June 2nd. It is hoped to bring to the microphone surviving members of past expeditions, so that first-hand accounts of some of the adventures which befell them may be recounted. The programme has been prepared and will be produced by Felix Felton.

### Ray Noble's Return

ON his return from America, Brighton-born Ray Noble has been booked by the B.B.C. to give three broadcasts from studios within four days. These will be heard on June 1st, 3rd and 4th, the latter in the Regional programmes and the two former in the National programme. During his stay in America he opened and closed all his programmes with two of his most popular compositions: "The Very Thought of You" and "Good-night, Sweetheart."

### Ballet Week in June

A BALLET WEEK in television will begin on June 5th, with a performance by the Ballets Joos. This famous company, now touring England, will be engaged on a three weeks' London season at the Old Vic, and their television appearance will contain excerpts from their repertoire at the Old Vic. During the week the Vic-Wells Ballet Company, paying a flying visit to London between provincial tours, will be televised on Whit-Monday evening, in the afternoon and evening programmes, both on Wednesday, June 8th, and the following Friday, and again on Saturday evening, June 11th.

It is hoped to include "Casse Noisette," Act II (Tchaikovsky); "The Gods Go A-Begging (Handel); Nocturne (Delius); and "Façade," by William Walton.

### Studio Variety

MIDLAND and Regional listeners will, on June 10th, hear a programme of studio variety, featuring the Eastern Sisters and Bob Arnold. The former follow the lines of the Western Brothers, but with a feminine angle. The artists' names are not given; both of them are well-known Midland broadcasters. Bob Arnold's speciality is rustic humour and songs.

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only 11½in. by 10in. by 7½in., this portable incorporates a 4-valve superhet with full-size moving-coil loudspeaker. A.V.C. and other refinements are included at the price of 8½ guineas.

### Trooping the Colour

ON June 9th, when the annual ceremony of Trooping the Colour takes place at the Horse Guards Parade, microphones and commentators will be present to give listeners to the Regional programme an account of the traditional and picturesque occasion. The commentaries will be confined to the intervals in the music, and for the rest, Trooping the Colour will speak for itself.

# ROUND the WORLD of WIRELESS (Continued)

## High-power Station for Lithuania

THE site chosen for the new 120-kilowatt transmitter which is destined to replace the present Kaunas station is Bobti, situated roughly 15 miles from the Lithuanian capital. Work on the construction of this transmitter is to be started this year.

## Brightening Up Turkey

FOLLOWING a recent broadcast speech to the nation by Kemal Ataturk, the railway authorities in the Ottoman Empire have decided to equip all trains with radio receivers for the benefit of travelling passengers, and to place loudspeakers in all station waiting-rooms.

## New B.B.C. Transmitter

IT is reported that the B.B.C. is contemplating the erection of a 5-kW transmitter to serve Notts, Lincolnshire and East Anglia generally. The original proposal was to erect a relay station at Norwich, but the projected station will probably be farther inland.

## Free Radio in Austria

ACCORDING to a recent report Herr Hitler is determined to increase the number of registered listeners in Austria, now standing at 600,000. He has issued



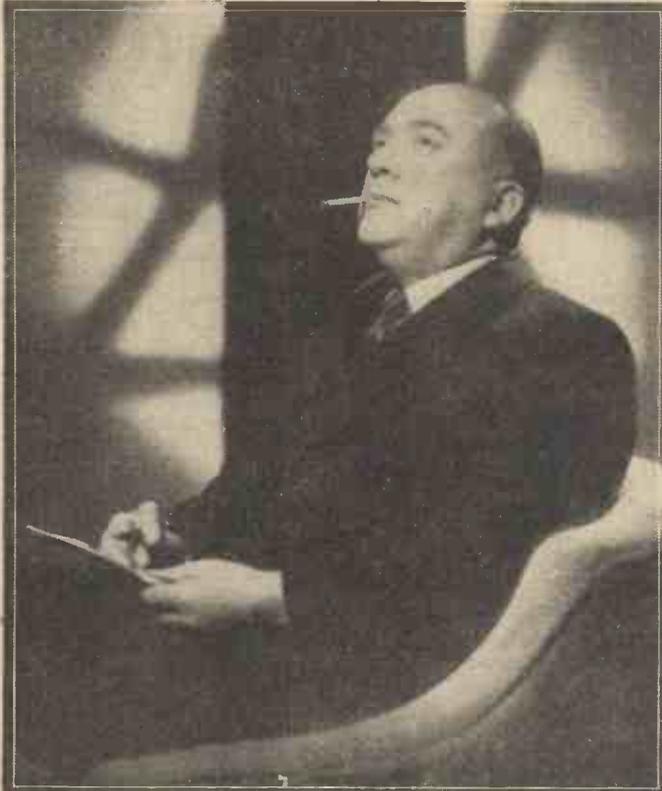
Paula Green, one of radio's most popular vocalists, who was recently heard with Michael Flome and his Orchestra, from the May Fair Hotel, London.

orders that all listeners whose income is below a certain amount shall be exempt from licence fees.

## G.E.C. Employees' Long Service

THE management of the Telephone and Radio Works of The General Electric Company, Ltd., at Coventry, gave a complimentary dinner the other night to those of their employees who have completed twenty-one years of service with the Company. More than eighty guests were

## INTERESTING and TOPICAL NEWS and NOTES



Horatio Nicholls, the world-famous song writer. He is also known as Lawrence Wright, the well-known music publisher, and every year at the North Pier Pavilion, Blackpool, he presents a seaside show entitled "On With the Show," which will be heard over the radio during the summer months.

present, and jointly they represented 2,333 years of service. Amongst them were seven who joined the Company last century, whilst the individual record for long service goes to a member of the staff who recently completed his fiftieth year with the G.E.C., having joined the firm in February, 1888.

## New B.B.C. Appointment

WE are informed that Mr. V. D. Carse has been appointed to the staff for training as an announcer. Mr. Carse, who was educated at Sherborne School, was a square-rig apprentice in the s.s. *Archibald Russell* and, in 1933 and 1934, he served as an A.B. in R.R.S. *Discovery II* on a voyage to the Antarctic. Later he became a member of the British Graham Land Expedition which spent two and a half years surveying the coast to the South and South-West of the Graham Land Peninsula.

## Promenade Concerts, 1938

WE understand that the summer season of Promenade Concerts at Queen's Hall will begin on Saturday, August 6th, and will continue until Saturday, October 1st. Sir Henry J. Wood will conduct the B.B.C. Symphony Orchestra of ninety players, under the leadership of Paul Beard.

## Cricket Commentaries

PENNETHORNE HUGHES will give a commentary on the last quarter-of-an-hour's play in the Somerset v. Gloucestershire Cricket Match, at Taunton, on June 6th: this will be preceded by the story of some historic games, recalled by J. G. Coates. Mr. Coates will also give an eye-witness account of the day's play on June 7th.

## Current Film Music

ONE of the "General Release" programmes of current film music played by the Midland Revue Orchestra, with Reg. Burston conducting, will be composed by Martyn C. Webster, on June 8th. The vocalists will be Marjorie Westbury, the Birmingham soprano, and Fred Forgham, who comes from Coalville, in Leicestershire. The programme will be repeated for Regional listeners the following afternoon.

## SOLVE THIS!

### PROBLEM No. 298

To carry out some home-broadcasting, Jones bought a cheap carbon mike on stand, and connected this to his pick-up terminals, with the necessary biasing battery joined to the terminals on the mike base. Results were very good except for background noise, and after some tests he decided that it would be worth while getting a better mike. He therefore purchased a transverse current component and mounted this in a ring with rubber bands in the usual way, but when joined to his pick-up terminals, he could obtain no results. He returned the mike to the makers, who tested it and reported it O.K. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newman, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 298 in the top left-hand corner and must be posted to reach this office not later than the first post on Tuesday, June 7th, 1938.

### Solution to Problem No. 297

When Atkins mounted his valveholders on the metal chassis the head of the fixing bolt to the L.T. positive filament terminal on one valveholder came into contact with the chassis, and although this did not provide sufficient short-circuit to prevent the valves from working, it provided an extra drain on the accumulator which produced the results he experienced. The following three readers successfully solved Problem No. 296, and books have accordingly been forwarded to them: J. Law, 10, Byron Street, Goole, Yorkshire. C. E. Stevens, 49, Maxwell Pk. Road, Hounslow, Middlesex. L. O. Wheatley, Upton, Station Road, Crowborough, Sussex.

# The Safety Factor in Radio Construction

Safeguards for Constructor and Components : Precautions with D.C. Receivers : "Live" Controls : Working Voltage of Condensers : Peak High-tension Voltages  
By FRANK PRESTON

EVERY reader knows that he might receive a nasty shock if he touches the live mains leads, but there are probably some who do not realise that a similar "kick" might result from touching the terminals of a condenser after the set has been switched off. This would normally apply only in the case of a high-capacity condenser used in the smoothing or decoupling circuits of a mains receiver. It is not impossible, however, when using a more modest battery-operated set if the condenser is rated at, say, 4 mfd., and one of its terminals touches the back of the hand.

## Charged Condensers

The reason for this is, of course, that the condensers connected in parallel with the H.T. supply "store" a certain amount of

electricity. Thus, after the mains leads or battery connections have been disconnected, the condensers are fully charged. In most cases the shock would amount to little more than a sudden "prick" unless one hand were against the chassis while the other came in contact with the positive terminal of the condenser. On the other hand it is possible in certain instances for the earth-return to the body to be completed through the earth lead and the floor.

To ensure that trouble is not experienced in this way, it is a wise procedure to discharge each of the high-capacity condensers before proceeding to handle the set. This is done simply by short-circuiting their terminals. The best method is to use a screw-driver, holding it by its handle and touching the negative condenser terminal with the tip of the blade and then completing the circuit by moving the blade until it is across the two terminals. (See Fig. 1.)

When using a D.C. receiver, especial precautions should be taken, particularly when the positive side of the mains is earthed. In that case the earth lead should be joined to the receiver through a fixed condenser between .1 and 1 mfd. The omission of the condenser would result in the mains being short-circuited. This would cause the fuse to blow, but there might be some disturbing signs before the fuse broke the circuit.

It should not be overlooked that even when there is a condenser in series with the earth lead the aerial coil is "live." If a condenser is not included in the aerial circuit this means that the aerial wire also is live. Consequently, if the lead-in should be touched by somebody standing outside the window (or even inside the house in some cases), a fairly severe shock could result.

Nowadays it is customary to fit an aerial-series condenser inside the set, but the insulation resistance of this might not always be very high. To be on the safe side it is, therefore, wise to fit another condenser of about .1-mfd. and of not less than 250

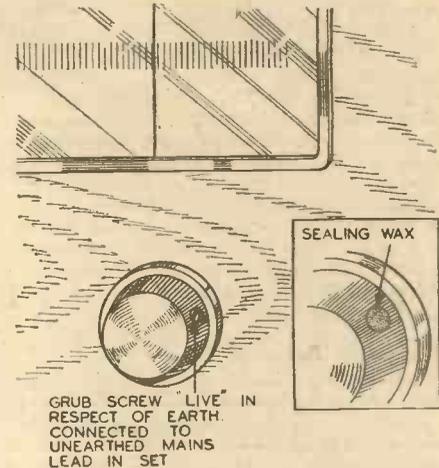


Fig. 2.—When using a D.C. set, it is wise to cover grub screws with sealing wax or other insulation.

unpleasant surprise. (See Fig. 2.) A method of obviating the trouble is to sink the screw and cover it with sealing-wax or Chatterton's compound.

The points raised above in connection with D.C. sets are not limited to the case in which the positive mains lead is earthed, because there is always the chance of inserting the mains plug wrong way round—unless an irreversible connector is employed, this being a convenience anyway—so that the positive lead is joined to earth accidentally. This would soon be discovered due to the failure of the set to operate, but that might be too late.

## Two-pole Switches

Similar points apply when using a D.C. eliminator. It is best when doing that to fit an earth terminal on the eliminator, joined to the negative lead through a fixed condenser, and to transfer the normal earth lead from the set to this point.

At this point it is worthy of mention that a two-pole switch should always be used in a D.C. or A.C./D.C. set so that both mains leads are completely isolated from the set when it is switched off. It is an I.E.E. regulation that such a switch should be fitted, but the matter is sometimes overlooked.

Cases have been known where a severe shock has been received due to watering the earth lead in dry weather when the set has not been completely isolated from the mains and the condenser in the earth circuit defective. The circuit from the "live" earth wire was completed through the body of the person concerned by the stream of water from the bucket or watering can.

## Extension Speakers

Another possible cause of shock is through the extension speaker leads should these be connected to the H.T. circuit, as they would when using the circuit shown in Fig. 3. If a person is standing, say, on the grass in the garden when the speaker terminals or bared ends of the wire are touched, the H.T. supply would be connected across him. It is unlikely that serious injury would

(Continued overleaf)

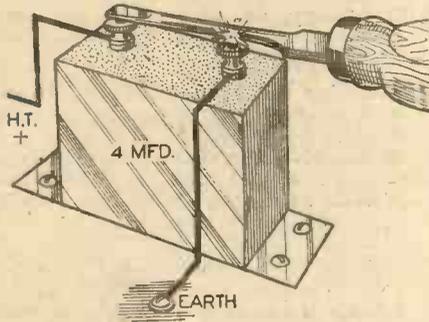


Fig. 1.—Discharging a high-capacity condenser after switching off the set, and before carrying out tests.

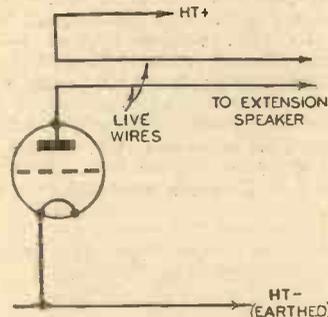


Fig. 3.—This method of feeding an extension speaker from a mains set might be dangerous.

volts working just inside the set, between the aerial coil and the aerial terminal.

Another possible cause of shock when handling a D.C. set with positive earth is touching a grub screw in one of the control knobs. This is at high potential in respect of the mains earth and can therefore give an

shock when the speaker terminals or bared ends of the wire are touched, the H.T. supply would be connected across him.

It is unlikely that serious injury would

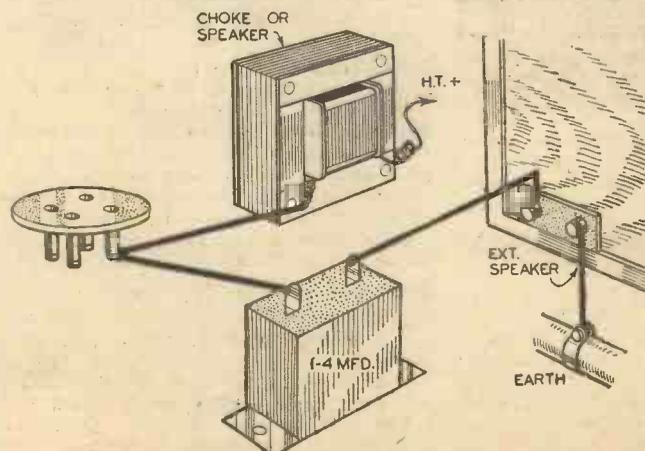


Fig. 4.—The correct method of feeding an extension speaker.

**THE SAFETY FACTOR IN RADIO CONSTRUCTION**

*(Continued from previous page)*

result—and many people would scarcely feel a shock at all—but to some the sensation might be unpleasant. The proper course is to use choke-capacity output as shown in Fig. 4. Instead of using an actual choke the same result can be obtained by leaving one speaker connected directly to the set in the usual manner and attaching the extension speaker as shown. Observe that the fixed condenser is in the positive lead, and that it should be rated at not less than 250 volts working.

**Condenser Rating**

So much for personal safety. There are various items that should receive attention to ensure safety of the components. Not least of these is that the smoothing condensers in an A.C. receiver or eliminator should have a rated working voltage of at least twice the normal output voltage of the rectifier. This is to ensure that they

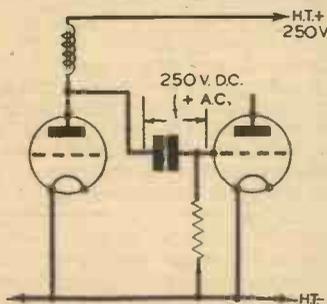


Fig. 6.—L.F. grid condensers have to "handle" both A.C. (or audio-frequency and D.C.).

will not break down in the event of a breakage in the H.T. circuit which would result in "no-load" working. As many readers are aware, the no-load voltage from a rectifier designed to give, say, 250 volts at normal current load might well approach 500 volts when current is not being consumed.

A mistake in this direction is sometimes

made when using a by-pass condenser after voltage-dropping resistors as shown in Fig. 5. Since the resistors reduce the total voltage from, say, 350 to 100, it must not be assumed that a condenser suitable for 100 volts working would be sufficient in a circuit such as that illustrated. If the valve failed, for instance, or if an open circuit developed in the H.F. choke, the voltage-dropping effect of the resistors would be

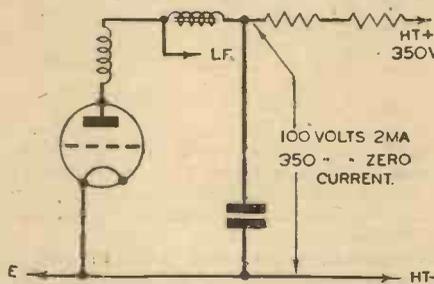


Fig. 5.—By-pass, smoothing and decoupling condensers should have a high voltage rating.

negligible since the voltage drop is dependent upon the current passed. If the current were zero the maximum voltage of the condenser, with the result that it would probably fail and short-circuit the H.T. supply.

**L.F. Grid Condenser**

Another mistake that often occurs in connection with condensers concerns that used in the grid circuit of an L.F. valve, as shown in Fig. 6. It is not difficult to see that the D.C. voltage applied to this condenser is that of the H.T. But there is also the low-frequency A.C. or signal voltage to consider, which means, in practice, that the condenser should be rated at not less than twice the H.T. voltage, and preferably several times that. It is most satisfactory to use a mica-dielectric component here, with a rated A.C. test voltage of not less than 750 volts when the H.T. voltage is up to 250, or at 1,000 volts test when the H.T. voltage is up to 500.

**Delay Switching**

Special safeguards should be adopted when using indirectly-heated valves with a metal or directly-heated rectifier. The reason is that the rectifier gives its full output almost immediately the set is switched on, whereas the valves take 30 seconds or so to heat up. Until the heaters reach normal working temperature the H.T. current passed is much below the normal current, and therefore a voltage far in excess of the normal figure is applied to the valves and by-pass condensers. The correct procedure, where possible, is to change the rectifier for one of the indirectly-heated type. Where this is impracticable or when using a metal rectifier, it is wise to include a thermal-delay switch in the H.T. circuit. This is designed to switch on the H.T. automatically after the set has been switched on for 30 to 40 seconds; in other words, after the valve heaters have reached their working temperature. The switch is generally connected as shown in Fig. 7, although alternative connections are possible to suit particular cases.

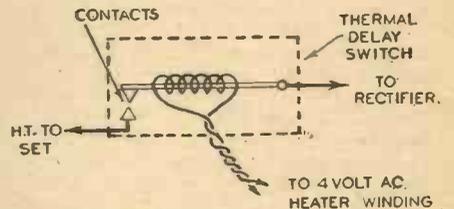


Fig. 7.—Principles of a thermal-delay H.T. switch.

Another method that can often be used is to replace the indirectly-heated output valve by one of the directly-heated type. As this valve takes the majority of the H.T. current it acts as a useful "ballast" and prevents an excessive voltage rise. When the speaker field is energised by connecting it in parallel with the H.T. supply, the precautions mentioned are not as important.

**Important Broadcasts of the Week**

**NATIONAL (261.1 m. and 1,500 m.)**  
 Wednesday, June 1st.—Commentary on The Derby, from Epsom.  
 Thursday, June 2nd.—Tosca, acts 2 and 3, from Covent Garden.  
 Friday, June 3rd.—London Music Festival 1938, fifth concert, from Queen's Hall, London.  
 Saturday, June 4th.—Experimental Hour: Matrimonial News, a play by Tyrone Guthrie.

**REGIONAL (342.1 m.)**  
 Wednesday, June 1st.—Walkure, act 2, from Covent Garden.  
 Thursday, June 2nd.—Franz Josef Haydn, a musical biography—3, Storm and Stress (1771-1780).  
 Friday, June 3rd.—Stanelli's Ladies' Night.  
 Saturday, June 4th.—Behind the Lace Curtains, a play by Esther McCracken.

**MIDLAND (296.2 m.)**  
 Wednesday, June 1st.—Time Turns Back: The '45 Rebellion, an account.  
 Thursday, June 2nd.—Franz Josef Haydn, a musical biography—3, Storm and Stress (1771-1780).

Friday, June 3rd.—Three Tales of the Improbable: We were Strangers, by Francis Durbridge; The Hill of Yesterday, by Colin Howard; and Barking Dog, by L. C. Walters.  
 Saturday, June 4th.—Three Aspects of Cricket; commentaries from Northampton, a Herefordshire village, and Oxford.

**NORTHERN (449.1 m.)**  
 Wednesday, June 1st.—Walkure, act 2, from Covent Garden, London.  
 Thursday, June 2nd.—Bridge Hand—3, commentary on the bidding and the play.  
 Friday, June 3rd.—Under the Cheviots, a story of life in Northumberland.  
 Saturday, June 4th.—Behind the Lace Curtains, a play by Esther McCracken.

**WELSH (373.1 m.)**  
 Wednesday, June 1st.—Brand New: a programme by artists broadcasting for the first time.  
 Thursday, June 2nd.—A Penillion recital.  
 Friday, June 3rd.—Preview of Summer, feature programme.  
 Saturday, June 4th.—Band concert.

**WEST OF ENGLAND (285.7 m.)**  
 Wednesday, June 1st.—Gloucestershire v. The Australians, 1930, reconstructed by J. G. Coates, followed by an eye-witness account of the first day's play Gloucestershire v. The Australians, 1938.  
 Thursday, June 2nd.—Variety from the Hippodrome, Southampton.  
 Friday, June 3rd.—The Island of Guernsey, a talk.  
 Saturday, June 4th.—Victorian Vignette.

**SCOTTISH (391.1 m.)**  
 Wednesday, June 1st.—Empire Exhibition Visit: The Palace of Engineering, a short description.  
 Thursday, June 2nd.—Scottish Music of To-day: Orchestral programme.  
 Friday, June 3rd.—Recital of Scots Folk Songs.  
 Saturday, June 4th.—Variety from the King's Theatre, Glasgow.

**NORTHERN IRELAND (307.1 m.)**  
 Wednesday, June 1st.—Empire Exhibition Visit: The Palace of Engineering, a short description.  
 Thursday, June 2nd.—Franz Josef Haydn, a musical biography—3, Storm and Stress (1771-1780).  
 Friday, June 3rd.—All Kinds of Musick: selection of tunes on unusual instruments.

# RADIO SERVICING WITH THE CATHODE RAY-3

The Cathode-ray Oscillograph as an Output Meter, and Ganging, are Discussed in this Article

THE service engineer is not so much concerned with absolute measurements as he is with comparative measurements. It is true that where such values as valve voltages and currents, component resistances, etc., are concerned, straight measurements form an ordinary testing procedure, but where such factors as receiver sensitivity, selectivity, and quality of reproduction are concerned, the service engineer works in an atmosphere of comparisons.

C.R.O. apparatus enables the service engineer to see instantly and exactly what happens as a result of many possible component changes or adjustments, and removes a great deal of the uncertainty that inevitably overhangs the work of anybody who has to service receivers without the aid of the cathode-ray. The very considerable removal of uncertainty is the outstanding feature of cathode-ray testing technique, and labels the C.R.O. as essentially a time-saver. To appreciate this time-saving element of cathode-ray testing, one has only to consider that very common example of a service engineer trying to improve the selectivity of a receiver. Whatever adjustment or component repair that he may make, it is necessary for him to check up to find the extent of the improvement, if any. How will he do this? Suppose we say, by a reception test. This may seem a very proper way to make a check, but it is going to take time, even if it is only a matter of minutes. Minutes are precious in service work, and it may well happen that a succession of such reception checks are required, in which case the time involved will mount up considerably. With C.R.O. apparatus, however, an H.F. response curve check will give all the information that is wanted, and the occurrence of any change in selectivity will be instantly apparent, and without the least uncertainty.

C.R.O. apparatus for service testing consists essentially of two instruments, the oscillograph and the oscillator, the latter being of the special type previously referred to. The oscillograph will contain a time-base and one, or perhaps two, R.C.C. amplifiers, the latter being designed for linear amplification over a wide range of frequencies. For normal service test requirements one amplifier will usually be found to be sufficient, this being used to amplify the Y deflecting voltage in the cases where insufficient deflection would be obtained without amplification.

As regards the controls on the oscillograph that are to be considered as most usual, these are:

Sweep frequency control (generally coarse and fine adjustments are provided).

Amplifier gain control.

Synchronising control.

Focusing control.

Sweep amplitude control.

Shift control (it is very convenient to have means of shifting the screen "picture" up or down, particularly when H.F. response curves are being obtained).

It is to be understood, of course, that the time-base can be switched in or out, as required.

Most receiver servicing tests are carried out with the time-base in action, the Y deflection being controlled by signals picked up at various alternative points in the receiver. It is to be mentioned that one side of both the X and the Y deflecting systems are normally "tied down" in potential, and that the deflecting voltages are applied between the "free" X plate and E, or the "free" Y plate and E. Thus, with the time-base switched on for X deflection, the Y deflecting voltage can be picked up from the receiver with the aid of one test prod. The amount of information that can be gathered by a run round with this one test prod is usually a source of surprise to people not previously familiar with cathode-ray testing technique.

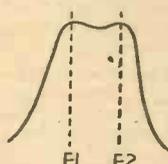


Fig. 10.—Illustrating the effect of A.V.C. on the tube.

## The C.R.O. as Output Meter

When straightforward peak signal trimming adjustments are being made, the oscillator can be used on amplitude modulation, and the C.R.O. employed as an output meter.

Assuming that receiver, oscillator and C.R.O. are all earthed, all that will be necessary will be to take the Y lead to the anode of the output valve. With push-pull, or class B output, the Y lead can be taken to either of the two anodes. It will usually be desirable to have the C.R.O.'s amplifier in use between receiver and Y, and the gain should be adjusted to give maximum sensitivity of indication (consistent with the trace not running off the screen vertically).

If the time-base is switched on, the trace will be that of an A.C. waveform (due to the audio frequency modulation of the oscillator), the Y deflection being controlled by the potential variations at the output valve anode. Trimming adjustments will have the effect of causing the screen "picture" to expand or contract vertically, and a peak adjustment is indicated by maximum vertical distance between positive and negative peaks. Alternatively, the time-base could be switched out, in which case the Y deflection will produce a simple vertical straight line trace, and trimming may be adjusted to give the maximum length of line.

## Ganging

As an aid towards the reganging of receivers in general, and of modern type, the C.R.O. and associated oscillator must be regarded as virtually a necessity if speed with certainty is to characterise the work.

In the simple case of a receiver having no pretensions to band-pass characteristics, and where all-trimmer settings will be of the peak type, the C.R.O. may usefully be employed as an output meter, as described above. Perhaps in connection with such

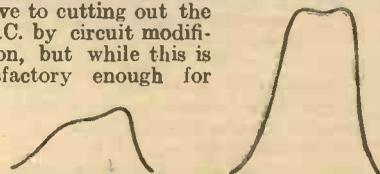
a simple case, one could say that simpler gear than C.R.O. apparatus would be quite satisfactory, but it must be remembered that the C.R.O. provides the means of checking up on H.F. response curves. This is a valuable attribute, even where a "straight three" receiver is concerned.

It is with the receiver containing band-pass couplings that the C.R.O. really shines as a trouble remover and a time-saver.

In such a case a considerable amount of the adjusting will be done with reference to H.F. response curves. The procedure is easy to follow, and such precautions as are necessary are not at all complicated. We will deal with the latter first.

The A.V.C. should be kept cut out while all the trimming is being done. (Disconnect A.V.C. feed lines from A.V.C. detector and earth them to chassis.) It is important to realise that the action of A.V.C. can lead to false response curves appearing on the screen. The reason for this is that although the trace on the screen represents a graph of detector-output volts against frequency, the conditions under which any particular response curve is produced are artificial, and differ in one important respect from the conditions of actual radio reception. In actual radio reception carrier and sideband frequencies are present simultaneously, but with a "wobbled" H.F. input the frequencies covered by the base of the response curve are passed through by the oscillator in succession, and at a certain rate. Referring to Fig. 10 the oscillator will attain the frequency F1 before it reaches the frequency F2. If the rise of H.F. amplitude exceeds the A.V.C. delay voltage, the A.V.C. diode will commence to rectify. The A.V.C. feed line to the controlled valves has, however, a certain time constant, and in view of the consequent "sluggishness" of the A.V.C. bias variation, it should be easy to appreciate that although the H.F. response of the receiver under reception conditions might correspond to a symmetrical curve, such as that of Fig. 7, yet, under "wobulation" conditions, the trace shown on the screen could be rendered lop-sided by the effect of A.V.C.

The idea of keeping the test signal well down in amplitude, so that the delay voltage keeps the A.V.C. out of action, may suggest itself to the reader as an alternative to cutting out the A.V.C. by circuit modification, but while this is satisfactory enough for



Figs. 11 and 12.—On the left is seen the effect of heavy damping on an I.F. circuit, and on the right how it appears when the damping is removed.

quick check test purposes, it is not to be advised when actual ganging work is being done. When making trimmer adjustments with an H.F. response curve as guide, it is desirable to have a reasonably big "picture" on the screen, and this makes a very low amplitude of input un-

(Continued overleaf)

## RADIO SERVICING WITH THE CATHODE RAY

(Continued from previous page)

suitable. At the same time care must be taken that valve overloading is not permitted as this, again, would give distortion of the trace. Using the C.R.O. amplifier in front of the Y plate with the gain well up will make it easier to get a good size of trace, without overloading of the receiver valves.

Another precaution concerns the frequency at which the time-base is run while H.F. response curves are being taken. This should not be too high, and as a general rule 25 sweeps per second can be considered as satisfactory.

The procedure for ganging follows the usual practice as regards the sequence of the adjustments. With a superhet, for instance, the I.F. trimming should be done first.

When adjusting band-pass I.F. stages for satisfactory response the Y amplifier lead should be taken from the detector. If this is a diode the high potential end of the diode load resistance will be the proper test point.

Where grid detectors are concerned one most frequently finds a resistance anode load in modern receivers, but should the case be met where L.F. transformer coupling is used between the detector and the succeeding valve, the anode circuit should be temporarily modified to have a resistance load while an H.F. response curve is being taken; otherwise the reactance component of the primary impedance will tend to produce a false shape of curve. Use the detector anode as a test point.

If a receiver contains three I.F. transformers the I.F. test signal ("wobbled") should be applied to the grid of the first I.F. valve, and the combined response curve of Nos. 2 and 3 transformers got right first.

Then the test oscillator input can be shifted back to the frequency-changer grid, and No. 1 transformer adjusted to give satisfactory response of the I.F. section of the receiver as a whole. During I.F. aligning work the receiver's oscillator should, of course, be kept out of action.

When band-pass circuit adjustments are tackled with the aid of an output-meter indication only, it is particularly easy to land up with a pseudo band-pass response that is, in reality, a double-peaked curve obtained by mis-tuning. There is little risk of doing this with a C.R.O. response-curve indication if a careful eye is kept on the changes of response-curve shape with each trimmer adjustment. The C.R.O. user scores heavily over his less fortunate technical brethren in the respect that the former is able to see *instantly* what effect any particular band-pass trimmer adjustment is having.

After the I.F. stages of a superhet have been correctly aligned the oscillator trimming and padding can be attended to, using the C.R.O. as output meter. Then the signal-frequency circuits should be aligned, and if there are any band-pass couplings involved, the adjustment should be done against a receiver overall H.F. response curve, using a "wobbled" test signal. In any case, a final check should be made of the overall H.F. response curve.

The fact that H.F. response traces can be obtained makes the C.R.O. an extremely useful device as an aid to the location of faults. As many of our readers will be able to testify, the locating of a fault frequently takes far more time than the actual rectifying of the fault, once it has been found. Particularly is this liable to be the case when the fault is associated with an H.F. circuit and affects the selectivity or sensitivity of the receiver.

Considering the H.F. section of a receiver it will be appreciated that no fault can develop affecting selectivity, or sensitivity, without in some way "making its mark" on the H.F. response curve.

Figs. 11 and 12 illustrate a case in point. A superhet gave weak reception. Results were so poor on all wavebands that it became a matter of immediate interest to find out what the I.F. stages had to say for themselves. A response-curve check on the I.F. section of the receiver gave the result of Fig. 11. This curve showed definitely that there was trouble in the I.F. section; moreover, its shape and size suggested the presence of excessive H.F. damping. Fig. 12 shows the effect of clearing the fault (a resistance leak through an I.F. trimmer).

Time in locating intermittent H.F. faults can very often be saved by obtaining an H.F. response curve and watching to see exactly what happens to it when the fault occurs. To quote an example: A superhet developed an intermittent signal fluctuation on one waveband. A "wobbled" test signal was applied, and a watch kept upon the overall H.F. response curve. It was observed that when the signal fluctuation occurred it was associated with a sideways jump of the response curve. A sideways movement of an H.F. response curve indicates one of two possible happenings, either a change of applied signal tuning, or a change of receiver oscillator frequency. In the case under consideration the first possibility could be ruled out so it became obvious that the fault, whatever it might be, was causing the receiver oscillator frequency to shift. This information made the tracing of the fault a comparatively simple matter, and a certain padding condenser was very soon on the scrap heap.

(To be continued)

## TOPICAL NOTES

### Educating Television Engineers

AT a recent lecture and discussion arranged by the Television Society on the subject of educating prospective television engineers, some very interesting points were raised. First of all it was emphasised that a very sound technical foundation was essential. Very often the student whether young or old, felt that many of the subjects included in his curriculum were irrelevant, but experience has shown that this is not the case. Television is a very specialised branch of applied science covering a wide variety of subjects for its complete understanding, and would-be recruits for its ranks are well advised to absorb every scrap of technical information that is possible, providing always that the source of this material is reliable. That is where the reader of PRACTICAL AND AMATEUR WIRELESS is able to score. The Editor, with his wide experience and practical knowledge acquired over a period of years, exercises the most scrupulous supervision to ensure that readers are given technically accurate facts in the columns of this journal, and this provides a good grounding for extending knowledge by the study of more advanced and specialised books. It was interesting to find at the same meeting that many speakers advocated the teaching of A.C. work before D.C., or alternatively the introduction of alternating currents, at a much earlier stage in a full course of study. There is a lot to be said for this point of view, for nearly all radio and television work, and

normal electrical activities for that matter, is associated with alternating or pulsating currents, and the earlier a student becomes familiar with the principles involved, the

quicker will he be in a position to understand the more advanced problems. Dealing with frequencies of such a high order, as is essential for television, necessitates a very intimate knowledge of fundamentals, but the future prospects in the television field are so good that the engineer will be well repaid for his efforts in acquiring this technical information.

### In Germany

AT the moment it is still a matter of conjecture as to the plans of Germany for the Berlin Radio Show, which opens early in August. Ever since 1929 the subject of television has been featured, and each year has found its presentation one of increasing importance, enabling the public to see behind the scenes. It is certain that this year will prove no exception to the rule, and although late in starting, the high-definition television service on 441 lines is sure to prove efficient. To meet a prospective market the manufacturers are engaged in designing good quality instruments, but it is doubtful whether there will be any really low-priced sets to compare with the People's Set which found a measure of favour on the sound broadcasting side.



Dinah Miller, the popular vocalist who is heard over the air with Jack Harris and his band from Ciro's Club, London.

# ON YOUR WAVELENGTH



## The Licence Figures

I OBSERVE that 18,593 new licences were taken out during April, and that a total of 540,519 paid licences were issued during that month, whilst 521,926 expired. There were approximately 8,560,000 licences in force at that time plus 49,800 free licences, making a total of 8,609,800. These figures show a slight drop for the corresponding period of last year, so I suppose the peak point will hover somewhere between 8 millions and 8½ millions. This seems to indicate that approximately one person in six owns a wireless set. As the average number in a family is only three, it would seem that half the homes in this country are without wireless.

## The Second-hand Receiver

DEALERS all over the country are most concerned at the problem of disposing of receivers which are traded in when the customer buys a new set. Such receivers, I understand, are being sold off at absurd prices, and thus militate against the sale of new receivers. This problem is an old one with which the motor and cycle trades have been wrestling for many years without having found any solution more satisfactory than pricing a car or a bicycle according to the year of its make and irrespective of condition. Now with a wireless set you cannot measure the number of hours it has been in use, and with new receivers being produced every month you cannot measure its value by its age, for six months seems to be a long time in the wireless industry, and a set produced that number of months ago can be out of date. It may be that the wireless manufacturers will agree upon a list of standard allowances for second-hand receivers, but that does not solve the problem because dealers cannot be compelled to honour such arrangements. They will agree to do so, but the smell of an order makes them forget their scruples and they will offer that little bit more which the dealer round the corner has refused. Personally, I think that the whole problem is due to over production and the high - pressure selling methods adopted in the wireless trade. High dividends are the object, and I think that it is a mistake

## By Thermion

to render a set obsolete by the production of new models every few months. There are too many types of wireless set on the market, and this means that the manufacturers have to resort to the artifice of imaginary selling points in order to effect sales among those who are not so knowledgeable as the readers of this paper. A second-hand set is without guarantee and it can often be an expensive proposition to get it in working order. If it is a discontinued model there is the difficulty of spares and service, and if as is so often the case the dealer and his assistants are without specialised knowledge, it is impossible to adapt

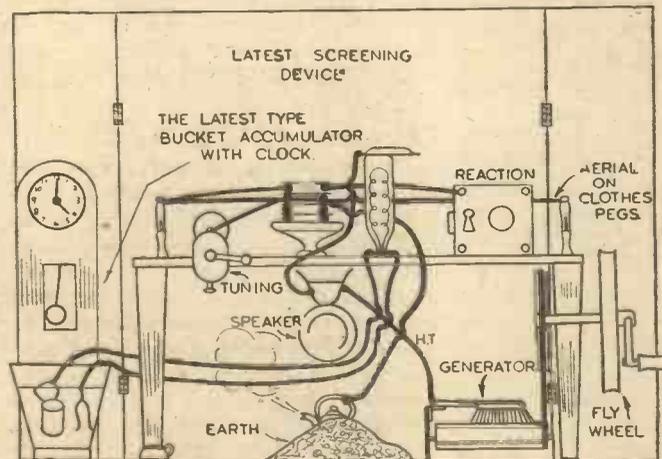
the wireless trade to scrap all of the sets which are traded in, for the public would then have no alternative but to buy new receivers or to make them.

## A Queer Set!

H. R., of Wolverhampton, sends me the following: "While I was looking through a back number of PRACTICAL AND AMATEUR WIRELESS, I read that you wanted drawings of receivers in use in queer places, so with much effort and skill I am sending you mine. The only difficulty I witnessed was the fact that I needed more than one person to operate the controls, but this was easily overcome by getting two local men as helps. I would like to state that I have not as yet patented this novel set, but if any of your readers would like to copy this they may do so."

## The Scout's Badge

I HAVE heard from a number of Scouts who ask me to publish a list of replies to the questions that are set for the wireless badge. I shall do this after I have consulted the Editor of *The Scout* as to whether such a procedure is permitted. After all, such questions are intended to indicate that the applicant for the badge has a background of wireless knowledge, and it does not seem to me that merely learning off a number of stock replies to standard questions will give that indication. Whilst I know very little



H. R., of Wolverhampton, is responsible for this set, which may not please everybody.

the receiver to make it really workable.

Without wishing to throw a spanner into the works, I advise my readers to advise their friends to have nothing to do with the purchase of second-hand wireless sets. If there is a problem as to what to do with second-hand sets that is one which the industry must solve without looking to the public for part solution. It would pay

about the Scouting movement, I suggest [that the granting of a badge should not be made too easy, and we] all know that there are Scouts whose uniforms are smothered with badges. I know a few of these Scouts and they are most ignorant on the subjects which the badges should indicate they understand. One Scout asks me to publish these answers because "there is a woeful

lack of technical books in his library."

#### Joke

A READER tells me that he was much amused at a friend's house by the efforts of the latter to put a straight-three in order. After an hour's work the owner of the set admitted that it was louder. The "friend" said that he had put a resistance across the speaker, whereas inspection showed that it was a fixed condenser! If this is a joke stop me and buy two.

#### Another Suggestion for the B.B.C.

IN view of the claimed popularity of the Spelling Bee Contest I suggest that the B.B.C. should have its announcers before the microphone and let them be cross-examined by such experts as the Editor of PRACTICAL AND AMATEUR WIRELESS, Thermion, and others. The results, I am sure, would be most amusing. We could, for example, ask Welsh, Irish, Scottish and English announcers to pronounce the word "Wurrrrrruld," or "Hoose," "Nacht," and so on. I suggest that the Oxford Dictionary should be used to judge. I guarantee that not one of the announcers would have the correct pronunciation.

#### The Derby Broadcast

IT seems that listeners to the Derby broadcast from Epsom, on June 1st, will be able to share not only the thrills of the crowd on the actual course, but the anticipatory excitement of the great Derby cavalcade as it journeys from London to Epsom.

A B.B.C. van, complete with transmitter, John Snagge and Richard North, will be travelling in the stream of traffic en route for the position which it hopes to occupy at the starting-point. Some two or three hours before the actual race begins, therefore, listeners will be invited to join the motley stream of private cars, motor coaches, coster carts, cyclists and others, heading for the Downs.

Commentators Snagge and North will describe the scene as they pass along, and will bring to the microphone such sounds and voices typical of the road as they can collect. If the van gets through on time, the actual start of the Derby will be described by Richard North from his position directly opposite the starters. In the event of the van being just "somewhere in Surrey" at three o'clock, the start of the race will be described from the Grand Stand by Thomas Woodroffe, assisted by a race reader. A reception point,

## Notes from the Test Bench

### Trimming I.F. Transformers

IT has been found that some listeners are using ordinary oscillators (uncalibrated) for lining-up I.F. transformers and results are unsatisfactory for the following reason. When the primary and secondary are brought into resonance, the signal from the oscillator will be heard, although the frequency adjustment may be very much out. If the second transformer is adjusted in a similar manner this also may not be in agreement with the first transformer settings and thus nothing is achieved by this method of adjustment. A calibrated oscillator must be used for this purpose, or one of the special I.F. liners such as is supplied by Messrs. Bulgin. It must be remembered that not only must each primary and secondary be matched, but also the frequency of each primary and secondary on all the I.F. components must be adjusted to that provided in the oscillator stage.

### A Biasing Point

IN some L.F. circuits it is possible to make use of a small biasing cell connected in series with the grid lead, the bias required being only of the order of 1.5 volts. It is important to remember, however, that owing to the high resistance of such a cell, if connected in series with a volume control it may prevent volume being reduced to zero. To overcome this difficulty a condenser should be placed across the cell, and it should have a capacity of 2 mfd.

### Disconnected Metallising

IN some cases of instability it is often found that it is due to the fact that the metallised surface of a valve becomes disconnected from the cathode or filament leg. This can sometimes arise from mishandling, the glass bulb becoming loose in the valve base and the continuity thus broken. In some types of valve a short thin wire is anchored to the metallising beneath a seal and this is joined to the filament leg. This wire may become broken through removing the valve by holding the glass, and therefore the base should always be gripped when plugging-in or removing a valve.

complete with effects microphones, will be situated by the Southern Railway's mound stand at Tattenham Corner. This will pick up the broadcasts from the van and will feed them by line to the control point in the Grand Stand. There will not, this year, be commentators at Tattenham Corner itself.

On June 3rd listeners will hear a straightforward broadcast on the Oaks, the classic for three-year-old fillies. The description of the race will be given by Thomas Woodroffe, assisted by a race reader.

### London's Blind Visitors

I AM informed that over a hundred blind Esperantists from fifteen countries will be coming to London for the thirtieth World Esperanto Congress to be held at University College in August. In all there will be nearly two thousand people from thirty countries at this great international meeting. Among blind persons Esperanto has always had a large number of adepts; they have their own Braille magazines in the language, some of which circulate all over the world, forming a bond of friendship and understanding usually impossible for sightless persons. In London the Lending Library for the Blind has a thousand volumes in Esperanto and one "talking book" gramophone record. During the Congress the blind Esperantists will have their own meetings, though they will also take part in the general arrangements, and many Esperanto-speaking Londoners are looking forward to "showing" them round the city, for it has been truly said that to explain the sights of a town to a blind person is to discover in the most ordinary of everyday things a wonder and beauty of detail hitherto unsuspected.

### A Limerick

A. A. CARSWELL, of Falkirk, sends me the following note: "Here is a little limerick that may interest you:

'Tis said that at Tristan da Cunha  
They shanghaied a man in a schuna  
And dropped him at sea,  
For the gentleman, he  
Showed signs of becoming a  
crunha."

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# Technical Fundamentals-10

The Principle of the Superhet, and Its Advantages are Discussed in this Article

BY using a "differential" reaction control condenser the reaction control capacity can be made to increase, and the by-pass condenser capacity made to decrease at the same time (and vice versa). A differential reaction condenser contains two sets of fixed plates and one set of moving plates and its action will be understood by reference to Fig. 44.

To deal with the general effects of reaction it must be understood that if the

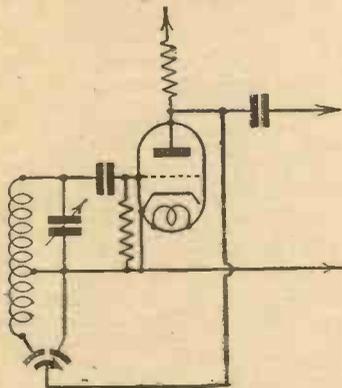


Fig. 44.—How a differential reaction condenser is employed in a detector stage.

reaction control condenser capacity is increased from minimum value a greater feed-back voltage is induced into the grid circuit, and the amplitude of the oscillations correspondingly increases. This regenerative amplification cannot be raised without limit, and the limit is marked by the valve jumping into continuous oscillation.

Reaction necessarily involves a feeding back of H.F. energy from the anode circuit to the grid circuit. Energy is dissipated in the grid circuit in various H.F. losses and the latter, as we know, have a close and important connection with selectivity. If the grid circuit receives a supply of energy from the anode circuit it stands to reason that the effects of the grid circuit losses will be less pronounced, and this implies that the selectivity will be raised. When interference between stations is being experienced with the simpler type of "straight" receiver, employing reaction, it will often be found that a little careful juggling with the volume and reaction controls will improve matters.

The fact, already mentioned, that increasing reaction above a certain point causes the valve to go into continuous oscillation brings us to a consideration of the valve oscillator.

In the ordinary tuned radio-frequency ("straight") receiver each tuned H.F. circuit works at the carrier frequency of the signal being received. If, for example, a 300-metre, or 1,000 kc/sec., signal is operating in the aerial circuit the oscillations will remain at 1,000 kc/s in every circuit right up to the detector.

It will, of course, be necessary for every H.F. circuit in the receiver to be variably tuned, to allow for the reception of signals of various different carrier frequencies. In the superhet receiver, however, only a certain number of the tuned H.F. circuits

are variably tuned and work at the carrier frequency of the signal, and these circuits (there may be only one, however) come first, counting from the aerial. The remaining H.F. circuits are fixed-tuned to a particular frequency which is independent of the signal carrier frequency, and is known as the "intermediate" frequency.

It is pointed out that whatever adjacent channel selectivity and H.F. amplification that a superhet may show is mainly to be attributed to its intermediate frequency stages.

As there are two high-frequency values, the signal carrier and the intermediate frequencies, involved in superhet reception it follows that a frequency conversion process must be an essential feature of the system. In brief, the signal comes at its carrier frequency, and carrying its modulation, through one or more H.F. circuits. Then a change of frequency is made, and the signal comes through the rest of the H.F. circuits with the carrier frequency changed to the intermediate value, although the modulation frequencies are unaffected.

Before considering how all this is brought about we will first look into the question as to what advantages are to be gained by employing such an apparently complicated system of reception.

## Matching

The fact that the intermediate frequency circuits are fixed-tuned gives more than a clue as to the position.

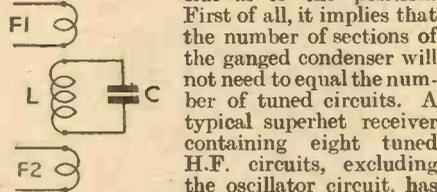
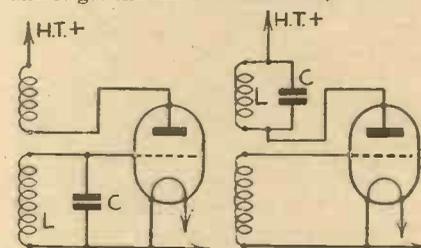


Fig. 47.—Illustrating the application of two different e.m.f.s to a closed circuit.

First of all, it implies that the number of sections of the ganged condenser will not need to equal the number of tuned circuits. A typical superhet receiver containing eight tuned H.F. circuits, excluding the oscillator circuit, has only three sections in the ganged condenser, and one of these belongs to the oscillator circuit. A little thought given to the idea of making a "straight" receiver with eight tuned circuits, and employing a ganged condenser with eight sections, should soon convince anybody that there is something to be said for the superhet. Quite apart from the formidable character of an eight-section ganged condenser, there is the problem of getting accurate matching between eight circuits to be considered, and remember, too, that each of the eight circuits will need wave-range switching.

The foregoing, important though it may appear to be, does not by any means exhaust the argument in favour of the superhet. The fact that the intermediate frequency does not vary with changes of signal carrier frequency, greatly simplifies the problems of the designer when it comes to a matter of making one or more H.F. stages have amplification and selectivity characteristics that will remain constant, and not vary with the tuning of the receiver. In earlier articles of this series we considered complications that arise with a variably-tuned circuit that has to be adjustable over a wide range of frequencies, and how changes of L/C ratio and H.F.

resistance affect the dynamic resistance and magnification of the circuit. It was also pointed out that it is very difficult to work to some specified band-pass characteristic, and to get the circuits concerned, if variably



Figs. 45 and 46.—Basic oscillators, showing the tuned circuits on grid and anode sides.

tuned, to hold closely to this characteristic over a range of frequencies.

In the case of an intermediate frequency stage in a superhet receiver there is only the one (converted) carrier frequency to be catered for, and the typical tuned primary, tuned secondary, I.F. transformer can be designed and adjusted for some particular selectivity characteristic, and to give some particular dynamic load, with the comfortable knowledge that the frequency upon which the design is based will be the frequency of operation.

So far we have been taking the frequency conversion process rather for granted, but as it necessitates the generation of local oscillations in the receiver, we will first deal briefly with the valve as an oscillator.

## The Valve Oscillator

In connection with regenerative amplification it was stated that a limit to the amplification is reached as soon as the reaction is advanced to the point that any further increase will cause the valve to "jump into oscillation."

It has been emphasised that reaction causes a feed back of energy from the anode circuit to the grid circuit, and by increasing the reaction sufficiently it becomes possible to supply the grid circuit with energy at just the same rate as the various circuit losses dissipate it. Under this circumstance the obvious happens—the oscillations will carry on indefinitely, even if the applied signal ceases. The

(Continued overleaf)

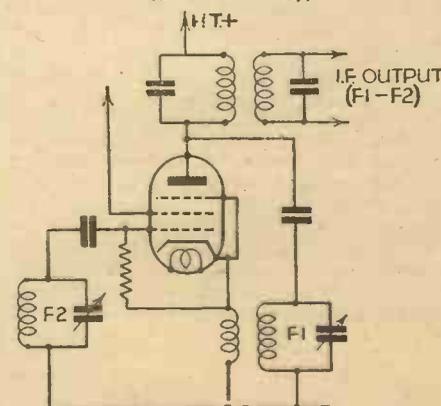


Fig. 48.—The first detector circuit, using an H.F. pentode.

## TECHNICAL FUNDAMENTALS

(Continued from previous page)

valve has, in other words, become a generator of oscillations.

The fact that we have stepped from the idea of regenerative amplification to that of the generation of oscillations may, however, tend to make the reader think that an applied signal is necessary to provide the initial start. This is not so.

Fig. 45 represents a simple basic oscillator circuit, and it is to be particularly noted that there is no question of there being any applied signal, for the circuit is self-contained. If the reaction is arranged in the correct sense, and is tight enough, then the mere act of switching on the valve will be sufficient to start the generation of oscillations in LC. The frequency of the oscillations will depend upon the tuning of LC.

The question as to how the oscillations start in the first place is simply answered. We have had no previous occasion in this series of articles to mention the self-oscillatory properties of a tuned H.F. circuit, but the fact is that a circuit containing inductance and capacity will (provided that the H.F. resistance is not too high) oscillate at its natural frequency when excited by any voltage impulse, even though the latter may be only a momentary "kick." In this connection there is a good and simple analogy in the pendulum. A pendulum needs only a tap to start it swinging at its natural frequency. In each of these cases (the electrical and the mechanical) a single impulse will set up oscillations that are of the "damped" variety, i.e., the oscillations commence with a certain maximum amplitude, but the peaks decrease with each successive alternation until zero is reached.

In the electrical case the actual process of oscillation involves a transfer and re-transfer of energy between the inductance and capacity of the circuit. Referring to Fig. 45, suppose an initial impulse puts a charge in C. This will discharge through L, and the current will create a magnetic field around L. The magnetic field will then collapse on the coil, setting up an e.m.f. of self-induction which will recharge the condenser. The latter will then discharge again (reverse direction of current), and so on.

Once oscillations do start in LC, they will not be damped out for the reaction will take charge and maintain the oscillations at constant amplitude. The necessary initial impulse need be only very slight, and is bound to occur when the valve is switched on and starts emitting.

Fig. 45 illustrates a case where the oscillating circuit is on the grid side of the valve. Fig. 46 shows another basic oscillator diagram and in this case the oscillating circuit is on the anode side of the valve.

Where the circuit of Fig. 46 is concerned it would be incorrect to suppose that the oscillations in LC are maintained by energy fed into LC by the grid circuit, for the latter contains no source of energy. It is to be understood that for both the Fig. 45 and the Fig. 46 circuits the H.T. supply represents the source of the energy that is consumed in the oscillating circuit. In the case of the arrangement of Fig. 46 the oscillations in LC will be maintained if an oscillating "feed current" component can be produced in the anode circuit. This requirement will be met if the anode current can be made to rise and fall at the correct frequency, and with the correct phase. This brings the matter to one directly concerning the reaction, for if the latter is of the correct sense and degree, the initial oscillations in LC will produce an H.F. voltage in the grid coil and this, in turn, will make the anode

current rise and fall. The anode current fluctuation will now contain the oscillating component necessary to feed energy into LC, and to maintain the oscillations.

### Superhet Frequency Changing

The frequency changing process involves the "mixing" of the signal oscillations and locally-generated oscillations, so we must first consider the effects produced by combining together two continuous oscillations of different frequencies.

Suppose that there are applied to the circuit LC of Fig. 47 two continuous H.F. e.m.f.'s of frequencies F1 and F2, respectively, F1 being the higher frequency. What is going to happen in LC? As the

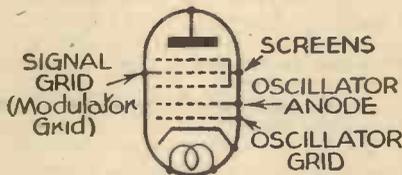


Fig. 49.—Diagrammatic representation of the pentagrid.

two e.m.f.'s operating in LC have different frequency values, no simple statement can be made that they are in phase, or that they are out of phase. Actually the phase relationship between them will vary. The two e.m.f.'s will drift into phase, drift out of phase (to 180 degrees), come into phase again, and so on, and this will occur in a certain regular manner. The definite fact is that the two e.m.f.'s will come into phase at a rate exactly equal to the difference between the two frequencies. As far as the resultant of the two e.m.f.'s is concerned, this will reach maximum peak value every time the two component e.m.f.'s get into

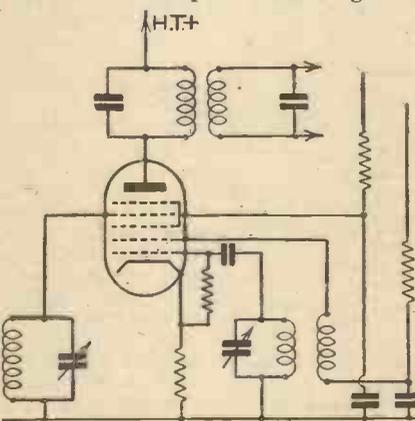


Fig. 50.—A pentagrid frequency-changing stage.

phase, and will drop to minimum value every time they get 180 degrees out of phase. It can be said that the resultant of the two component e.m.f.'s is "beating" at the frequency F1-F2.

If we could get this F1-F2 frequency filtered out from the two component frequencies, we would have a definite case of frequency "changing," but as the arrangements of Fig. 47 stand, there would be no hope of doing so. It must be remembered that the F1-F2 frequency is no more than the amplitude variation of the resultant of the two component e.m.f.'s, and that the latter are actively present. It would be quite impossible, assuming that the "beat" frequency is the one we were after, to pick it out by a coupled tuned filter.

It becomes a different story, however, if we apply the resultant voltage developed across LC to a detector. Then the output

of the detector will contain an F1-F2 component that can easily be filtered out from other components of the detection process. That the output current of the detector should contain an F1-F2 component can be deduced from quite elementary considerations. The resultant input voltage is rising and falling in amplitude at the frequency of F1-F2, so it could be assumed, just from that fact alone, that the detector output current would have a fluctuation at F1-F2.

The application of the above to superhet practice is as follows: Of the two frequencies, F1 and F2, one is that of the incoming signal oscillations, while the other is that of oscillations generated in the receiver itself by a valve oscillator. By suitable adjustment of the local oscillation frequency the value of F1-F2 can be made exactly equal to the intermediate frequency. As to whether the local oscillation frequency is the higher, or the lower, of the two component values is immaterial from the theory point of view, although it is almost invariable practice to make the local oscillation frequency the higher one. Thus the frequency conversion from signal carrier to intermediate frequency is a conversion from F2 to F1-F2.

In working out the basic theory we have taken no account of modulation. Actually, any L.F. modulation carried by the signal oscillations will appear as modulation of the "converted" oscillations, and there will be no trouble on this score provided that the F1-F2 frequency is very considerably above the highest audio frequency. That the intermediate frequency is well above audibility is emphasised by the full title of the system, which is "supersonic heterodyne."

### The "First Detector"

To employ detection as part of the frequency changing process is not so essential as the foregoing may suggest, for there happens to be an alternative (and a better one), but we will deal with the latter presently.

When a detector is used for frequency changing it is referred to as the "first detector." Obviously, there will have to be another detector (the second detector) to do the normal detection work necessary (in any type of receiver) to obtain the audio frequency, corresponding to the signal modulation, and necessary for the output stage of the receiver. It should be clear that the I.F. section of the receiver begins and ends with the output circuit of the first detector, and the input circuit of the second detector, respectively.

Fig. 48 shows an example of the first detector circuit using an H.F. pentode for both detection and the generation of oscillations.

### Frequency Changer Valves. The Heptode

Fig. 49 diagrammatically indicates the electrode assembly of the heptode type of frequency changer (indirectly heated mains variety). There are five electrodes of grid construction, two of these being bonded together. Counting up from the cathode, the first and second grid constructed electrodes form the grid and anode, respectively, of a triode oscillator, and Fig. 50 shows appropriate external connections for the generation of local oscillations. Each of the two electrodes which are bonded together acts as a screen. The remaining grid electrode is the one to which the signal oscillations are applied, while the outer anode is the one that is connected to the first I.F. transformer.

(To be continued)

A PAGE OF PRACTICAL HINTS

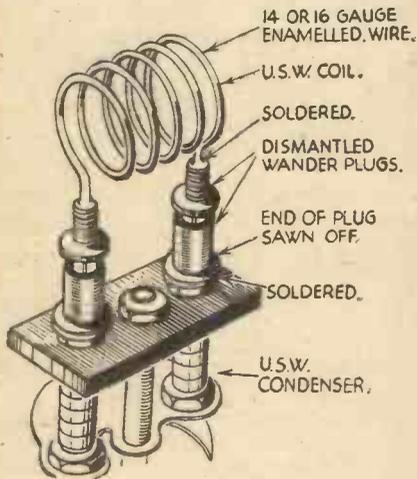
SUBMIT  
YOUR  
IDEA

READERS  
WRINKLES

THE  
HALF-  
GUINEA  
PAGE

Ultra-short-wave Coil Mounts

I HAVE devised the simple method, shown in the sketch, of mounting ultra-short-wave coils. Four wander plugs and a length of 14- or 16-gauge wire are required. The caps and lock-nuts are



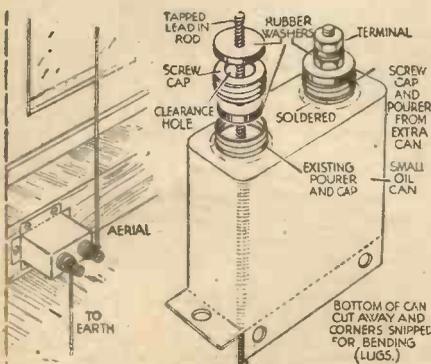
A simple method of mounting ultra-short-wave coils.

removed and the plug-parts of two of the wander plugs are sawn off, the coil being wound and soldered on to the two whole plugs. The other two parts are soldered on to the condenser terminals, as shown in the sketch.—F. SHEEN (Lenton, Nottingham).

A Weatherproof Lead-in Cover

AN empty oil-can, with the power and cap from another, together with four rubber washers, made the neat rainproof cover for the down-lead entry illustrated.

The extra pourer was soldered over a hole drilled in the top of the can to match the existing outlet, the bottom of the can being cut away, and the corners snipped to allow the bending operation. The lead-in rod was then passed right through the can and fastened to the screw cap by means of



A disused oil-can was used for making this weatherproof lead-in cover.

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

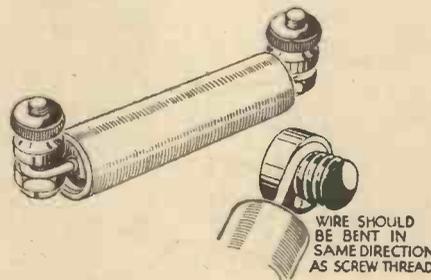
SPECIAL NOTICE

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

the rubber washers and terminals, clearance holes having been drilled in the screw caps.—L. BATTON (Stockton-on-Tees).

Connecting Small Resistors

MANY home constructors, no doubt, find that the wire ends on small resistors and tubular condensers are not quite long enough to make contact between



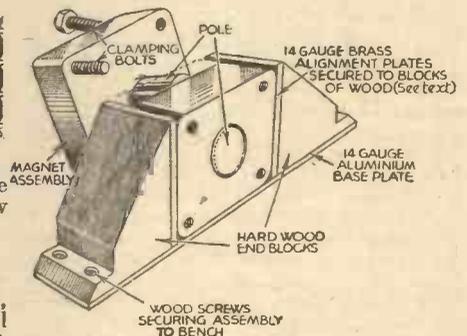
A useful dodge for connecting small resistors.

the necessary components, but the problem can easily be solved by the following dodge. About 1/4 in. of the protruding wire is all that is needed, so the rest should be snipped off with a pair of pliers.

Two 6BA screws are required with flat nuts and two terminals. Bend the wire ends and insert the screws so that the wire is looped as shown in the sketch. Make sure the nuts are screwed up as tightly as possible. The terminals are then put on and the resistors can be wired up to the set in the usual way.—FREDERICK W. AUSTIN (Paddington).

Re-aligning P.M. Moving-coil Speaker

I OFTEN clean out my speaker and have overcome the difficulty of centralising the pole-piece by carefully making a magnet mount in the manner shown in the accompanying sketch. It took some time to attain the correct air-gap, but eventually by trial and error, and with the use of two heavy-gauge pieces of brass and teak end blocks, the exact re-assembly became a simple operation after each cleaning. To retain the exactitude of the mounting, it became necessary to fit the assembly to

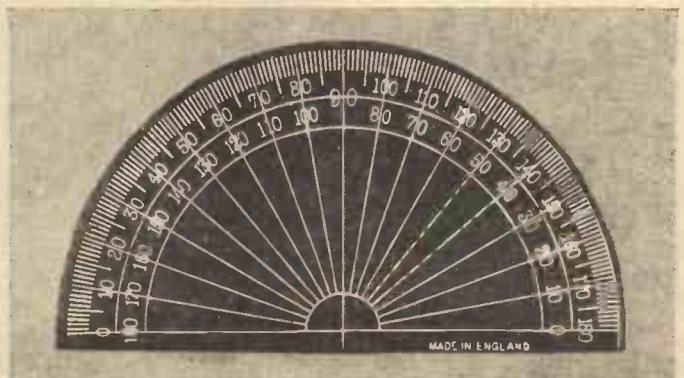


A device for re-aligning the pole-piece of a P.M. moving-coil speaker.

the bench, but the end blocks were first of all secured in position by countersunk wood screws let into the base of each block of wood, the screw holes shown at the end of each block being for the fitment of the whole unit to the bench; corresponding holes were drilled in the aluminium base plate.—S. T. SIMMONDS (Barnet).

A Novel Short-wave Dial

TO make this useful dial take a celluloid protractor to any photographic dealer and have prints made to the number required, at 2d. each. The result is a black and white photo of the protractor. Cut this part out of the print, and glue it on to the front of panel. It makes a good finish to the receiver front, and can be toned.—C. MELLANBY (Pwllheli, N. Wales).



A photographic print made from a celluloid protractor forms this novel short-wave dial.

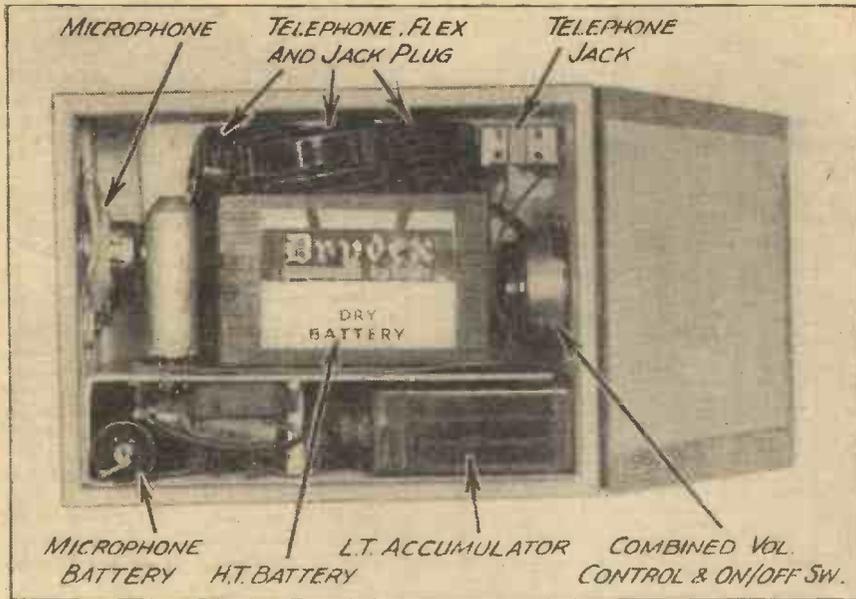


Fig. 1.—A view of the completed Aid, showing how the various parts are accommodated.

**M**ANY listeners are unable to hear the normal programmes owing to defects in their ears, and if the volume of the receiver is turned up sufficient for them it becomes objectionable for the

be used in the home and stood upon a table. It may, of course, easily be carried under the arm, or if intended for outdoor use a carrying handle may be attached quite simply to the top of the case. The micro-

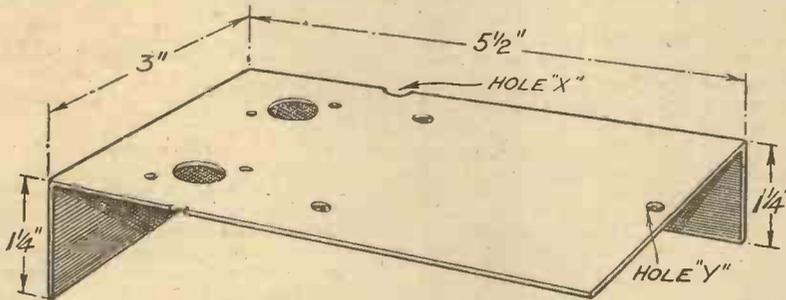


Fig. 2.—The chassis, cutting and drilling dimensions.

remaining members of the household. Similarly, normal conversation in the home has to be carried out at excessive volume in order that speech becomes intelligible, and thus there is need for some form of amplifier which may be used by those who suffer from this inconvenience. There are many forms of hearing aid now available, but in the majority of cases a simple two-stage amplifier of good gain, in conjunction with a reliable microphone and earpiece, will provide the necessary amplification to enable the majority of deaf people to take part in normal conversation. It must be emphasised, however, that deafness can take many forms and consequently it is impossible to guarantee that this, or any other form of hearing aid, will be suitable in every case. There are no high-note boosters or other devices of a similar nature in the aid to be described, which is purely a miniature two-stage unit, making use of miniature components and valves, but the gain is very high and in most cases it will be found quite sufficient for the purpose for which it has been designed.

**The Circuit**

The arrangement incorporated is shown in Fig. 6, whilst the photographic illustrations show the neatness of the design. No handle or other carrying device was fitted to the model, as it was intended merely to

# THE "P"

An Easily Constructed  
Listeners who are H

phone is provided with a 1.5 volt energising cell, and this is permanently wired. It is a simple matter to replace this when needed. The output from the mike is fed to the first valve through a special miniature mike transformer, and coupling between the first and second valves is by a similar type of component designed for intervalve use. The bias for the second valve is obtained automatically by means of a half-watt resistance and small bypass condenser in the usual circuit arrangement, and the 'phones are plugged into a small jack when required. A volume control combined with an on-off switch is provided so that the level of the output volume may easily be adjusted, and both H.T. and L.T. batteries, although of the miniature type, are provided with terminals or sockets so that connection may more easily be made. The entire apparatus fits into a small box measuring 6in. by 4 1/2 in. by 3 in. (internal dimensions), and the sample illustrated was made from thin plywood covered with leatherette paper. The valves are the special miniature components designed for deaf-aid apparatus by the Mullard company, and it should be noted that those illustrated are provided with metal screening covers. The makers inform us, however, that stocks of these are limited, and when disposed of the

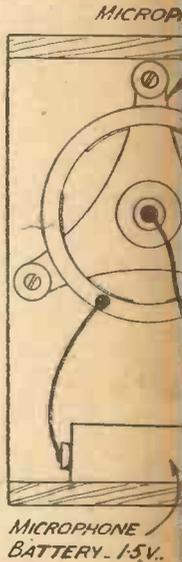


Fig. 4.—Wiring

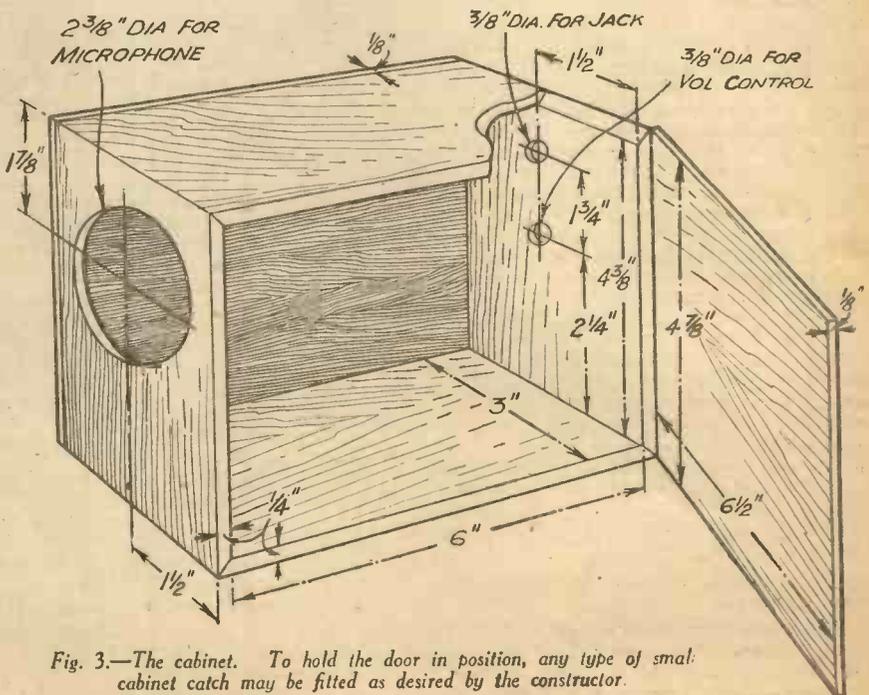
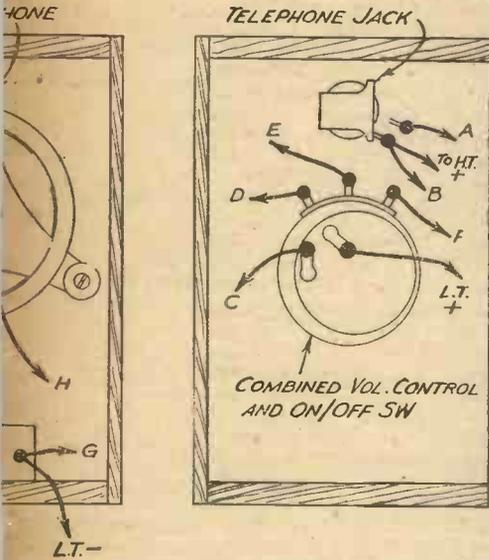


Fig. 3.—The cabinet. To hold the door in position, any type of small cabinet catch may be fitted as desired by the constructor.

# "W." DEAF-AID

## and Two-stage Amplifier for Domestic Use for Hard of Hearing - - - By W. J. DELANEY

newer types will be of plain glass. This will not affect the working in any way and it is quite in order if you obtain them when ordering your components at a later date.



to mike, control and jack. This should be studied in conjunction with Fig. 5.

### Construction

The amplifier is built on a small aluminium chassis, dimensions of which are given in Fig. 2. Two small holes are required for the valveholders, and holes are also required for the attachment of the transformers and through which certain leads are passed. Details of these are clearly given in the wiring diagram. Care should be taken to specify the correct type of valveholder for the valves, noting carefully the type number given in the list of parts, as these are similar in design to those made for the Hivac midjet valves, but the two are not interchangeable, the valve leg spacing being slightly different. One fixing bolt for the valveholders is used as a common anchoring point for the L.T. negative lead, whilst in other cases the original wires are used as fitted to the transformers, condenser, and resistance. When the valveholders are mounted the wiring to the filament legs should be carried out before attaching the transformers, as the latter will cover the valveholders and prevent connection. Note, also, that the valveholder sockets must be carefully bent down towards the chassis to clear the transformer, and care must be taken not to permit the bent-over tags to come into contact with the chassis.

### The Cabinet

The cabinet, or containing box may, of course, be built from metal if desired, but the wood is quite simple to work and cover. Dimensions are given in Fig. 3, and the

large hole for the mike should be cut slightly larger than the overall size of the instrument so that it may be mounted in a "floating" condition. This is accomplished by cutting a star-shaped piece of thick rubber as shown in Fig. 7 and inserting the arms of this beneath the split surrounding ring of the mike. Three small screws with washers beneath the heads will then enable the mike to be screwed into position. At the back of the cabinet two holes are required for the control and jack, and before mounting these components the connecting lugs should be well tinned. When the case is completed it may be covered with the leatherette paper or in any other finish desired by the constructor, and the equipment is ready for assembly.

One lead from the mike transformer primary has to be attached to the biasing cell, and this may be soldered quite simply to the zinc case. The cell in use was one half of a 3d torch battery purchased at the local sixpenny stores. A lead is then soldered to the top cap for subsequent

connection to the large ring of the mike and this also has to be soldered. Connection to the remaining side of the mike is by means of an ordinary small battery plug, attached to the remaining blue-lead on the mike transformer primary, the yellow lead being cut off short or rolled up carefully out of the way. A second wire is then soldered to the case of a cell (or attached at the same time as the transformer lead) for subsequent connection to the L.T. negative terminal. The yellow lead from the second transformer is pulled out and will just reach to the jack whilst still permitting the H.T. battery to be inserted, and when soldering this to the lug on the jack a second short wire should be attached to the same position for subsequent connection to the H.T. positive socket. The flexible lead attached to the second anode

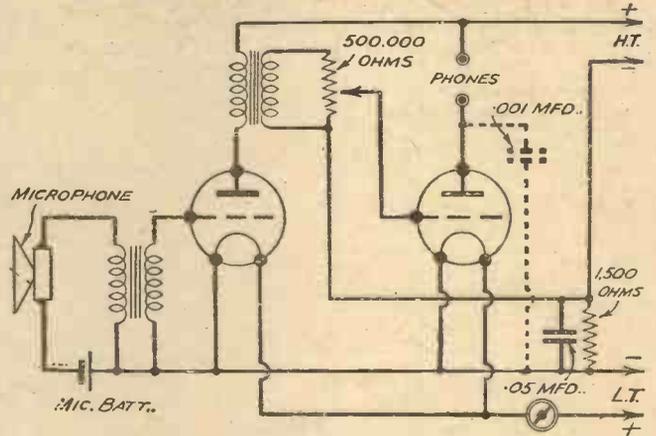


Fig. 6.—Theoretical circuit of the complete Hearing Aid.

lug should be taken up to the other side of the jack and a small nick is made in the edge of the chassis to clear this as shown in

(Continued overleaf)

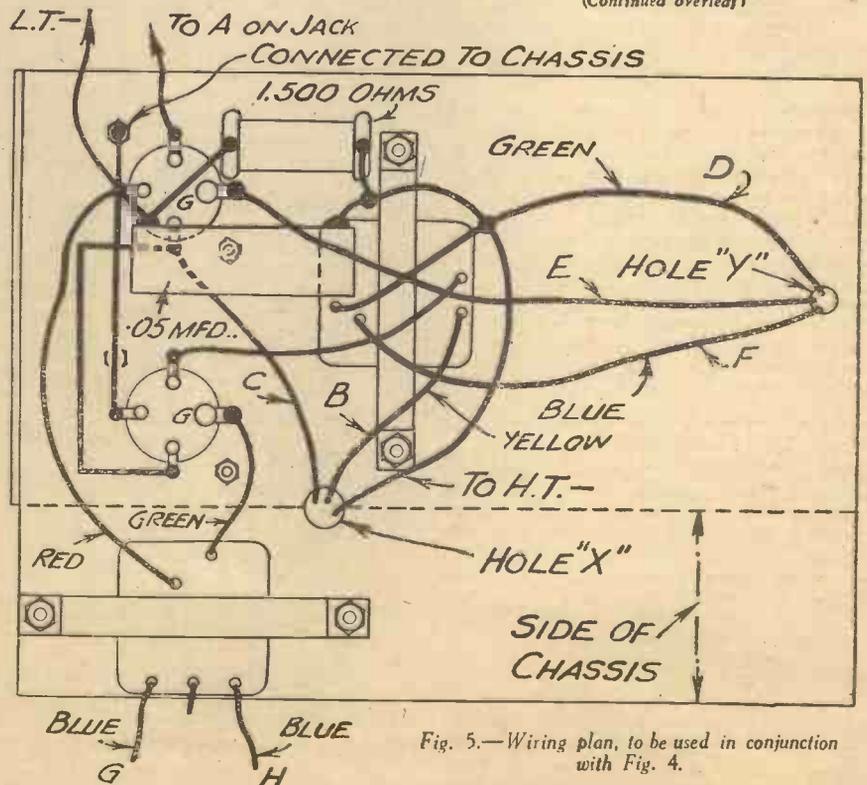


Fig. 5.—Wiring plan, to be used in conjunction with Fig. 4.

**THE "P.W." DEAF-AID**

(Continued from previous page)

the wiring diagram. The L.T. positive lead, which is brought up at the opposite edge of the chassis, is attached to one of the lugs on the on-off switch, whilst a further flexible lead is attached to another lug on the switch for subsequent connection to the L.T. positive terminal. A plug should then be attached to the H.T. negative lead which is brought through the chassis as indicated and joined to the H.T. negative socket on the miniature H.T. battery.

**Using the Device**

Plug in the valves and attach the Bulgin plug to the leads to the earpiece. The apparatus is now ready for use and by turning the rear knob in a clockwise

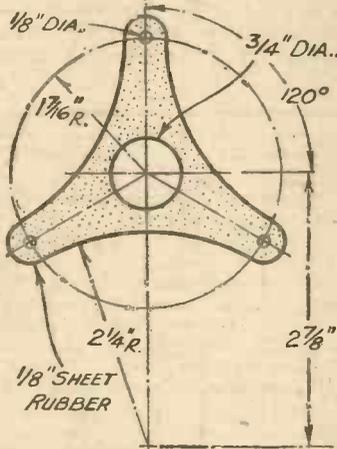


Fig. 7.—Details of the rubber mike support.

direction the apparatus is switched on and volume will be at a minimum. As the control is rotated further the gain will be increased and will build up to maximum. If, of course, the earpiece is left uncovered a microphonic howl may be set up due to feed-back between mike and earpiece and thus the two should not be allowed to face each other. The control and jack are fitted to the rear of the case as it is considered that this is most logical when the case is standing on a table. The user will naturally be sitting behind it and it will be directed toward the person who is speaking, or toward the radio. A single earpiece is employed in the design illustrated and was intended to be held when the apparatus is required for use, but special earpieces are available with clips or headband, or alternatively a complete headset may be used. This will necessitate a larger case to enable the additional earpiece and headband to be accommodated above the battery, but this detail is, of course, left to the builder, who may alter the case in any desired manner whilst still retaining the main essential—the chassis design.

**LIST OF COMPONENTS.**

- One microphone transformer, type L.F.35, Bulgin.
- One Midget L.F. transformer, type L.F.33, Bulgin.
- Two Midget valveholders, type V.H.33, Bulgin.
- One combined 500,000 volume control and on-off switch (Lab type), Erie.
- One Midget jack, type J.6, Bulgin.
- One flat top plug for telephone earpiece, type P.15, Bulgin.
- Single telephone earpiece or pair of 'phones, Peto-Scott.
- One microphone, Peto-Scott.
- One 1,500-ohm half-watt resistor, Erie.
- One .05 mfd. tubular condenser, T.C.C.
- One 1.5 volt biasing cell (See Text).
- One type D.A.1 Midget valve, Mullard.
- One type D.A.2 Midget valve, Mullard.
- One type X.325B Midget dry battery, Exide.
- One type PRA3S L.T. accumulator, Exide.
- One chassis and carrying case (See Text).
- Sundry bolts, flex, and two H.T. plugs.

**NOTES FROM THE TRADE**

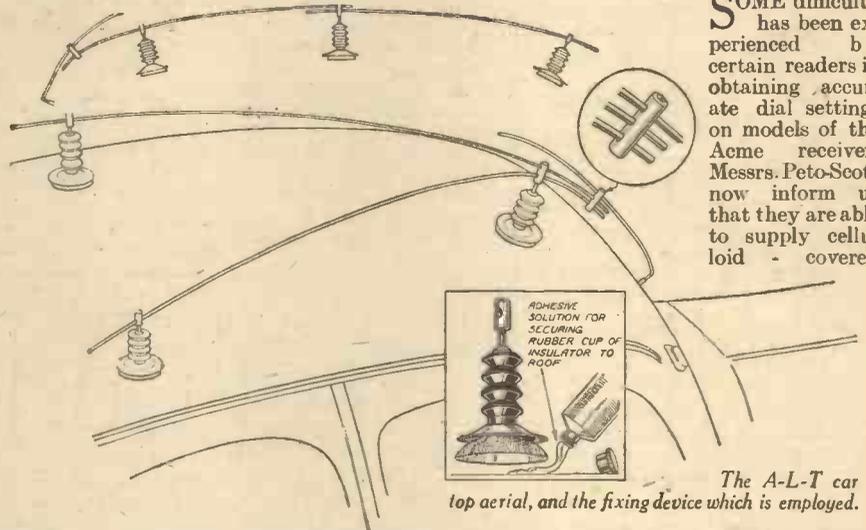
**A-L-T Car Aerial**

The illustration below shows the parts employed in the A-L-T car aerial, which is suitable for both closed and sunshine-roof type cars. It is supplied with large rubber suction cups and a tube of special cement which enables these cups to be firmly attached to the body of the car. The insulating pillars upon which the metal rods are mounted are of the type having a long leakage path and it is possible to erect the rods in various ways. A drilled pillar enables three rods to be accommodated and

ratio is 20 and the voltage drop 40. The anode to cathode voltage should not be allowed to exceed 400, whilst the maximum peak to peak scanning voltage should be about 120 volts. The peak discharge current should be limited to 300 mA. The valve is designed for both line and frame time bases, and is similar to type T.31, except that the anode is brought out to the base and thus renders it suitable for magnetic scanning. The price is 10s. 6d.

**Dials for "Acme" Receiver**

SOME difficulty has been experienced by certain readers in obtaining accurate dial settings on models of the Acme receiver. Messrs. Peto-Scott now inform us that they are able to supply celluloid-covered



The A-L-T car top aerial, and the fixing device which is employed.

thus a "V" or straight arrangement may be utilised. A lead-in wire is fitted, and the cost of the complete kit is 22s. 6d. Supplies may be obtained from Wireless Supplies Unlimited, of 278, High Street, Stratford, E.15.

**High-quality Programmes**

WITH reference to the recently introduced high-quality sound programmes broadcast on the television sound wave by the B.B.C. it is interesting to note that all Coscor console television receivers, right from the time when they were first introduced, are provided with an extra position on the waveband switch permitting television sound to be received (without re-tuning), while the entire vision deck, including, of course, the cathode-ray tube, is switched off. This scheme was incorporated as Messrs. Coscor always believed that the B.B.C. would sooner or later decide to utilise the 41.5 mc/s band for high-fidelity sound transmissions.

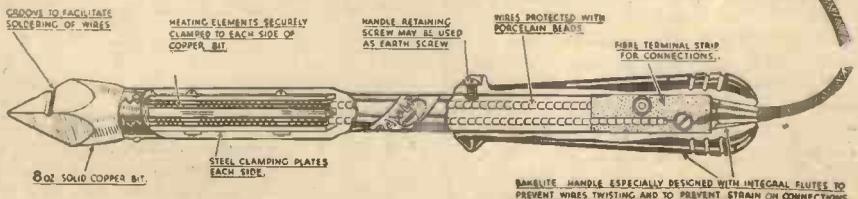
paper printed scales which will simplify the lining up of station indications in this particular receiver, and these dials will be available at 3d. each.

**Rawplug Soldering Iron**

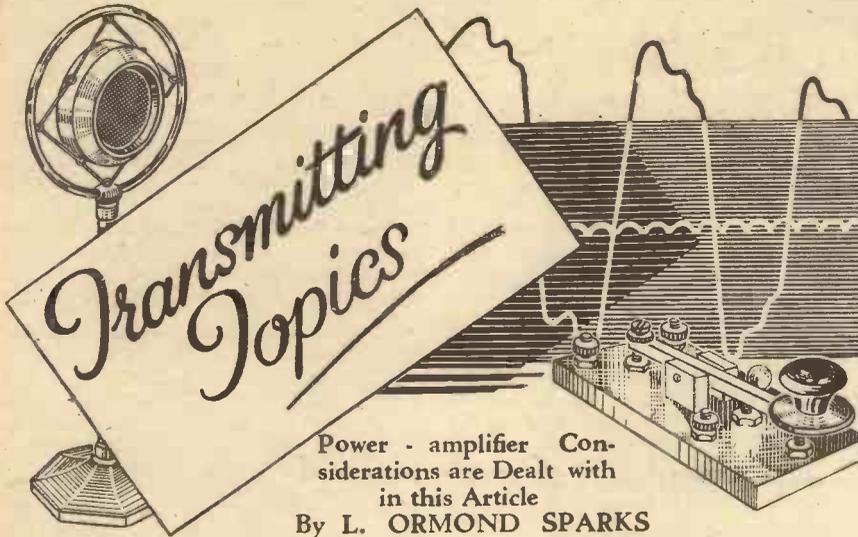
A NEW iron, known as the "De Luxe," is being introduced by Messrs. Rawplug, and is shown below. The bit in this particular model is a fixture, and cannot be replaced by the purchaser, and the element is of a similar type. The makers claim that this has been done as, in the past, it has been found that inexperienced replacement of the bit or element often leads to complaints. The voltage ranges of the iron have been increased so that the iron is more suited to the particular voltage available. Thus, the iron may now be obtained suitable for 100 to 110; 200 to 210; 220 to 230; or 240 to 250 volts. This eliminates the possibility of the element burning out. The makers state that this iron is as nearly perfect as it is possible to produce and each iron carries a guarantee for six months. The main details of the iron are shown below and the price is 9s. 6d.

**Mazda Thyatron**

A NEW thyatron is now available in the Mazda range, and is known as type T.41. This is of the type having a heater rated at 4 volts 1.5 amps., and the control



Details of the new De Luxe Rawplug soldering iron.



**T**HE oscillator, or oscillator and doubler stages in a transmitter do not always provide the required power, therefore, in such cases it becomes necessary to provide additional amplification between the exciting source and the aerial system. Bearing in mind that this is a question of amplifying at radio frequency, particular

present. It will be noted that the grid and anode circuits are tuned and, as both circuits are tuned to the same frequency, it will be appreciated that care is required, otherwise oscillations will be generated by the feed-back introduced by the capacity coupling between the electrodes of the valve, plus any external coupling which might be provided by inefficient layout. The most simple and usual way of eliminating this undesirable possibility is by the process of "neutralising," which, strangely enough, does not seek to cure the trouble by stopping the feed-back, but by actually providing another path for the transference of energy from plate to grid.

This may sound very confusing, therefore the following points should be noted.

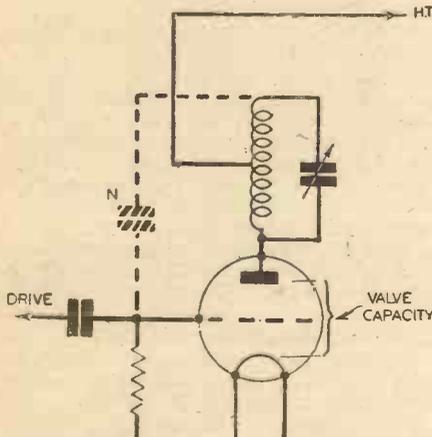


Fig. 1.—The fundamental circuit of a power amplifier.

care has to be taken in the design, layout, and adjustment of such stages, as any trace of instability will ruin the transmission.

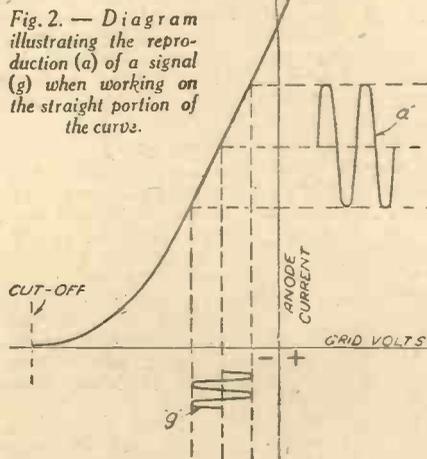
The section involved in this particular work is usually known as the Power Amplifier or, more briefly, the P.A., but one must not confuse it with power amplifiers of the L.F. type.

Once an A.A. station owner has become well versed in the handling of the various types of oscillators and the adjustment and use of frequency doublers, he should commence experiments with P.A. stages as his ultimate rig will, undoubtedly, embody such arrangements.

Power amplifiers can be considered under two headings, namely, those using simple triode valves, and those using modern pentodes. Both types have certain advantages, but the beginner cannot do better than start with a pentode, although, if the subject is to be covered thoroughly, experiments should be carried out with triode circuits.

**Circuit Considerations**

The fundamental circuit is shown in Fig. 1. There are several variations, but we are not concerned with them at the



**Second Feed-back**

Supposing it is possible to arrange that the second feed-back is out of phase with that provided by the inter-electrode capacity, then, at any and every instant, the two feed-back supplies will oppose each other, and, if operating conditions are adjusted perfectly, a point will be reached when they will cancel out, thus rendering the original feed-back ineffective. The second path is usually provided by a very small condenser, known as a neutralising condenser, its maximum capacity not being greater than that of the valve. The dotted lines in Fig. 1 indicate the component.

With the introduction of the pentode, with its extremely low inter-electrode capacity, it has been found that neutralising can, more often than not, be dispensed with, when the P.A. stage employs a valve of

this type. With triodes, however, it is always advisable to provide some form of neutralisation.

**Operation of the P.A.**

Many beginners get confused over the operating conditions under which the P.A. works. The amplification of such high bias voltages usually raises the first cloud, so let's see what actually happens.

With an ordinary low-frequency amplifier, certain very definite operating conditions have to be observed if perfect reproduction is required. This will be more readily understood by reference to Fig. 2, which shows the grid volts/anode current curve of a typical L.F. valve.

The input signal is represented by the curve "g" while the anode output is shown by "a." It will be noted that the operation takes place on the straight portion of the curve and, so long as it remains within those limits, the anode output will be an identical amplified version of the grid input.

If, however, the input signal is too large, it is possible for the grid curve to be driven into the positive portion, in which case grid current would be set up, distortion introduced, and the input reduced.

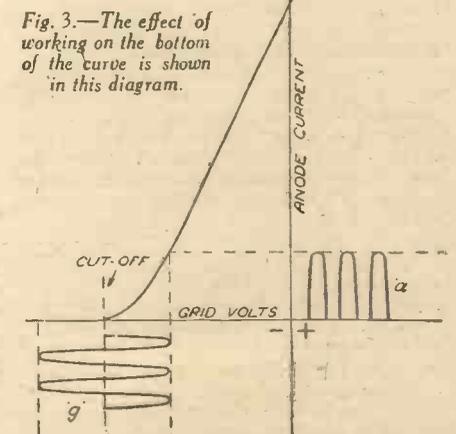
With a P.A. stage the requirements are almost opposite to the above. Consider the curves shown in Fig. 3, where it will be seen that the valve has been biased to the point of "cut-off," and the drive so adjusted that it is operating right down on the bend of the curve.

An examination of the anode output curve reveals that it is no longer an amplified version of the input, but rather a series of peaks or pulses and, when these are applied to the anode load, they will set up oscillatory voltages across it, causing an oscillating current to flow therein.

**Anode Load**

The anode load will not take the form of a pure resistance, but of a coil and condenser combination, usually called the "tank" circuit. It must be remembered that when a parallel tuned circuit is in a state of resonance with an applied signal it will act as a high resistance, thus producing the valve's requirements for efficient operation.

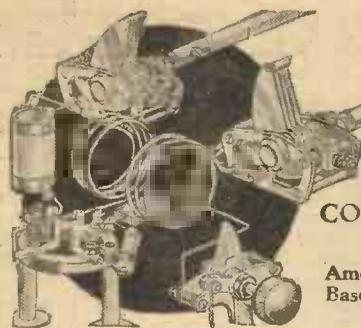
With the L.F. circuit, as soon as the distortion mentioned is introduced, the



anode output will not only consist of the input frequency, but there will also be present a certain proportion of harmonics of the signal frequency, which, from the reproduction point of view, is not required.

In the P.A. case, however, this harmonic content does not cause any worry, as they will have little or no effect on the anode tank circuit, which, as mentioned above,

(Continued on page 297)



# Short Wave Section

## CONSTRUCTIONAL HINTS FOR THE SHORT-WAVE EXPERIMENTER

Amongst the Subjects Dealt With in this Article are Baseboard, Chassis and Cabinet Construction, and Decoupling

THE amateur whose experience has been confined to home-constructed experimental receivers incorporating components to hand, is usually impressed, when the opportunity arrives to try out a sponsored or commercially designed short-wave receiver, by the ease of operation, and particularly with the stability of the instrument, even when receiving very weak signals. It follows, therefore, that when building a new experimental receiver, or rebuilding an existing one, he will endeavour to obtain, amongst other desirable features, an equal degree of stability by adopting the constructional

tion in its mis-application is the root cause of instability.

With commercial practice in mind, the experimenter decides that the solution to the problem is to house the unstable set in a metal cabinet, and all will be well. When this is done, however, it is found that things are considerably worse, and the set is more or less useless. When it is taken into consideration that specially designed short-wave components are used, one cannot blame the inexperienced constructor who regards short-wave receivers as tricky in construction and operation.

The true facts are, however, that modern short-wave receivers are neither tricky to build or operate, and if one is prepared to exercise patience and common sense during construction a stable and sensitive receiver should result.

### Decoupling

One common cause of failure is that of sacrificing efficiency in order to reduce the initial expense. For example, we admit that it is possible to build an efficient short-wave receiver which does not incorporate either decoupling or L.F. choke output, but such an arrangement will not provide the maximum of all-round efficiency from a given number of valves, and it is almost certain that even the most carefully built receiver will not entirely be free from instability on weak signals.

No matter what the type of receiver used, the writer believes in the incorporation of decoupling, grid stoppers, H.F. by-passing, and L.F. choke output arrangements. With reference to metal chassis, panels, and cabinets. In the early days we made our own metal chassis and cabinets and screening boxes, and cut our own panels. Taking into consideration the fact that metal chassis, panel and cabinet assemblies are available commercially, the experimenter is in a position to make up a permanent receiver along commercial lines at comparatively low cost.

If it is desired to follow this procedure, the experimenter is advised to write to the manufacturer of these assemblies, obtain the dimensions of standard chassis and panels, get out the drawing board, and arrange the panel and chassis layout of his existing components to suit the dimensions given. By following this procedure, unneces-

sary expense and mistakes, also poor performance due to cramping of components, will be avoided.

### Wooden Cabinets

In some instances wooden cabinets are preferred, the experimenter making and polishing one to suit his own taste and requirements. Fig. 1 shows a suitable arrangement for housing an untuned H.F., detector and pentode type receiver incorporating wave-band switching, band-spread tuning, three-valve headphones output, and loudspeaker output on four

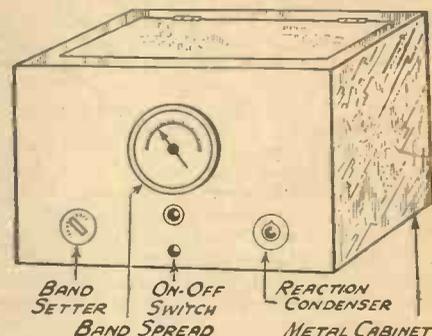


Fig. 2.—Using a standard metal screening box.

valves. This cabinet is simply a plain oak box. The loudspeaker baffle is screwed to the front panel, a metal sub-panel being fitted to the set chassis and screwed to the front panel. A solidly built cabinet of this description made of polished oak will have quite a professional appearance.

Fig. 2 shows the general arrangement of panel components when a metal cabinet or screening box of standard dimensions is used, and is a very suitable panel layout for a regenerative two-valve receiver.

Opinions are divided relative to separate and built-in loudspeakers. There are, no doubt, some who, like the writer, prefer a separate loudspeaker.

The first difficulty is apt to centre on the most suitable dimensions for the speaker cabinet. It should not be too small on the one hand, or too big on the other, and should be as free as possible from box resonance, with a fret of suitable design which, whilst pleasing to the eye, will not impede the sound waves emitted by the loudspeaker.

Fig. 3 shows a loudspeaker cabinet made and used by the writer. Solid oak,  $\frac{1}{2}$  in. thick, is used, and a 6 in. moving-coil speaker is mounted on a five-ply baffle,

(Continued on opposite page)

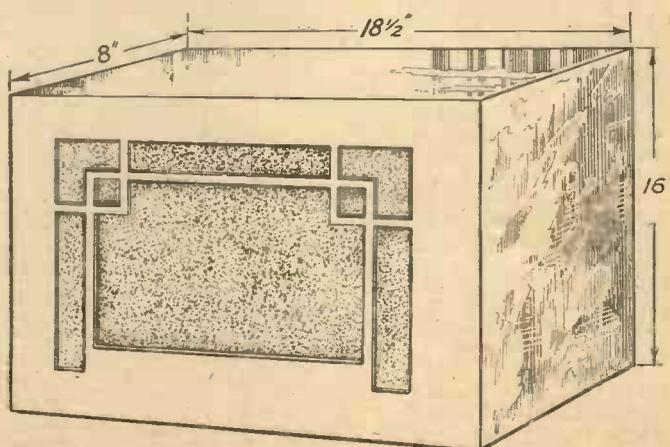


Fig. 3.—A solid loudspeaker cabinet designed to avoid resonance troubles.

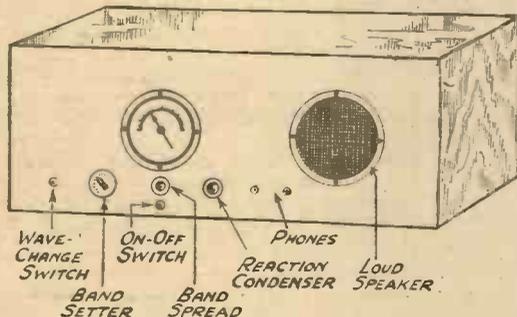


Fig. 1.—Suggested design for panel layout of an untuned H.F.-Del.-Pen. receiver.

methods as favoured by the professional designers.

In adopting such methods of procedure he is wise, but before going ahead will be wiser in carefully studying matters, formulating and planning down to the last detail, because by so doing the possibilities of snags being experienced will to a considerable extent be removed.

### Baseboard Disadvantages

For example, the recognised method of short-wave receiver construction during the early days was the baseboard method. Now this method has several disadvantages, which will not be apparent to present-day constructors whose experience centres on baseboard arrangements incorporating modern and specially designed short-wave components.

We do not need to discuss the disadvantages in detail in this article, but to confine our attention to one fact which is common to many present-day experimentally designed and constructed receivers, namely, a lack of stability, which prevents the best being obtained so far as performance is concerned, even though specially designed components are used.

### Metal Chassis

Generally speaking, receivers built on the metal chassis and panel basis are stable in operation if the application of this form of construction is correct. In many instances it is not correctly applied, with the result that instead of acting as a preventive of instability, metal construc-

**SHORT-WAVE SECTION**

(Continued from facing page)

which is screwed to the fret. The whole is french polished light oak.

It is advisable, especially when the speaker is to be used in conjunction with a short-wave receiver, to use hard wood in the construction of speaker cabinets, as the possibilities of box resonance is reduced. The writer also prefers an open-backed cabinet.

**Wiring Details**

Just a few comments relative to wiring. It is usual to use solid connecting wire in the wiring up of battery-operated short-wave receivers of from one to six valves. In the case of the A.C. mains-operated type multi-stage superhet capable of delivering a considerable output, the special multi-strand flex, as used by manufacturers, is worthy of consideration, especially when leads of abnormal length are necessary, because it has been found that microphony in some instances is set up by the use of heavy gauge solid connecting wire.

Certain modern short-wave receiver components are obtainable in both screened and unscreened form. H.F. chokes may be taken as an example. If a new H.F. choke is required, by all means choose the screened type, and in addition, get to know the minimum and maximum limits at which it will function efficiently. With reference to dual and triple range tuner units, various types both screened and unscreened are available.

If screening is desired, it is advisable to purchase the specially designed screened-tuner unit which covers a definite range of wavelengths, rather than attempt later to screen an existing tuner of the unscreened type, as in doing so the maximum tuning range will be considerably reduced by screening. The same remarks also apply to plug-in coils.

**TRANSMITTING TOPICS**

(Continued from page 295)

is tuned to the signal frequency and would, therefore, not offer a high resistance path to the harmonics, so that they would not set up any appreciable voltages across the load.

The highest efficiency is obtained from a P.A. stage when the anode pulses are high and narrow but, as such conditions can only be produced by increasing the bias and, likewise, the drive, i.e., the signal input, it must be appreciated that the apparent gain in efficiency does not indicate an increase in output for a given input in the more usual sense.

It is possible to drive the grid too hard, with the result that a power loss will be set up due to the grid current which would be created, and which would tend to retard or hold up the driving power.

**Increasing the Output**

The only efficient way of actually increasing the output is to increase all governing factors, namely, drive, bias, and the anode high-tension, but, once again, limiting factors are introduced by the valve itself as any given type will only handle a certain power. If excessive power is handled, heat will be generated within the valve and, if this is taken beyond given limits, the structure of the valve will be damaged, often beyond further use.

The question of what power any given valve can handle must be dealt with in another article, as that, together with the problem of the power applied to the aerial, forms a subject too lengthy to be dealt with in this issue.

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# Practical Television

June 4th, 1938.

Vol. 3.

No. 103.

## Visiolympia

**Q**UITE recently the Radio Manufacturers Association released details concerning the plans they are making in connection with this year's radio exhibition which is due to open on August 24th. These have now been studied carefully, and the changes proposed are certainly very radical in character. For a long time it has been a sore point that no indication of a radio receiver's performance could be given to interested members of the public. This was because a level volume of sound was fed direct to the loudspeaker, but this year a different form of distribution is to be tried out. This will be of a high-frequency type, and the comparison of results from a local station and a distant station will be possible. The main item, however, is the big effort which is to be made to further popularise television. Whether the scheme proposed is the correct one is open to criticism, and it is known that many exhibitors are convinced that the methods of presentation are not the best. In place of the variety theatre which has been an attraction for five years there is to be a large television studio with a stage measuring 100ft. square. Visitors will be allowed to pass through the studio while transmissions are in progress, and the equipment and layout employed will simulate, as far as possible, that now in use at the Alexandra Palace. Working in close conjunction with the B.B.C., picture signals will be available almost continuously for the daily eleven hours that the exhibition is open.

## Receiver Demonstrations

**T**O overcome last year's restrictions, whereby the television sets of fourteen different manufacturers were shown working in darkened rooms where limited accommodation was provided by tickets, the R.M.A. are proposing that all television sets giving pictures up to two feet square are to be shown in operation on the manufacturers' stands built in the well section of the main hall. This may be a much more convenient way from the public point of view, but it would seem to lend itself to undue congestion in the gangways separating the stands. The reason for adopting this policy is certainly a sound one, and is two-fold in character. First of all, it is essential to dispel from the potential viewer's mind that to watch television pictures it is necessary to sit in a darkened room. The modern cathode-ray tube has been so improved in its manufacture that the resultant pictures are sufficiently brilliant that they may be watched in ordinary artificial light or daylight, provided, of course, that there is no direct beam thrown on to the screen itself. The second point is that any segregation of radio and television is contrary to present views. The two services are irrevocably linked together, and there is no doubt that ultimately they will merge completely, and the sooner the public realise this the better it will be for everyone concerned in the industry. It is known that the Television Advisory Committee hold this point of view, and this year's plans for Olympia attempt to fall in with this out-

look. It is not yet known how many manufacturers will avail themselves of the facilities that are offered, but it is thought that at least the same number as last year will be represented. One big problem that will have to be met is the provision of satisfactory stand designs which will enable good viewing to be undertaken under the conditions imposed. This will not be an easy matter, while the main exhibition lighting, as well as the separate stand illumination, will have to receive the most careful consideration if optimum results are to be achieved. The R.M.A.'s change of policy towards television, however, is welcomed, and all concerned are hoping that this year it will be "visiolympia" in every sense of the word.

## Modern C.R. Tubes

**P**RESENT day wireless valves bear little resemblance to those in use several years ago except for the fact that they operate as a result of an electron stream



An officer cadet in the Cambridge University Officers' Training Corps using a 3-metre portable radio telephone set. Note the dipole aerial which he carries.

passing from the heated cathode to the anode. Although passing through a period of development of much shorter duration, exactly the same can be said of the modern cathode-ray tube used in a television receiving set when compared with the earlier laboratory models which were mostly of the soft or gas filled type, and employed in the laboratory. The electrode assembly has undergone radical changes, especially in the electrostatically operated class with the multiplicity anodes, carefully designed deflector plates to prevent trapezoidal effects and beam fouling and electrical corrections to eliminate any astigmatism defects. The electromagnetically

operated tube has retained the original electrode simplicity, apart from a complete reshaping of the electrodes to obtain a very narrow intense beam for focusing and deflection by external means. The demand for a flat screen face has added to the difficulties of manufacture because of the very careful annealing to prevent any strain in the glass itself, which, of course, is augmented because present-day types are of the hard type, or in other words are completely evacuated. When a cathode-ray tube fails to operate satisfactorily as a result of the cathode emission falling off or because it has become gassy, the scrap value is in the glass envelope only, and to remake the tube means the application of the whole of the manufacturing processes as for a new tube. This question will have to be studied very carefully in the near future, however, for eventually tube replacement problems in sets must arise. A set purchaser can hardly be expected to pay the full retail price demanded for a tube sold as a single piece of equipment because of the high prices now ruling. No doubt a compromise will be found, and this will encourage set users to have their receivers "revitalised" by replacing the old C.R. tube with a new one.

## Work Abroad

**I**N the Empire State Building they are still conducting experiments with a view to ascertaining the range of the ultra-short wave transmitters which work on a carrier frequency of 46.5 megacycles for vision, and 49.75 megacycles for sound. At the moment the aerial design is of such a character that good reception is practically limited to one direction, owing to the surrounding tall steel buildings producing reflected signals with a slight time-lag from the main picture, with the result that the receiver screen has a series of "ghosts." Real entertaining programmes comparable with those in this country do not appear to have materialised, and film transmissions together with stills constitute a large proportion of the fare seen by the selected viewing points. How long it will be before America puts into operation a real live service is still a very moot point, for although they may be achieving good results with equipment in the laboratory, the real criterion is what can be done under proper field conditions. and this is still problematical.

For some time now the Russian authorities have been carrying out very searching investigations into the various forms of television transmission and reception, but no cut-and-dried scheme has yet been made public. It is learned, however, that in Moscow there is every hope that experimental transmissions will start in a few weeks' time, but the method to be employed or the standard of picture definition used is as yet unknown. Largely as a result of the communal form of life existing in that country experiments are being undertaken to develop a satisfactory scheme for relay distribution over a limited area. A special type of set is being produced for this purpose so that subscribers to the scheme can receive pictures of a quality and strength comparable to individual aerial feeding to separate sets. In selected clubs, and political centres in Moscow itself, receiving sets have been installed with the idea of securing reports on the results of any experimental transmissions, and by the autumn there is every hope that some form of service will be inaugurated.

## This Reshuffle

**T**HE details of the wavelength changes which were decided upon at the recent Cairo conference were given in detail

in the issue of PRACTICAL AND AMATEUR WIRELESS dated May 14th. From the television angle the greatest interest is centred on the ultra-short-wave allocation, which for the first time received the most careful consideration in view of the national and international developments in the television field. The four separate bands which have been allocated provide for eleven broadcasting stations by taking into account the present frequency band of the television picture signal as used by the B.B.C. station at Alexandra Palace.

What is going to happen when the degree of picture definition is improved is not known, but perhaps this was left to a future conference when it is remembered that as far as this country is concerned no alteration is contemplated until at least the end of 1940. Although there is provision for only eleven stations, it must not be inferred that development will be restricted because the range of signals is not so large as with medium- and long-wave broadcast stations. The degree of overlap will depend on the careful planning of station position, and there is nothing to prevent this country from going right ahead with its projected chain of television stations, as envisaged by the Government committee set up to inquire into this question some time ago. It is still a mystery why that part of the country outside London and the Home Counties must continue to wait for television facilities other than the spasmodic long-distance reception which keeps being recorded from time to time. The final answer rests with the Government's advisory committee, and every time questions are raised in Parliament it is stated that a longer period of experiment must be given to the London station. Surely this has been on the air long enough for real qualitative data to be collated, and it would mean a big thing for the industry if some definite statement was to be made before radio's autumn season becomes an actuality. One thing that is welcomed is the use of ultra-short waves for real quality transmissions by the B.B.C. in connection with some of their concerts. Perhaps this will be very materially extended, and so give people with sets capable of tuning down to these low wavelengths an opportunity of appreciating the type of fare now radiated by the B.B.C. television station.

### Good Camera Work

THE engineers responsible for handling the electron cameras used by the B.B.C. for either studio or outside broadcast work have, as a result of long practice, become very skilled. The use of the correct lenses to suit the occasion, coupled with excellent panning, has done much to improve the method of presentation of the individual items constituting a complete programme. When seated on the camera "dolly" the operators see a replica of the scene focused on to the photo-electric mosaic, which is exactly the same size as that electrically synthesised. By keeping the subject within the optical screen area, therefore, the operator is certain that his picture fulfils requirements. It is rather curious, however, that this picture is upside down, and it must take a time to become familiar with this fact.

Whether this has been arranged by design or accident is not known, but it certainly tends to prevent the camera man from becoming too interested in what is being televised, and makes it difficult for attention to wander.

## Leaves from a Short-wave Log

### From Britain's Oldest Colony

SIGNALS have been heard from the new transmitter which the Caribbean Broadcasting Service has installed on the island of St. Kitts (St. Christopher). The wavelength used is 47.02 m. (6.38 mc/s), but the power is not mentioned. The programme is given daily between G.M.T. 20.00-21.00. St. Christopher was first discovered by Columbus who gave his name to the island in 1493; it was later captured from the Spaniards, and ranks as the oldest British colony.

### Franco Station in Amateur Band

EA9AH, Tetuan (Spanish Morocco), a Nationalist station which may be heard nightly relaying war news bulletins from Radio Malaga (Spain), now works regularly after midnight on 21.36 m. (14.05 mc/s). Radio Malaga also possesses its own short-wave channel, namely 20.77 m. (14.445 mc/s).

### In Memory of Marconi

The anniversary of the late Marchese Marconi's birthday, April 25th, has now been declared an annual national holiday in Italy, as a tribute to his memory.

### Chilean Wavelengths and Call-signs

According to the latest official list, certain alterations have been made in the wavelengths and call-signs of the principal Chilean short-wave stations. The 250-watt transmitter at Valdivia is now CD 1190, and works on 25.21 m. (11.9 mc/s). At Santiago, the following stations are in daily operation: CB 1174 (4 kW) on 25.55 m. (11.74 mc/s); CB 1170 on 25.64 m.

(11.7 mc/s), 150 watts, and CB 960 on 31.25 m. (9.6 mc/s), 100 watts.

### Also in Nicaragua

In the Nicaraguan capital there are now eight short-wave transmitters of which the latest details are given hereunder: YNAA, to which three channels have been allotted, namely, 49.71 m. (6.035 mc/s); 31.48 m. (9.53 mc/s), and 25.23 m. (11.89 mc/s); the power is 500 watts. YNLF may operate on 31.06 m. (9.66 mc/s) and 39.16 m. (7.66 mc/s), power 500 watts. YNPR, 34.92 m. (8.59 mc/s), 800 watts; YNOP, 52.1 m. (5.758 mc/s), 800 watts; YNOD, 41.63 m. (7.206 mc/s), 70 watts; YNLG, 45.39 m. (6.61 mc/s), 500 watts; YNIGG, 45.91 m. (6.535 mc/s), 200 watts; and YNGU, 32.26 m. (9.3 mc/s), 30 watts.

### New Station at Buenos Aires

The 10-kilowatt transmitter erected by the Argentinian Government for the special purpose of propaganda broadcast programmes has been allotted the following channels: 25.58 m. (11.73 mc/s); 30.99 m. (9.68 mc/s); and 48.54 m. (6.18 mc/s). Tests have already been heard in the United Kingdom on the 30-metre wavelength.

### Bucarest Tries Out Short Waves

It is reported from Paris that the Electro-Technical section of the Bucarest (Romania) University is carrying out experiments in speech and music on 36.21 m. (8.285 mc/s) with a 250-watt transmitter. With the exception of a few transmissions made on 21.51 m. (13.95 mc/s) in 1935 Romania, so far, has not established any short-wave radio broadcast system.

## VERA LYNN

### A Brief Biography

MISS VERA LYNN appeared with a juvenile troupe at Dagenham when eleven years old, playing charity shows... continued with the troupe for four years. Howard Baker, the well-known band leader, then spotted Vera, and engaged her for several weeks. Next went with Billy Cotton to Manchester for a fortnight. Met Joe Loss at the age of eighteen and broadcast with the famous Astoria maestro on two occasions.

Biggest break of her career happened when Ambrose contracted her to broadcast with his orchestra. Has been with him for over twelve months, and records solo for Decca. Has also recorded with Jay Wilbur, Prima Scala, Maurice Winnick, Rosina, Joe Loss, Charlie Kunz, Joe Orlando, and Ronnie Munro and Felix Mendelssohn.

Vera, who is twenty-one, was born at East Ham; her parents encouraged her in every possible way; is self taught; ran her own dancing school at fifteen; is tall and slim. Vera is one of the most likeable young ladies it is possible to meet. Made a host of friends everywhere; has own fan club with 150 members; possesses own microphone equipment; constantly practising. Ambition is to be a film star, and to sing on the American air-waves.

Vera drives a car, and her chief hobbies are painting, tennis and riding; has appeared in television, Empire broadcasts, and B.B.C. shows. Always ready to lend a helping hand for charity shows, particularly for the School for the Blind.



Miss Vera Lynn.

# B.L.D.L.C. The British Long-Distance Listeners' Club

## Band-pass Tuning

THE circuit familiarly referred to as a band-pass input tuning may be arranged in many different ways, and it still causes confusion to readers whose only recognition of a band-pass circuit is the coupling condenser seen joined to the lower ends of the two tuning coils. It must be remembered that one of the most effective input circuits of the band-pass type is that incorporating what is known as a link winding. In many cases existing dual-range coils may be adapted for such purposes by making use of the existing reaction winding. This is especially the case where the reaction winding is "split," part being wound near the medium-wave coil and part near the long-wave coil. Obviously such a circuit or use of the coils will prevent reaction from being used, but the coils may then be employed for an H.F. stage and a standard coil used for the detector stage in the usual way. The accompanying circuit shows a band-pass circuit of the type referred to and also introduces an interesting detail in the aerial coupling. It will be seen that the aerial is transferred with the wave-change switch so that a correct coupling may be obtained on the long-wave band. It is often found that the aerial is left connected to a point on the medium-wave winding which, whilst giving optimum results on medium waves, still leaves something to be desired on the long waves, and the transfer tapping enables maximum results to be obtained on both wavebands.

## Interference

Some peculiar forms of interference are reported from time to time, and although certain freak cases do arise it is often found that peculiarities are more or less common to certain combinations of circumstances. For instance, when two powerful stations are situated in a direct line and at equal distances from a receiver, it is possible for

the carriers to so mix as to cause background interference which, if the wavelengths are related, may easily result in modulation of one of the signals. Other similar details are reported from time to time, but do not answer to any standard rules or theories. Similarly, at the present time we are receiving many reports of the reception in the South of England of a well-known commercial European transmitter on a short wavelength, but although the wavelength corresponds approximately to a harmonic of that station it is contrary to regulations to permit the strength of radiation on that harmonic which is obviously being used. The only inference is that they are not using good harmonic suppression or that some peculiar effect is coming into play which is as yet untraced. Many similar experiences are reported from time to time, and each listener must therefore be prepared to devote a little time to tracing out the details in his particular case.

## Chassis Materials

We are still receiving inquiries regarding the choice of materials for chassis, and can again state that for normal purposes it is not a matter of great importance. Remember that copper has the best efficiency but is highest in cost, whilst metal surfaced wood is easier to work and is quite reasonable from the point of view of cost. In a normal broadcast receiver earth return points may be made to various parts of the chassis, but in a short-wave or ultra-short-wave receiver it may be found preferable to run a thick bare wire along the chassis and to take earth leads to that wire. This is especially the case when the chassis is made from steel or some other material, as the high-frequency resistance of such material may be quite high. It will be found in many receivers, especially where H.F. stages are used, that common earth leads can cause just as much trouble as

common H.F. leads, and we have received details of an advanced case in which a separate earth lead to each stage was used as the only cure for instability.

## Service Test Gear

A difficult problem to answer is "What is the simplest apparatus I can use for general test purposes?" The answer is a milliammeter; but this alone is obviously not all-sufficient. A keen experimenter could make use of such an instrument in order to ascertain practically every available detail in a set—merely by using it in its normal duty as a current measurer.

We have already explained how it may be adapted so that it may be used to read voltage or resistance values, and although such a meter could be included in a cabinet with all the necessary extra parts to enable it instantly to be switched into any circuit to read any desired value, it is sometimes preferable to have all the equipment separated and included in small containers. The only disadvantage of this scheme is that a little delay will be experienced when the instrument is required for use, in selecting the appropriate container and making the various connections.

# RADIO CLUBS & SOCIETIES

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

## THE SOUTHEAST AND DISTRICT RADIO AND SCIENTIFIC SOCIETY

THE most successful 1.7 mc. field day of the above society was held on Sunday, May 15th; 61 members and friends attended, including 13 members of the Ilford and District Radio Society. The start was at Battlesbridge, and the transmitter was eventually located two miles south of Brentwood, and eleven miles from the start. It was found hidden in an innocent looking hke tent up a little-used lane. Mr. G. T. Peck was not to be denied, and was the first to arrive, having taken 1 hour 40 minutes, and covered about 20 miles. After a long interval Mr. E. B. Greenwood arrived to claim second place. Tea had been arranged for all, and this terminated a most enjoyable meeting. The next 1.7 mc. field day is to be held on June 26th, and any person interested should communicate with the hon. secretary, J. M. S. Watson, 23, Eastwood Boulevard, Westcliff-on-Sea.

## SLOUGH AND DISTRICT SHORT-WAVE CLUB

IT is very gratifying to note that since the inauguration of our campaign, the attendance at meetings has risen by over 80 per cent. However, the membership has not increased so much as we should have liked, and members are therefore asked to notify the secretary of anyone who might be interested.

At the meeting held on May 10th, the chief item was the discussion on the proposed amalgamation with a radio club at the Social Centre. Mr. Logan, of the Centre Magazine Committee, kindly attended the meeting and cleared up various doubtful points. It was decided to postpone the decision on this matter until it could be more fully gone into.

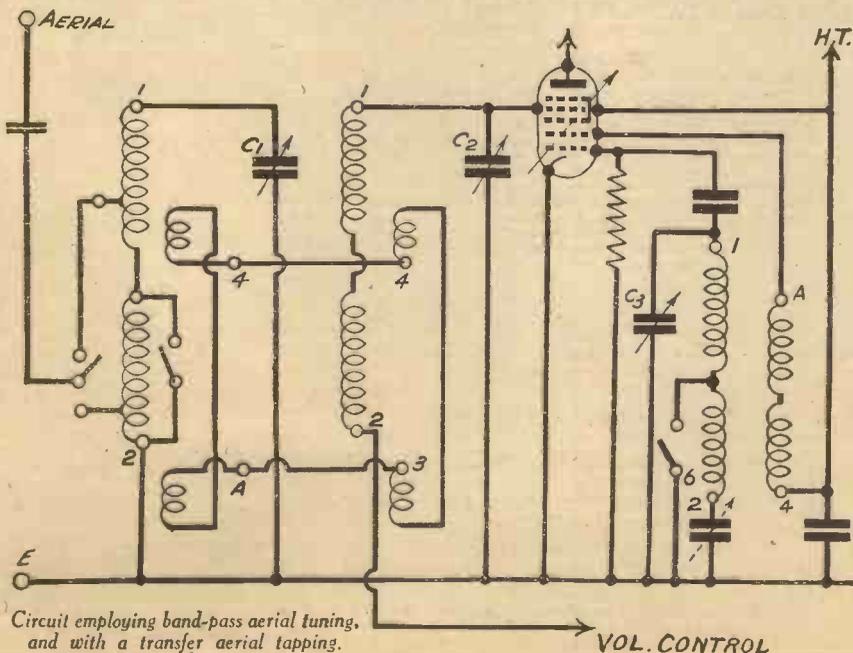
The meeting also included another lecture by Mr. Sly, and a junk sale. The Morse practice, which for the first time was split into two sections, went off particularly well. A surprise item was an "auto-key" by 2DAJ, which came in for some cutting remarks about bad spacing!

Hon. secretary, J. H. White, 20, Chalvey Road East, Slough, Bucks.

## ROBERT BLAIR RADIO SOCIETY

AS the weather improves we hope to arrange some "field days," and get out into the open air. Each Wednesday of the week a talk is given by the "Technical Adviser," on various subjects of interest to the beginner in the study of the theory of wireless, and an advanced group are still busy polishing up their Morse practice.

Thursday evenings are given up for practical work, such as servicing members' or their friends' sets, and members also construct their own sets on that evening. A hearty welcome is extended to anyone to visit the society, any Wednesday or Thursday evening, from 8 p.m. to 10 p.m. Hon. secretary, A. R. Richardson, 24, Mercers Road, London, N.19.



Circuit employing band-pass aerial tuning, and with a transfer aerial tapping.

# LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

## Station VR6AY

SIR,—It may interest other readers to know that I have just received a QSL card from VR6AY. I heard this station on March 7th, the day after the station began its transmissions, and despatched the report the same day. The top of the card is occupied with a photograph of the equipment, including a wind-driven generator, and a Sargent communications receiver, while at the bottom is a map of the Pacific Ocean with a small inset map of Pitcairn Island. A point of interest is that the "Y" of the call-sign has been filled in with red ink instead of being printed, owing to the official call-sign not being known until after the station had commenced its transmissions. On the back of the card is a short description of the founding of the island and its topography. A New Zealand stamp has been used, and has been postmarked "Pitcairn Island, N.Z. Agency." No mention is made of the power.—M. EVANS (Blandford, Dorset).

SIR,—I dare say that the following bit of news will interest some of your readers.

Pitcairn Island has supplied me with a verification card for my report sent in April last. Naturally, I was rather surprised, and not a little pleased, to receive a card so soon, and I should be glad to hear from anyone who has also received a card from the station in question, which is VR6AY, operated by Andrew Young.

The QSL card is the usual postcard size with a photo of the equipment at the top and a very interesting map of the South Pacific, showing the location of Pitcairn Island in relation to New Zealand, etc. On the back is a brief résumé of the history of the island, stating, among other things, that most of the fruit that is grown on the island is bartered with passing ships in exchange for food supplies and other goods of civilisation.

The station was received on a home-built three-valve battery receiver, using a W.B. 37S speaker and Brown's "A" type headphones, and using an inverted-L aerial 30ft. long.—D. C. CHAMBERLAIN (2CHD) (Thorn-ton Heath).

## A.R.P. and Amateurs

SIR,—If space can be found for this letter it may be the means of preventing patriotic amateurs from

1. Wasting valuable operating time;
2. Jeopardising themselves as holders of experimental licences by attempting to organise communication services; and
3. Offering their stations to A.R.P. authorities who obviously have no control whatsoever, directly or indirectly, over radio communication.

Condition No. 14 of the Amateur licence can only be interpreted as meaning that the

station will be, as in the last war, closed down immediately an emergency arises.

The fact that the Postmaster-General does not contemplate any other step is borne out by the Home Secretary's reply to a scheme, worked out over a year ago, in which responsible amateurs were to have co-operated with the police in forming an emergency radio link for A.R.P. communications.

Sir Samuel Hoare states that "he is advised on technical grounds that, owing to traffic-carrying capacity and mutual interference difficulties, the use of wireless for A.R.P. communications is not considered practicable. A.R.P. authorities are being circularised that the telephone must be regarded as the normal means of communication, and relied upon as far as possible, with a messenger service as a stand-by. Volunteers for A.R.P. service should mention, at the time of enrolling, any operating qualifications."—N. P. SPOONER (G2NS) (Boscombe, Bournemouth).

## Radiation Interference

SIR,—I have been very interested in this correspondence, and on reading the letter from Mr. C. Wilson, of Chieveley, I wrote to him for further detailed particulars which he has kindly given me.

CUT THIS OUT EACH WEEK.

## Do you know

- THAT miniature cathode-ray tubes are available for the construction of test equipment.
- THAT the efficiency of an H.F. choke is increased if the winding is sectionalised.
- THAT the high-note response of certain L.F. transformers will be improved if a resistance is shunted across the secondary.
- THAT by enclosing a receiver in a metal box (earthed) direct pick-up on the wiring will be avoided and selectivity thus improved.
- THAT the same colour code is employed for fixed condensers as is used for fixed resistances.
- THAT the unit for colour-coded condensers is the micro-microfarad.

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 Neaves, 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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I have not re-read the whole of the correspondence, but if my memory serves me rightly, one correspondent reported that the audio-frequency output from the relay system was re-radiated to his receiver, and that it was tuned out by him with coils which were tuned to radio frequency.

Mr. Wilson reports that the interference in his case, and which was identical with that experienced by J. W., of Wigan, was that on withdrawing the coil from his Short-wave Two, he received both the National and Regional programmes. He states also that no broadcast sets were in use at the time, and that the next nearest set is at his neighbours, who reside approximately a quarter of a mile away. He further states that when he added a capacity in series with the aerial, consisting of a small piece of flex, the interference was eliminated—but when the "series condenser" is shorted out, the interference immediately returns. It will be noted that when the coil was withdrawn from the short-wave set the aerial was still connected to the grid of the valve, and had a path to earth via the electrodes of the valve, and the conducting path through the valve formed by the electron stream. I understand also that J. W., of Wigan, cured his interference by replacing a faulty series aerial condenser with a good one—therefore, by adding a capacity in series with the aerial as Mr. Wilson did.

Please excuse me for bringing the new theory of detection and loudspeaker reproduction into this discussion, but it helps to offer an explanation. With regard to the radiation interference from the relay system which was tuned out at radio frequency—this is explained by the fact that it has been proved in the new theory experiments that the loudspeaker output from any wireless set can be tuned out and rendered inaudible at radio frequency. The output consists of a composite radio-frequency wave which is literally a "carrier" wave for the audio-frequency modulations to which the loudspeaker responds.

With regard to the interference which cannot be from the relay system—it will be remembered that a powerful signal will "break through" into a circuit with which it is not in resonance, by reason of its strength, and the powerful signals causing the interference in this case have "broken through" the resonance of the aerial and earth system. I noticed in the article on Outdoor Radio that a resistance of 1 megohm can be placed in series with the medium-wave winding to load it to tune to the long wavelengths. It is quite possible that the faulty series aerial condenser developed a high resistance and loaded the aerial circuit, and allowed powerful signals to "break through." *Weak signals are naturally selective.*

From information supplied by Mr. Wilson it seems certain that the detection of the interfering signals took place in his aerial-valve-earth system. To explain how the signals were detected would require more investigation—but it will be remembered (in the new theory) that any device which allows more current to flow in one direction than in the other will act as a detector of wireless signals, so that the amplitude of the positive half-cycles becomes greater than the negative.

If any reader has a better explanation, please let us have it.—D'ARCY FORD (Exeter).

READ "THE CYCLIST"  
2d. Every Wednesday.

# Practical and Amateur Wireless BLUEPRINT SERVICE

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

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

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

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

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Leader Three (SG, D, Pow)	22.5.37	PW35			
Summit Three (HF Pen, D, Pen)		PW37			
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW30			
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41			
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48			
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49			
Genet Midget (D, 2 LF (Trans))	June '35	PW1			
Cameo Midget Three (D, 2 LF (Trans))	8.9.35	PW51			
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)		PW53			
Battery All-Wave Three (D, 2 LF (RC))		PW55			
The Monitor (HF Pen, D, Pen)		PW61			
The Tutor Three (HF Pen, D, Pen)	21.3.33	PW62			
The Centaur Three (SG, D, P)	14.8.37	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	PW60			
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72			
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82			
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	25.8.37	PW78			
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84			
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Fury Four Super (SG, SG, D, Pen)		PW34C			
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All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW70			
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D.C. Ace (SG, D, Pen)		PW25			
A.C. Three (SG, D, Pen)		PW29			
A.C. Leader (HF Pen, D, Pow)		PW35C			
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B			
Ubique (HF Pen, D, (Pen), Pen)	28.7.34	PW36A			
Armada Mains Three (HF Pen, D, Pen)		PW38			
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50			
"All-Wave" A.C. Three (D, 2 LF (RC))		PW54			
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)		PW56			
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70			
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80			
Four-valve : Blueprints, 1s. each.					
A.C. Fury Four (SG, SG, D, Pen)		PW20			
A.C. Fury Four Super (SG, SG, D, Pen)		PW34D			
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45			
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47			
A.C. All-Wave Corona Four	0.11.37	PW31			
<b>SUPERHETS.</b>					
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£5 Superhet (Three-valve)	5.6.37	PW40			
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D.C. £5 Superhet (Three-valve)	1.12.34	PW42			
Universal £5 Superhet (Three					
valve)					
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW44			
F. J. Camm's Universal £4 Super-		PW50			
het 4		PW60			
"Qualitone" Universal Four	10.1.37	PW73			
<b>SHORT-WAVE SETS.</b>					
One-valve : Blueprint, 1s.					
Simple S.W. One-valver	9.4.38	PW38			
Two-valve : Blueprint, 1s.					
Midget Short-wave Two (D, Pen)		PW38A			
Three-valve : Blueprint, 1s. each.					
Experimenter's Short-Wave Three (SG, D, Pow)		PW30A			
The Prefect 3 (D, 2LF, (RC and Trans))	7.8.37	PW63			
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	29.8.30	PW68			
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Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77			
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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, QP21)		WM362			
1935 £6 6s. Battery Three (SG, D, Pen)		WM371			
PTP Three (Pen, D, Pen)	June '35	WM389			
Certainty Three (SG, D, Pen)		WM393			
Minute Three (SG, D, Trans)	Oct. '35	WM396			
All-Wave Winning Three (SG, D, Pen)	Dec. '35	WM400			
Four-valve : Blueprints, 1s. 6d. each.					
65s. Four (SG, D, RC, Trans)		AW370			
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402			
2HF Four (2 SG, D, Pen)		AW421			
Crusader's A.V.C.4 (2HF, D, QP21)	18.8.34	AW445			
(Pentode and Class B Outputs for above : Blueprints 6d. each)	25.8.35	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)	Apr. '33	WM401			
Five-valve : Blueprints, 1s. 6d. each.					
Super-quality Five (2HF, D, RC, Trans)	May '33	WM320			
Class B Quadradyne (2 SG, D, LF, Class B)	Dec. '33	WM344			
<b>NEW CLASS B FIVE (2 SG, D, LF, Class B) .. Nov. '33 WM340</b>					
<b>Mains Operated.</b>					
Two-valve : Blueprints, 1s. each.					
Consoelectric Two (D, Pen) A.C.		AW403			
Economy A.C. Two (D, Trans) A.C.		WM286			
Unicorn A.C.-D.C. Two (D, Pen)		WM394			
Three-valve : Blueprints, 1s. each.					
Home-Lover's New All-electric Three (SG, D, Trans) A.C.		AW383			
S.G. Three (SG, D, Pen) A.C.		AW390			
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399			
A.C. Pentaquester (HF Pen, D, Pen)	23.6.34	AW439			
Mantovani A.C. Three (HF Pen, D, Pen)		WM374			
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401			
Four-valve : Blueprints, 1s. 6d. each.					
All-Metal Four (2 SG, D, Pen)	July '33	WM326			
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386			
<b>SUPERHETS.</b>					
Battery Sets : Blueprints, 1s. 6d. each.					
Modern Super Senior		WM375			
Varsity Four	Oct. '35	WM395			
The Request All-Waver	June '36	WM407			
1935 Super Five Battery (Superhet)		WM379			
Mains Sets : Blueprints, 1s. 6d. each.					
1934 A.C. Century Super A.C.		AW425			
Heptode Super Three A.C.	May '34	WM359			
"W.M." Radiogram Super A.C.		WM360			
1935 A.C. Stenode	Apr. '35	WM385			
<b>PORTABLES.</b>					
Four-valve : Blueprints, 1s. 6d. each.					
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389			
Holiday Portable (SG, D, LF, Class B)		AW393			
Family Portable (HF, D, RC, Trans)	22.9.34	AW447			
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363			
Tyers Portable (SG, D, 2 Trans)		WM367			
<b>SHORT-WAVE SETS—Battery Operated</b>					
One-valve : Blueprints, 1s. each.					
S.W. One-valve converter (Price 6d.)		AW329			
S.W. One-valve for America	23.1.37	AW429			
Rome Short-Waver		AW452			
Two-valve : Blueprints, 1s. each.					
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402			
Home-made Coll Two (D, Pen)		AW440			
Three-valve : Blueprints, 1s. each.					
World-range Short-wave 3 (D, RC, Trans)		AW355			
Experimenter's 5-metre Set (D Trans, Super-regen)	30.6.34	AW433			
Experimenter's Short-waver (SG, D, Pen)	Jan. 19, '35	AW463			
The Carrier Short-waver (SG, D, P)	July '35	WM390			
Four-valve : Blueprints, 1s. 6d. each.					
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)		AW436			
Empire Short-Waver (SG, D, RC, Trans)		WM313			
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383			
Superhet : Blueprint, 1s. 6d.		WM307			
Simplified Short-waver Super	Nov. '35	WM307			
<b>Mains Operated.</b>					
Two-valve : Blueprints, 1s. each.					
Two-valve Mains Short-waver (D, Pen) A.C.		AW153			
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.		WM368			



# QUERIES and ENQUIRIES

## Mixer Circuit

"I wish to use with my amplifier a pick-up and a mike which needs an input transformer. I wish to fit volume controls to both mike and transformer in such a way that I can mix the outputs, and should be glad if you would tell me the best way of doing this. Should the mike control be across the mike or across the transformer secondary?"—H. W. S. (Stoke Newington).

A VOLUME control suitable for the pick-up must be obtained, and a control for the secondary of the mike transformer. Probably 250,000 or 500,000 ohms will be found suitable. The two controls must be joined in parallel with pick-up and with transformer secondary, and the end of the pick-up control should be connected to the arm of the mike control. The lower end of the latter should be joined to the earth line (or bias), whilst the arm of the remaining control should be joined to grid, that is, the remaining input terminal. This will enable both components to be controlled and mixed in any desired degree.

## The Vitesse

"I have now completed the Vitesse receiver but there is lack of volume and a whistle on most stations. I have tried repeatedly to trim the I.F. transformers, but do not seem to arrive at a correct setting. Can you suggest what might be wrong with the set—it is wired exactly to specification and all specified parts are used?"—M. C. (Dublin).

THERE would appear to be some instability which is preventing the transformers from being correctly aligned and which results in loss of signal strength. There are two schemes which we have found effective in such cases and they are as follows: Firstly, remove the second I.F. transformer and disconnect the leads joined to the tags underneath the base. Drill four holes in the chassis and take these leads straight down, thus avoiding the risk of instability due to the close proximity of the terminals on the two transformers. The other scheme is merely to screen the diode lead which runs from the valve to the coil unit. Either of these schemes alone may prove effective, although in stubborn cases it may be necessary to adopt both of them.

## Car Radio

"I am contemplating building a small radio set for use in my car and should be very much obliged if you would tell me how the current from a six-volt car battery is stepped up high enough to run the radio; also where would you advise me to get the components?"—T. M. (N.7).

THE current is not stepped up—only the voltage is changed. To operate a radio receiver you need a high voltage and small current, and thus, as the car battery delivers a D.C. supply which

cannot easily be transformed to a higher voltage, it has first to be changed into an alternating current (A.C.) supply. The most satisfactory way of effecting this is to make use of a component known as a vibratory rectifier which first changes the supply to A.C. and then, after passing it through a transformer to obtain the necessary high voltage it rectifies it so that it is again D.C. Components for this purpose are obtainable from Messrs. Bulgin. The receiver circuit will depend upon your own particular preferences, but a good superhet with efficient A.V.C. is desirable.

## "Parvo" Midget Coil

"I have the special B.T.S. coil taken from the Midget Parvo receiver and I should like to use it in an ordinary straight-

### RULES

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

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

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

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

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

three receiver. Is it suitable? If so, what is the key to the coloured leads?"—T. K. J. (St. Annes-on-the-Sea).

THE coil is a standard H.F. transformer with reaction and may, therefore, be used in a simple detector-2 L.F. circuit. The primary winding has one red lead, which is the low-potential (or earthy) end, and the aerial end is the top of the coil. The secondary winding is between the white lead and the fixing bracket, the latter being, of course, earth. The two-point on-off switch for wave-changing should

be joined between earth and the yellow lead. The reaction winding is between the blue and green leads, the blue being joined to the anode and the green to earth through the reaction condenser.

## Interference Suppressor

"I believe there is a suppressor made for use in the mains leads to a vacuum cleaner or similar apparatus. Could you tell me how this type of suppressor is constructed, where I can buy one, or the parts needed to make one at home?"—G. T. (Hendon, N.W.9).

THE component in question is manufactured by Messrs. Belling and Lee. There are two types, one for use with two-pin mains plugs and one for the three-wire system. The circuit employed consists of fixed condensers between each mains lead and earth and a high-inductance choke in series with one mains lead. In the component referred to the choke has an inductance of 2,000  $\mu$ H and the condensers are .01 and .1 mfd.

## Smooth Reaction

"I am in difficulty regarding the reaction circuit in my short-wave circuit. I have tried differential and ordinary condensers, have tried an S.G. valve with reaction controlled by the screen-grid voltage through a potentiometer, but cannot obtain a nice smooth build up. Can you suggest the best way of overcoming this difficulty with a standard 6-pin short-wave coil?"—T. F. (Chelmsford).

IN view of the ideas you have already tried it is possible that your circuit is badly designed or defective in some way. The only scheme not mentioned by you is one which has been found to give quite good results in certain receivers and consists of the inclusion of a variable resistance in series with the reaction circuit. The anode is joined to a choke in the usual way and to the anode one end of a variable resistance (value about 2,500 ohms) is joined. The arm of the resistance is then joined to the reaction winding which is earthed through a reaction condenser in the usual way. By adjusting both condenser and resistance it is often possible to obtain a very smooth effect over the entire range, and the resistance gives better control than the condenser.

## Visual Tuning Indication

"I believe you published some time ago a scheme for using an ordinary flash-lamp bulb as a visual tuning indicator. I cannot trace the article, and wonder if you can refresh my memory concerning the scheme."—S. R. S. (Bridgend).

THERE are two schemes indicated, one of which has the bulb joined in the speaker circuit, and the other in which the bulb is included in the heater circuit of a controlled valve. The former scheme is difficult to adjust, and the latter has the disadvantage that two chokes on a common former are required. It gives the better results, however, and the lamp is wired in series with one choke winding which is in turn in one of the heater leads to the controlled valve. The other choke winding is in series with the I.F. transformer primary (on the H.T. side). In the no-signal condition the lamp glows at maximum brilliancy and the signal decreases the glow. The correct tuning point is indicated when the lamp is partially or entirely extinguished.

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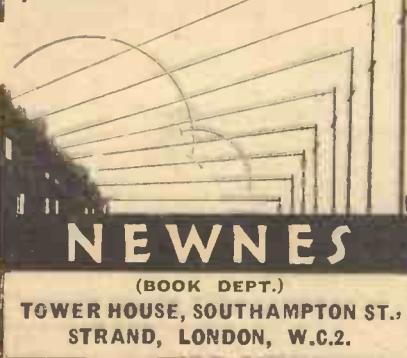
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# CUTTING OUT CRACKLES— See page 317

# Practical and Amateur Wireless

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

Edited by F.J. CAMM

a GEORGE  
NEWNES  
Publication

Vol. 12. No. 299.  
June 11th, 1938.

AND PRACTICAL TELEVISION

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*Explained*



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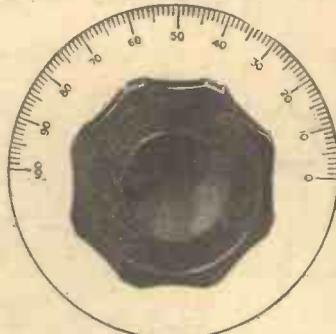
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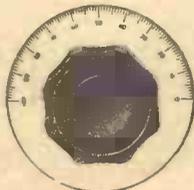
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# Simplest S.W. Two Refinements —See Page 309



## Practical

## and Amateur

## Wireless



*Edited by* **F. J. CAMM**

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

VOL. XII. No. 299. June 11th, 1938.

## ROUND *the* WORLD of WIRELESS

### Colour Coding

EVERY constructor is now familiar with the colour method of indicating values of fixed resistors, although many are not aware that many other components are provided with coloured indications as to value or purpose. Whether or not the idea is desirable, the majority of manufacturers now adopt some scheme of the kind. The Radio Component Manufacturers Federation have drawn up recommendations for various components, and in this issue we give all the present codes covering resistances, condensers, transformers, etc. Many constructors complain that the codes are difficult to remember and consequently they have to spend much time when constructing a receiver looking up reference tables in order to identify the various component values. All of the tables are included on one page in this issue and this should be cut out and kept on the workbench or fixed to the wall so that it will always be handy. If any further tables or recommendations are made at a later date these will be given and may be added to the data included in this issue.

### Paris Push-buttons

AT the recent Paris Spring Radio Exhibition a large number of receivers were seen fitted with push-buttons. It would appear that this feature is receiving great publicity in France at the moment.

### Gibraltar

ON June 13th Regional listeners will hear a radio picture in sound and narration of the story of Great Britain's smallest dependency. From its first occupation by the Moors in A.D. 711 up to the present time, when it stands as the British key to the Western Mediterranean, the story of the famous rock will be described.

### B.B.C. at Empire Exhibition

THE B.B.C. Symphony Orchestra of 119 players will visit the Empire Exhibition on June 13th, to play in the Concert Hall. The first part of the concert will be broadcast in the Scottish and the main Regional programmes. The orchestra will be under the baton of Sir Adrian Boult, who recently returned from the United States.

### Bristol Radio Exhibition

SPECIAL attention is being given to the variety show, which is a main feature of the Bristol Radio Exhibition, to be held in September. We understand that nearly all available stand space has been taken and the exhibition promises to be the best which has yet been held in the West.

### Tests Match Broadcasts

A DEPARTURE from the usual practice of breaking in on the advertised programmes for the purpose of Test Match

M. Sayers' stories featuring Lord Peter Wimsey. The story selected is "The Learned Adventure of the Dragon's Head." Producer Leslie Stokes hopes that further programmes on these lines may be broadcast during the autumn.

### Richmond Horse Show

THE London season provides few functions more delightful and informal than the annual Horse Show held in the Old Deer Park at Richmond. A popular feature of this Show is the competition for the Furnivall's Cup, in which children's jumping ponies compete. On June 10th, B.B.C. commentators and mikes will be present so that a phase of this popular occasion may be described to those who are not able to be present. Thomas Woodrooffe will introduce the event, whilst the commentary will be by Major G. Phipps-Hornby.

### Police Cycle Radio

THE Aberdeen Police Force now have a number of cycles fitted with radio. A miniature set is housed in a bag behind the saddle and a small loud-speaker is fitted to the handlebars. This is in a clip so that it may be removed quickly in the event of difficulty in hearing due to traffic noises. It is then used as an earphone. A medium-short wave is employed and headquarters can keep in touch with members of the force in outlying districts. Two-way systems are at present being experimented with by Sergeant Smith, who is responsible for the radio work in this case, and some of the apparatus will be displayed at the police inspection this month.

### Bebe Daniels and Ben Lyon

IN the "Silent Melody," a new musical comedy to be heard in the Regional programme on June 8th, the well-known film stars Bebe Daniels and Ben Lyon will star. The B.B.C. Variety Producer says that the show has been waiting to be cast for more than a year.

### Band Boomerang

THE next Band Boomerang will include Max Schonherr and his Band in Vienna and Peter Yorke and his Orchestra in London. The programme will be heard on June 9th, and it is interesting to note that apart from a twenty-minute conversation between the two studios no opportunity occurs for rehearsals.

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Commentary will be a feature of the broadcasts in connection with the present series, starting at Nottingham on June 10th. Commentaries are to be given this season at fixed periods during the matches. Seven such periods will be included in the programmes on the first day of each match, and six fixed periods on each of the subsequent days. The periods will be either of ten or fifteen minutes' duration.

### Detectives in Fiction

THE last of the present Detectives in Fiction series is to be broadcast during the present quarter on June 10th. This will be a dramatised version of one of Dorothy

# ROUND the WORLD of WIRELESS (Continued)

## Bombay's New Station

THE Governor of Bombay, His Excellency Sir Roger Lumley, recently opened the new 10-kW station at Bombay. This station, the call-sign of which is VUD, will transmit on 90.8 metres after dark and on 49.3 metres during daylight.

## Honolulu "In Town To-night"

THE B.B.C. Variety Department should feel flattered about the recent news from Honolulu, where "In Town To-night" is announced as a new regular feature.

## INTERESTING and TOPICAL NEWS and NOTES

### Violin Recital

ALFRED CAVE, leader of the B.B.C. Midland Orchestra and the City of Birmingham Orchestra, will give a violin recital on June 15th. His programme will include works by Gibbs and Dohnanyi.

Orchestra, with their arrangers, Ralph Bruce and Ray Terry, will say au revoir until the autumn. The speaker will again be David Porter, who produces this light entertainment feature.

### Sir John Reith on Broadcasting in 1937

MORE than £3,000 was raised last year as a result of appeals broadcast during the Children's Hour, according to Sir John Reith, writing in the new "Britannica Book of the Year," which has just been published under the auspices of the Encyclopædia Britannica. By the end of 1937 there were 7,751 schools with sets installed to receive school broadcasts, 2,000 more than at the end of 1936. Altogether about £150,000 was raised as a result of the broadcasting of charity appeals last year.

There were 1,213 S O S and police messages broadcast from all transmitters during the year.

### Dance Cabaret from Newquay

DANCE Cabaret will be broadcast from the Headland Hotel, Newquay, on June 16th. The artists will be: The Radio Revellers, "Kings of Syncopation"; Tessa Deane, "The Popular Singer"; Shirley Waldron and his Dominoes Dance Band. The programme will be compered by Eric Barker.

### Gilbert and Sullivan Music

REGINALD BURSTON will conduct the B.B.C. Midland Orchestra in a programme of music from the Gilbert and Sullivan operas. He will include selections from six popular favourites.



The Columbia Broadcasting System's new West Coast Headquarters after its opening on April 30th. The building also is the home of station KNX.

### Polish Radio Activity

IT is reported that the Polish Broadcasting Authorities are very active in the provincial towns, recruiting new subscribers. They are also organising special training classes for broadcasting pioneers, collecting gifts of receiving sets for the poorer elementary schools, organising popular entertainments to arouse interest in broadcasting in the small towns and villages, and giving free information on technical questions.

### Theatre Variety

MIDLAND and Regional listeners will hear on June 17th a variety programme from the stage of the Hippodrome Theatre, Aston. There have been numerous broadcasts from this theatre, which is a "sister-theatre" to the Coventry Hippodrome. The details of the bill for the broadcast have not yet been arranged. Ivan Huckerby conducts the Aston Hippodrome Orchestra, which broadcasts regularly.

### Louis Levy to Conduct Variety Programmes

WE are informed that by arrangement with the Gaumont-British Picture Corporation, Ltd., Mr. Louis Levy has been offered a part-time contract to conduct certain programmes in the Variety Department for a period of twelve months from July 4th next.

### "Swift Serenade's" Au Revoir

WHEN "Swift Serenade" is broadcast in the Regional programme on June 14th, the Swift Serenade Concert

## SOLVE THIS!

### PROBLEM No. 299

Hawkins had made up an experimental amplifier and as he needed a volume control he looked through his collection of apparatus and found a valve which was suitable. When he fitted this, however, he found that although it controlled volume from minimum to maximum, it gave very little control over the majority of its movement, and then suddenly came into effect and gave a rapid adjustment. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 299 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, June 13th, 1938.

### Solution to Problem No. 298

Jones overlooked the fact that the carbon mike on stand included an input transformer in its base, and thus, when he obtained the new mike he also needed a transformer in order to match the input circuit. Only one reader succeeded in solving correctly Problem No. 297, and a book is accordingly being forwarded to J. P. Cook, "Aintree," Mounton Road, Chepstow, Mon.



Turner Layton carries on business as usual, while in St. George's Hospital with a broken leg.

### Clifton String Orchestra

A STRING Orchestral programme from a West of England studio on June 13th will include the Glazounov Saxophone Concerto, with Monte Stanford as soloist. The Clifton String Orchestra will be led by Joan Allen and conducted by Reginald Redman, and the programme will also include the Theme and Derivations by Becket Williams, the West Country composer.

# COLOUR CODES EXPLAINED

Details of all the Special Codes Now Employed to Identify the Values of Components and Their Use in Modern Circuits

EVERY constructor is now aware of the fact that modern fixed resistors are coloured to indicate the value—this being regarded as a much more satisfactory method than affixing a label which might at some future date become lost or defaced and thus prevent the value of the component from being ascertained. In addition to resistors, however, condensers are also provided with such a code, although this is not in such common use in this country. Manufacturers of complete receivers often adopt a code for the wiring of the receiver so that their service engineers may more easily locate certain leads when testing the receiver. By adopting a colour code for standardisation it becomes a simple matter for a service man or experimenter instantly to identify components or other details in any make of receiver, and it has been decided that such items as mains transformers and battery leads shall also be identified in a similar manner. To enable every reader to become acquainted with all these codes we give below those which have so far been standardised, and although these have been given before in various issues they are now collected in a single article so that it may be cut out and kept in the workshop for ready reference.

## Resistance Codes

For fixed resistors the code consists of three colours, and although these are sometimes given in the form of three bands or dots on the component the standard way which is most generally adopted is to colour the entire body of the component for the first colour, one of the tips for the second colour, and to display the third in the form of a dot or band on the centre of the body. This is the order in which the colours are read, and the colours in each case stand for the figures from 0 to 9. The complete reference table is as follows:—

Colour	Fig.	No. of Noughts.
Black	0	None
Brown	1	0
Red	2	00
Orange	3	000
Yellow	4	0000
Green	5	00000
Blue	6	000000
Violet	7	0000000
Grey	8	00000000
White	9	000000000

An example will make the scheme quite clear. Suppose we have a resistance with a red body, a black tip and an orange spot or band. Then the value will be 2 (red body) followed by one nought (indicated by the black tip), followed by three noughts, or in other words 20,000 ohms. If it is found that a resistance does not bear a dot or band on the body it indicates that the dot is of the same colour as the body.

## Condenser Codes

In the case of fixed condensers the code is exactly similar but the basis, instead of the ohm, is the micro-microfarad. Thus a .001 mfd. condenser (which is the same as a 1,000 micro-microfarad) would be indicated by a brown dot followed by a black dot followed by a red dot. In addition to small fixed condensers, however, a code is drawn

up for multiple condenser blocks provided with cable or flexible leads for connection. The following is the recommended code:—

The highest capacity positive voltage	.. Red
The second highest positive voltage	.. Yellow
The third highest positive voltage	.. Green
The fourth highest positive voltage	.. Blue
The fifth highest positive voltage	.. Violet
Principal negative connection	.. Black
Second negative connection	.. Brown
Third negative connection	.. Grey
Centre connection for voltage doubler condensers	.. White

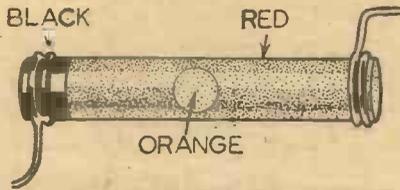


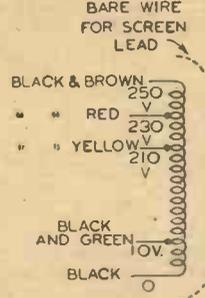
Fig. 1.—Example of resistance colour coding. This is a 20,000 ohm component.

Where a condenser has two terminal wires only, they are red and black (for positive and negative respectively), irrespective of the capacity and voltage rating of the condenser. Where two capacities are equal, the higher voltage shall be given the higher colour in the table. In addition to the colours it is also necessary to mark condensers in which two or more complete units are embodied, and for this purpose the following marks are adopted:—

Common positive junctions shall be marked +.

Common negative junctions shall be marked —.

Series connections shall be marked ±.



## Unconnected Sections

Thus 8+8 denotes 2 sections with a common positive.  
 8-8 denotes 2 sections with a common negative.  
 8±8 denotes a series voltage doubler connection.  
 8 & 8 denotes 2 isolated sections.

## Fuses

Fuses for use in battery or mains receivers are also coded to indicate the value, the colour usually being shown by a strip of coloured paper inside the glass tubular container. The code is as follows:—

60 mA	.. Black	1 amp	.. Dark Blue
100 mA	.. Grey	1½ amp	.. Light Blue
150 mA	.. Red	2 amp	.. Purple
250 mA	.. Brown	3 amp	.. White
500 mA	.. Yellow	5 amp	.. Black & White
750 mA	.. Green		

## Mains Transformers.

In the case of modern mains transformers flexible leads are used for connection in place of terminals, and these leads are covered either with coloured cotton or passed through insulated sleeving with the

appropriate colour embodied. The primary has a black lead for the 0 connection (one side of the primary), and for the remaining tappings a combination of black and another colour is employed. Usually the lead is striped for this purpose. Black and green indicates 10 volts, black and yellow 210 volts, black and red 230 volts, and black and brown 250 volts. The screen sometimes interposed between primary and secondary is generally a bare wire.

For the secondaries red is employed for the high voltage, the centre tap being red and yellow. The rectifier heater is green, with a green and yellow centre tap, and for the heaters brown, with a brown and yellow centre-tap is used. Any additional L.T. winding is coloured blue with blue and yellow centre tap. It will thus be seen that centre taps are indicated by a yellow lead bearing a stripe corresponding to the remaining connections to the section which is tapped.

## Battery Leads and Plugs

In the case of combination leads for battery voltages, or for the plugs which are fitted to the ends of such leads, the code adopted to indicate the various tapping points is as follows:—

Highest positive voltage (H.T.)	.. Red
Second positive voltage (H.T.)	.. Yellow

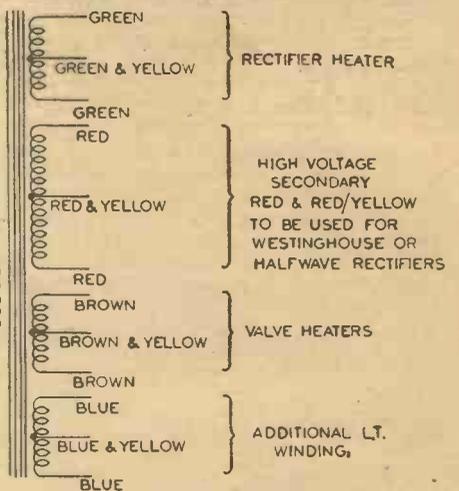


Fig. 2.—Diagram illustrating the code for mains transformer leads.

Third positive voltage (H.T.)	.. Green
Fourth positive voltage (H.T.)	.. Blue
Low tension positive (L.T.)	.. Pink
Common negative (L.T., H.T., G.B.)	.. Black
Maximum G.B. negative	.. Brown
Second G.B. negative	.. Grey
Third G.B. negative	.. White

Any additional point such as 4th greatest G.B. negative, or 5th greatest H.T. positive, or positive bias is violet, and any centre tap, white.

## NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

2nd Edition  
 By F. J. CAMM

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

# A Robot Timer

Some Interesting Details of a Method Used in America to Overcome Distortion on a Dual-wavelength Programme

**L**ISTENERS in London or other big cities do not know of some of the difficulties which are encountered in country districts, although little has been heard in this country of difficulties met with in the case of those B.B.C. stations which operate on a common wavelength. In America, however, people living between Chicago and Lincoln, Nebraska, were annoyed by a barrel-like effect that linked the WBBM and KFAB programmes from either or both stations. They complained to the Columbia Broadcasting System, and set in motion the engineering force. Eventually a queer contraption resulted, and the problem was cleared up. The following data concerning the interesting problem was collected by the Radio News of America.

It took twenty-three thousandths of a second for an electrical current to travel the five hundred miles of telephone wire between stations WBBM in Chicago and KFAB in Lincoln, Nebraska. Consequently, a programme wired from WBBM to KFAB would go on the air just twenty-three thousandths of a second later in Lincoln than in Chicago.

Ordinarily, a delay of this kind would make no difference. But, with both stations operating on a frequency of 770 kilocycles, there was a fifty-or sixty-mile strip of territory between them where a receiver set at 770 kilocycles would bring in both stations.

## Controlled Wavelength

This presented no problem of heterodyning, because the precision equipment at both stations kept both transmitters exactly on the assigned frequency. However, the overlapping area was nearly midway between the stations, and since radio waves travel with the speed of light (less than three thousandths of a second for five hundred miles), reception from KFAB coming in twenty-three thousandths of a second behind WBBM gave a hollow, barrel-like quality that is so unpleasant.

Frank B. Falknor, chief engineer of Columbia's central division, tackled the problem. The only cure was to get exact time synchronization. The problem reduced itself to delaying WBBM's broadcast by exactly twenty-three thousandths of a second. This was much more difficult than it sounded, for the delay had to be effected without reducing the tone quality of the broadcast. For this the tone frequencies ranging from 50 to 6,000 cycles had to be equalised.

It was impossible to buy equipment, for the good and sufficient reason that nobody had ever faced the problem before. The nearest approach was in transatlantic telephone work, where the telephone company had installed equipment to delay the voice long enough for an automatic volume control tube to function and control fading.

This meant that CBS would have to devise its own electrical equipment, a job that would take several months. In the meantime, Falknor went to work on a makeshift mechanical delay to fill in while the electrical delay was being developed and installed.

## Mechanical System

Sound travels through air at the rate of 1080 feet per second. Hence, if WBBM's programme were to travel through twenty-three feet of air before reaching the mike, it would be delayed by the necessary twenty-three thousandths of a second.

Falknor had a section of lead sewer pipe cut to the proper length, and set it up with a loudspeaker at one end and a dynamic mike at the other. He killed echoes at the speaker end by installing an exponential

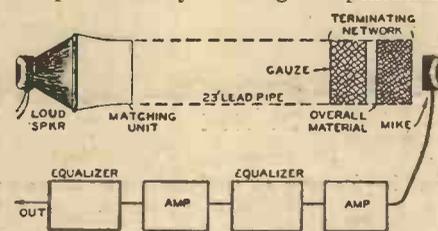


Fig. 1.—The physical problem.

matching unit made of an aluminium casting. It was designed to match the impedance of the speaker with that of the pipe. This functioned so well that sound leaving the speaker went into the pipe without distortion.

However, there was sound reflected from the mike diaphragm. These waves,

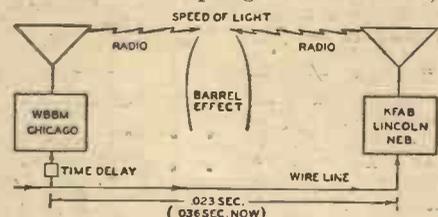


Fig. 2.—The first solution.

meeting those coming from the speaker, caused a series of beats that distorted the sound picked up by the speaker.

The cure for this was a terminating network or cloth placed in the pipe near the mike end. Because of the wide range of audio frequencies encountered, Falknor began by putting gauze near the centre of

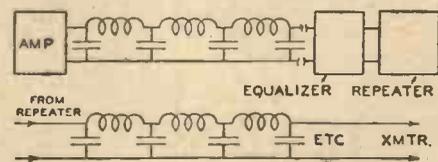


Fig. 3.—The final solution.

the pipe. Working toward the mike end, he used heavier and heavier fabrics, concluding with some pieces cut from a mechanic's overalls.

This improvised damping equipment worked quite well, but there were still humps in the sound. These were eliminated by feeding the output from the mike through electrical equalisers, one equaliser for each hump. Since each equaliser cut the total volume, an amplifier was installed after every equaliser.

The finished contraption worked as shown in the accompanying illustrations. Programmes were fed into the loudspeaker at the same time as they left for KFAB. Sound from the speaker went through the matching unit to the lead pipe, and at the end of twenty-three thousandths of a second had reached the mike. The cloth network eliminated most echoes, but cut the entire volume enough so the mike output was fed through an amplifier. It then passed through a series of equalisers and amplifiers to eliminate all humps, and then to the transmitter. While all this was happening the identical programme was travelling the wires to Lincoln, and was broadcast from KFAB at the exact instant it left the aerial of WBBM. It gave satisfactory results over a tone range from 100 to 5,000 cycles from the day the two stations were synchronised, and was used for several months.

## The Electrical System

The electrical delay system that was put in permanent service has an even wider range, equalising frequency extremes from 50 to 6,000 cycles.

It is made up of filter sections having attenuation characteristics similar to ordinary telephone cable. The problems of equalisation and repeating are similar to those encountered with cable.

Each filter section gives the greatest time delay possible while having the ratio of loss between the lowest and highest frequencies such that transmission at the two extremes may be equalised.

The programme is fed to the first filter section. Then it goes to an equaliser, which, of course, reduces total volume, and then to an amplifier. From here it goes to the second filter section, etc., until it has been delayed the correct time interval.

Since the robot timer was put in service, new telephone cable between WBBM and KFAB has increased the time lag to thirty-six thousandths of a second. In the equipment now used it takes twenty filter sections to delay transmission this long, and the programmes radiate from the two stations at exactly the same instant.

Thus, sometimes does the broadcast engineer face and solve problems which are "not in the book" and for which he must use his ingenuity. Falknor is modest: he says it is all in the day's work.

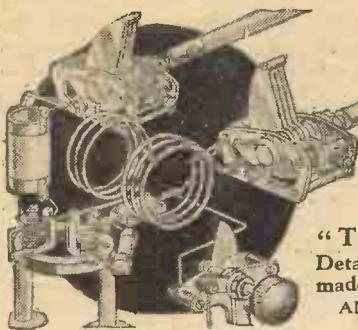
**NOW READY!**

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

Edited by

**F. J. CAMM**

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



# Short Wave Section

Adding Refinements to  
**"THE SIMPLEST SHORT-WAVE TWO"**  
 Details of a Few Interesting Modifications which can be made to the Original Receiver Described in PRACTICAL AND AMATEUR WIRELESS, dated April 3rd, 1937.  
 By FRANK PRESTON.

THE very simple two-valve short-wave receiver described in the issue dated April 3rd, 1937, has proved extremely popular, and many readers have written to tell us of the excellent results which they have obtained with it. As the name suggests, the main feature of the set was its real simplicity, which was combined with sane and sound design. It would not be easy to improve the range or reliability of the set without adding to the

condenser. This is shown in Fig. 3. The .00016-mfd. condenser (or a component of approximately this value) should be of the midget type, since there is insufficient space on the panel for a larger one. It will also be appreciated that the .0005-mfd. pre-set condenser is no longer required, since the fixed vanes of the two tuning condensers are connected directly to the top of the grid winding on the coil.

The larger of the two new condensers constitutes the "tank," and is used merely to select the required band of frequencies, while the 25-mmfd. component is the tuner, or trimmer; this is used for station selection once the required band has been chosen. In consequence of this arrangement, tuning is considerably simplified and greater accuracy is possible.

Those who wish to buy two new condensers could use the special Eddystone bandspread tuning outfit, which comprises a tank condenser with scale graduated in ten steps and with a special "stop" device for these steps, and a small trimmer with slow-motion drive. The trimmer has a maximum capacity of approximately one-

tenth that of the tank unit, and therefore fully covers each of the ten bands.

It will be understood that the existing two condensers—.0005-mfd. variable in series with the .0005-mfd. pre-set could be retained as a tank or band selector if the variable condenser were moved to the new position and fitted with a plain knob and pointer or small dial. If the condenser is not of the midget type it will probably be necessary to lower the reaction condenser to make room for the .0005-mfd. component above it.

## L.F. Transformer Coupling

Another refinement which is worth while when greater signal strength is desired from the more distant stations consists of replacing the resistance-capacity coupling between the two valves by transformer coupling, as shown in Fig. 2. The transformer should be a small one—the primary has to carry only a small current—so that it can be mounted on the under-side of the chassis between the two valveholders or in another convenient position not too far away from the detector valveholder. The transformer should have a ratio of about 1 to 3, since if it has a higher ratio than this instability might become troublesome. In any case, the output pentode will be fully loaded on most stations with a transformer of the ratio mentioned.

To check any slight tendency toward instability produced by using the transformer it might be found desirable to fit a .001 or .002-mfd. fixed condenser between the anode of the pentode and earth. This, also, is shown in Fig. 2.

## H.F. Pentode Detector

H.F. pentodes make very effective detectors and often allow of better reaction

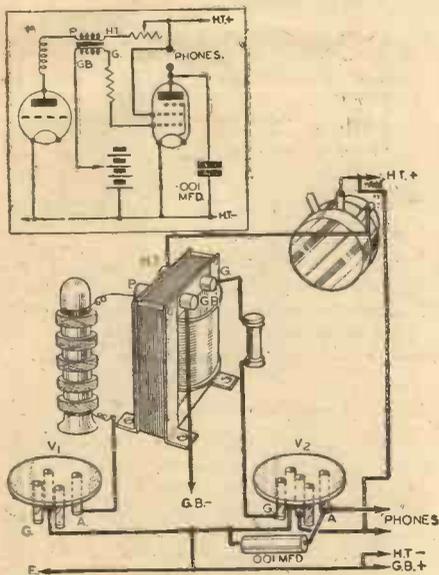


Fig. 2.—Theoretical and pictorial diagram of the change from R.C.C. to transformer coupling.

number of valves, but there are a few refinements which many experimenters might wish to add.

I will make it clear in the first place, however, that the refinements will not make the set more efficient, any more than the fitting of more comfortable seats to a car will improve speed. They will make the receiver rather easier to handle, and some of them will have the effect of permitting of quicker tuning; this is especially desirable when listening to amateur transmitters who operate for only a few minutes before "changing over" for reception from a fellow experimenter.

## Band-spread Tuning

One modification that is especially desirable in this connection concerns the tuning system. Alteration from a single tuning condenser to a band-spread system is nearly always fully justified and worth the additional cost. The simplest method of changing is by fitting a .00016-mfd. variable condenser with simple knob and pointer, just above the .0003-mfd. reaction condenser—see Fig. 1—and mounting a 25 mmfd. tuning condenser on the slow-motion drive in place of the .0005-mfd.

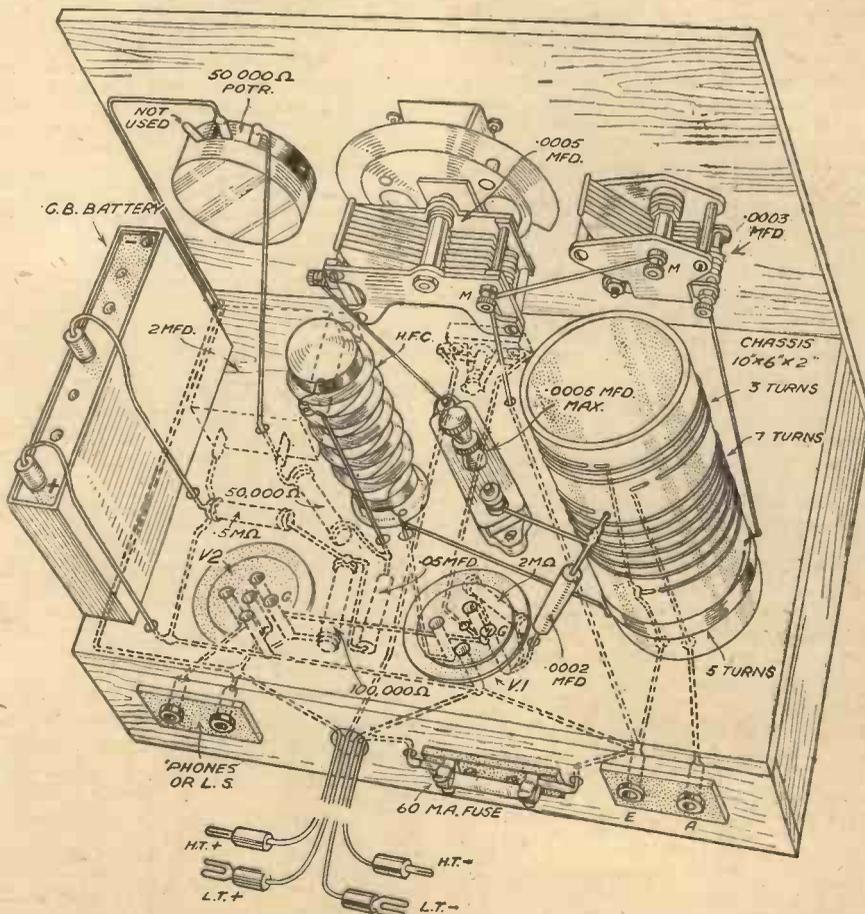


Fig. 1.—The original "Simplest Short-Wave Two" which has proved extremely popular.

control, especially in short-wave receivers. It is not difficult to replace the original triode by a pentode by following the circuit and connections shown in Fig. 4. In this case it will be better to retain resistance-capacity intervalve coupling, or otherwise to use a resistance-fed transformer. The reason is that an H.F. pentode has a very high impedance and for efficient operation requires a high anode load. Actually, the load resistance should be not less than 250,000 ohms, but this is too high in practice, due

of the older-fashioned push-pull type if one is available, or it can be of the more-usual toggle type, such as the Bulgin type S.87.

When there is no objection to spending a few extra shillings it is worth while to replace the reaction condenser by one of the special midget slow-motion type. This is generally made in a capacity of .0002 mfd. only, but that will usually be a sufficiently high value. The type of condenser in question has a drive giving a step-down

tive of the voltage or condition of the H.T. battery. Because of that, better quality is often obtained, and there is no danger of the H.T. current rising due to the G.B. battery becoming run down.

It should be explained that it is not necessarily suggested that all of the refinements described should be added to the original set. Any of them can be employed separately according to individual ideas, and according to the experimental work which it is wished to carry out.

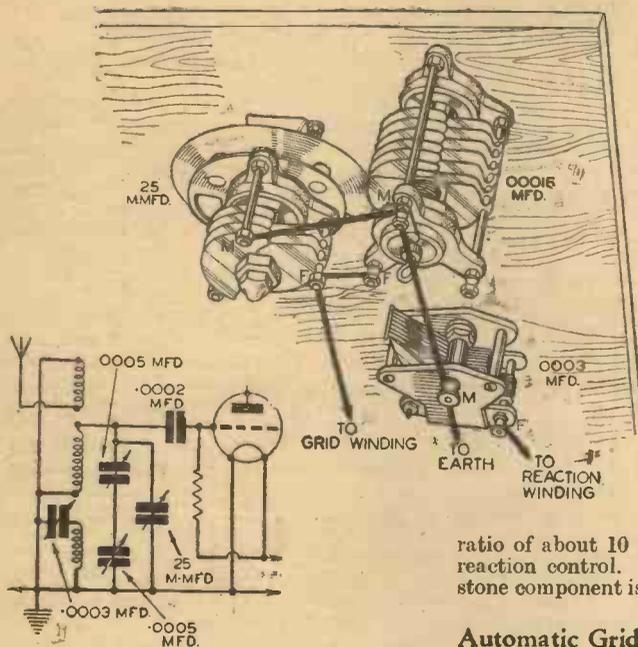


Fig. 3.—(Left)—How band-spread tuning is arranged. In the theoretical diagram a 25m.mfd. tuning condenser is added to the original set. In the pictorial diagram two new condensers are shown.

ratio of about 10 to 1, which is ideal for reaction control. The price of the Eddy-stone component is 6s.

**Automatic Grid Bias**

The only other refinement that could be recommended is that of automatic grid bias. This simply involves the inclusion of a 500-ohm resistor in series with the H.T.—lead, as shown in Fig. 5, shunted by a 25-mfd. electrolytic condenser. The condenser need not have a working voltage greater than 12, and models are included in the lists of almost all condenser manufacturers. Automatic G.B. is useful in that it maintains the correct bias voltage on the grid of the output pentode, irrespec-

to the limited H.T. voltage. If the value were as high as this the voltage applied to the anode would be too low for efficient working. In consequence, a compromise is made by using a 100,000-ohm resistor in place of the previous 50,000-ohm component, while a 20,000-ohm resistor is fitted in place of the 50,000-ohm variable resistor used for controlling the detector anode voltage.

The variable control is retained, however, but is used for feeding the screening grid. A .1-mfd. tubular condenser is also connected between the screening grid and earth to act as an H.F. by-pass. It serves virtually the same purpose as before, and is valuable in "smoothing-out" reaction control, as well as for making final reaction settings to bring a signal up to its maximum strength. The extra components are very small and can thus be easily accommodated. It will be understood that a four-pin H.F. pentode should be used to save the trouble of changing the valveholder and modifying all of the connections. This particular type of valve is, as many readers are aware, obsolescent, but is still obtainable if a spare is not already on hand.

**Three-point Switch**

Due to fitting the potentiometer for controlling the screening-grid voltage, it becomes necessary to replace the two-point on-off switch by a three-point switch. This is so that both the H.T. and L.T. negative leads can be broken when the set is switched off. If the two-point switch were retained there would be a constant drain of H.T. current through the potentiometer, valve filaments and accumulator, from H.T. + to H.T.—. Notice also that the new switch is in the negative instead of the positive L.T. circuit. The switch can be

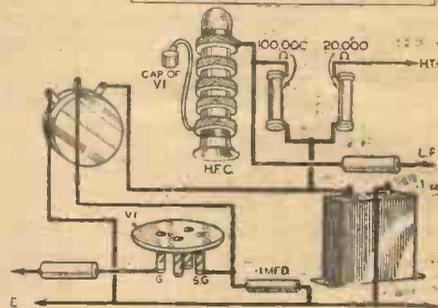
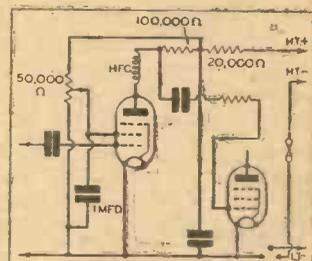


Fig. 4.—It is not difficult to replace the triode detector by an H.F. pentode. Note that the on-off switch must be changed for a three-point one as shown in the circuit. If this is not done the H.T. battery will slowly discharge through the S.G. potentiometer.

**H.F. Amplifier**

Since the original receiver was made, an H.T. unit has been added. This does not greatly extend the range, except when a good aerial is not available. It does, however, improve reaction control when an ordinary broadcast aerial is used; this would normally exert a pronounced damping effect and possibly prevent the detector from oscillating at certain tuning points.

The amplifier consisted of an H.F. pentode valve, with aperiodic grid circuit, comprising a good short-wave H.F. choke. Aerial connection to one end of this was made through a .00005-mfd. fixed condenser. An H.F. choke was inserted in the anode circuit, a lead being taken from the "anode" end to the aerial terminal of the two-valver through a .001-mfd. fixed condenser. It will be understood from this that the circuit was perfectly standard.

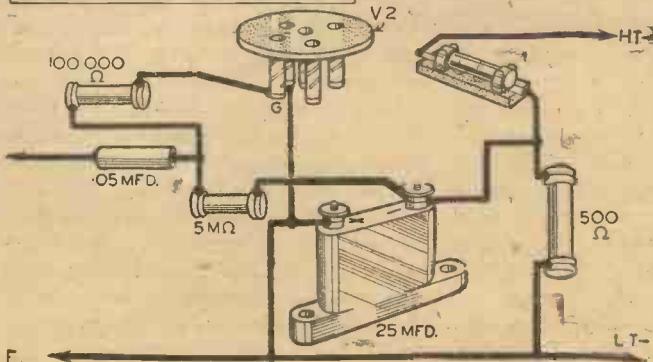
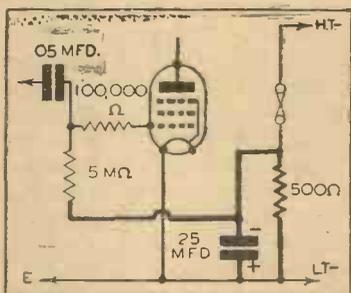


Fig. 5.—It is worth while to add automatic grid bias, by following the simple connections shown here. Only two new components are required.

# ON YOUR WAVELENGTH



By Thermion

## A Black List

C. J. H. of Moreton-in-Marsh, tells me that he and a friend, both members of the B.L.D.L.C., are compiling a black-list of amateurs who do not respond with a QSL card when an International reply coupon is enclosed, or a stamped addressed envelope in the case of English amateurs. I quite agree that this is an annoying remissness on the part of amateurs. If they do not want S.W.L. reports they should say so at the end of their transmissions. Will amateurs please take this friendly hint? How many of them collect unused stamps?

## Second-hand Sets

I WROTE a paragraph last week on the problem of disposing of second-hand sets at ridiculous prices by dealers who have not the vision to see the ends of their noses. I listened the other day to a very interesting discussion on this same subject, and it seemed to be the general view that the problem was created firstly by over-production; secondly by the too-rapid production of new models; thirdly by the methods of some manufacturers of unloading large consignments of their sets at reduced discounts in order to get some ready money, and by the competition of those who cannot really claim to be in the trade. Now if a manufacturer offers sets to dealers at more than the agreed discount, the dealer is rendering him a service, firstly in taking them, and secondly in getting rid of them. A dealer knows that he can only sell, say, a dozen of a particular wireless set in one season. The manufacturer comes along and presses him to take three dozen at a reduced discount. The dealer, therefore, has no option but to offer them at cut prices in order to clear them. The part-exchange racket is responsible in some measure for price cutting. In the motor trade you could walk along a certain road, buy a second-hand car for four or five pounds, and immediately trade it in at a shop across the road and be allowed forty or fifty pounds for it. Those dealers who have agreed to maintain fixed retail prices often dodge the issue by allowing some fabulous sum for a piece of junk. Another

cause of the trouble is the fact that there are too many wireless dealers, or, rather, too many people selling wireless sets. The trade has become so cut up that it does not pay many firms to deal entirely in radio, so you find wireless sets mixed with potatoes, cabbages, bicycles, sewing machines, and what not. If the number of wireless agencies were reduced it would pay those remaining to deal entirely in wireless, and it would be easier to enforce trade agreements. There are so many people dabbling in the business that their methods compel the legitimate dealer to follow suit. The wireless industry is a new one, and it has not yet learned the methods of older industries. It cannot understand slumps, and presumes that trade is bad because it does not remain at the level it did in the boom years. There are far too many gadgets on wireless sets which are not used and not wanted. Push-button tuning is the cry this year. I cannot trace that anyone complains about having to tune to a particular station, so I do not know why the trade should give the public something for which it has not asked. The public does, however, complain about poor quality, lack of selectivity, interference, and so on, and I recommend the trade to concentrate upon improving the radio side of their receivers before toying around with the mechanical side. There are far too many different types of valves, and far too many new types of valves being produced. All of these things inculcate uncertainty in the minds of the public, and they are afraid to buy a new receiver lest it be rendered obsolete the following week, or jobbed off for half the price. Stability is required in the wireless trade, and concentration on a few models rather than the

production of a new model because a competitor round the corner is doing the same. Many manufacturers follow one another like flocks of third-rate sheep, but without the mentality of third-rate sheep. They are purely industrialists and financiers, who imagine that you can go on selling wireless sets by a succession of publicity stunts, drawing attention to their imaginary virtues. I hope all that will soon cease.

## Radiolympia

I SAW the Editor the other day filling in reams of forms concerning the PRACTICAL AND AMATEUR WIRELESS stand at Radiolympia. Which reminds me that within a few weeks people will be stalking round the Exhibition asking to see "Thermion," trying to avoid "Thermion," saying that they do not wish to see "Thermion," inquiring who is "Thermion," and telling other people what they think of "Thermion." The pro-croonerites (the whole three of them) will be round as usual trying to convert all and sundry to the merits of *ridm*. I really must give this word to the English language, for it is an insult to use a good dictionary word such as rhythm to describe the concatenation of cacophonous tinnabulation which goes under the name of swing music. Swing music! How I like that word *swing*! How I should like to see every jazz-band leader *hanging* about.

## Song Plugging

A FEW years ago the B.B.C. set its face against song plugging. It informed band leaders that they were not to indulge in the reprehensible practice of receiving "considerations" from music publishers for plugging several times nightly, each day in the week, for the full life of a song (at least a fortnight), the latest parpular number—usually a far-trart. It is true to say that ninety-nine per cent. of the public loathe the tunes. I believe the B.B.C. selected its own songs for dance bands, in an effort to put a stop to such illegal conduct. Now I learn song plugging has broken out again, and the B.B.C. has issued a stern warning about it. I shall be glad if my readers will report to me any occasion on which a song is plugged by any particular

dance-band leader, so that I can take steps to have the matter aired at headquarters.

### Push-button Tuning

**I** ASKED readers to let me know if they were interested in a push-button receiver; I have received only one postcard, and I hope that this will be a lesson to the radio trade that the public is not really interested in push-button tuning.

### Pictures with Colour

**W**ITH an eye to the future many inventors are flirting with various ideas which they hope will bring to fruition the perfect colour television scheme. This is, of course, quite a natural idea, for there is no doubt that as time passes every television service will be capable of furnishing high quality pictures complete with colour tones and stereoscopic effects. At the moment every scheme propounded adds considerably to the complication of the transmitting and receiving equipment in no small measure, and until material simplification can take place we shall have to be content with monochromatic pictures. Even so, each new colour television proposal should be examined with care to see if it lends itself to commercial application. One idea which has just been propounded employs a mechanical scanner consisting of a combination of vibrating mirrors or prisms which serve as the scanner for the optical image reflected from the scene being televised. This beam is then projected and focused on to a special glass prism which breaks the light up into its spectra colours in the usual way. Each of the primary colours it is desired to incorporate in the picture is made separately to activate photoelectric cells highly responsive to their own particular colours. From each individual cell the output is amplified and fed as a modulation to separate carrier waves. At the receiving end the various carrier waves feed their own signals to light-modulated sources having the appropriate colour filters. The separate beams then pass through another prism which combines the effects prior to being thrown on to a scanning device for projecting the coloured picture on to a screen for viewing purposes. One inherent drawback to this idea is at once obvious, and that is the necessity for using a separate carrier wave for each colour. If it is found possible to combine separate colour tone modulations so that they can be radiated as signals on one carrier frequency, the idea may become commercially practical, but

## Notes from the Test Bench

### Chassis Connections

**A** DIFFICULTY which is often experienced in some receivers is that instability arises, due to poor earth connections. It is a common practice to make a number of earth points in the form of screws or bolts in the chassis, and these are used to act as earth return points. Where instability is found difficult to cure it is recommended that the bolts be connected together by bare wire, preferably soldering the heads or nuts. An extreme case recently came to hand, however, where, in spite of such earth bonding, the instability persisted, although improved slightly by the inter-connection. It was subsequently found that the chassis was greasy and the bolts and nuts were not making sound contact with the chassis, and this point should be borne in mind. The ideal scheme is, of course, to solder or otherwise anchor all earth leads to the chassis surface.

### Ganging Coils

**W**HERE it is found difficult to gang two or more coils, if the coils and condenser are of the type designed to match and gang accurately, the inter-circuit wiring should be suspected. The stray capacities introduced in this way may in some cases upset matching but may be balanced by connecting one of the mid-geet padding condensers across the low section. Tests will, of course, have to be made to find which section is low, and a suitable trimmer joined across the tuning condenser—not across the coil.

### O/C Condensers

**A** DIFFICULTY which often arises when testing a defective receiver is the tracing of an open-circuited condenser. Rough tests with 'phones or meters will not reveal such a fault, and the only effective test is to connect the condenser across a voltage supply, leave it for a short time, and then place it on one side for a fairly long period of time. It should then be joined across a pair of 'phones or a meter and a click or a stick of the needle should be obtained, indicating that the condenser insulation is good and that the condenser is in good working order. A modern high-voltage oil-dielectric condenser which was recently tested in this way gave an appreciable shock when the fingers were placed on the terminals after a period of two weeks!

if not, then the complications are likely to hinder the scheme's development.

### A Go-ahead Club

**I** HAVE received the following report from Mr. N. Postles, of Sale:

"Naturally, I am a reader of PRACTICAL AND AMATEUR WIRELESS, and wondered if you would include in your column a reference to the fact that on Thursday, May 19th, there was held the inaugural meeting of the new Sale and District S.W. Radio Club. This meeting was well attended and lasted from 8.30 p.m. to 10.30 p.m. At this meeting the following officers were elected: chairman, Mr. F. Wittenburg; treasurer, Mr. Horrocks; joint publicity and social secs., pub. sec., Mr. N. Postles (2CXH); social, etc., Mr. S. C. Allen (AA applied for).

"We have fifteen members at the moment including two transmitting members: G2RA and G5UP, one AA—2CXH, and one AA applied for. The subs. have been fixed at 6d. per week, with an entrance fee of 1s. Anyone wishing to join the club should apply to N. Postles, 104, Cross Street, Sale. 'Phone: SALE 2162."

### Agitation

**I** AM informed that the provinces are beginning to display marked agitation in their demands for television facilities comparable with those now enjoyed by London and the Home Counties. Every time the question is raised the reply is to the effect that the delay is not a whim of the B.B.C., but the advice of the Government-appointed television advisory committee. The apparent complacency of this body has already been the subject of Press comment, for since it was formed there have been only two public announcements. It is felt, with some justification, that this country will lose its lead in television unless plans for the service beyond the present single station are proceeded with immediately. Surely enough experience has been obtained by engineering and production staff alike, while the co-axial cable could provide instant facilities for tests to be undertaken in at least one other important city of this country. Perhaps the authorities are holding their hand until some psychological moment such as the commencement of the autumn radio season. Television is far less seasonal than aural radio, however, and surely something is due to the public who find the money to provide the broadcasting services.

**BUY**  
**"THE CYCLIST,"**  
2d. Every Wednesday



# Practical Television

June 11th, 1938. Vol. 3. No. 104.

## A NOVEL TELEVISION PICTURE TRANSMITTER

This Article Describes Equipment Used for Providing Picture Signals Independent of those Radiated by the B.B.C.

**A**LTHOUGH the times during which high-definition television signals are available for normal viewing has of late been extended, as far as the manufacturer of cathode-ray tubes and television receivers is concerned, he is confined to the morning and afternoon transmissions of from two to two and half hours daily. This is quite inadequate for most purposes, and in many cases steps have been taken in some works to provide picture signals through the medium of a local transmitter. This can take one of several forms, according to special needs, and one of the most interesting is that designed by the Baird laboratories; details of which have just been released. Subject movement in a picture for test purposes is seldom required and in this particular case a still picture scanner is employed, the equipment having been in use now for nearly two years, giving satisfactory and reliable service throughout the whole of the period. The arrangement is wholly electronic in operation, and once switched on and set up according to the standards desired can be left running without constant supervision.

### The Picture Tube

The essential feature of the apparatus is a special form of cathode-ray tube which is illustrated in Fig. 2. This is about 2ft. long, and at one end is the standard neck and electrode assembly common to Baird "Cathovisor" cathode-ray tubes, that has an indirectly-heated cathode, modulator electrode, and high potential anode. The tube then "bells" out to a cylindrical section approximately 4ins. in diameter, at the far end of which is mounted at right angles to the tube axis a circular nickel plate, 3½in. diameter. On this has been "printed" a picture 2½in. by 2in., which resembles in formation the screen mesh blocks used for illustrating this journal, except that the picture is a positive one instead of the negative required for printing purposes.

The picture itself, conforming by measurement to the standard B.B.C. five to four ratio, comprises the head and shoulders of a woman (Madeleine Carroll, so often used for test purposes by the Baird Company from their Crystal Palace station, prior to the fire), dressed in a check blouse, together with lettering and a drawn pattern. Made up in this way the final picture includes both half tones as well as black and white effects, while the picture design chosen provides an excellent one for checking the linearity of scan in a television receiver, a factor of extreme importance in all commercial models.

### Principles Involved

The tube is completely evacuated, and for its operation depends on the principle of the varying secondary

emission of electrons from the plate. Before being mounted in position inside the tube the plate is treated by filling the block screen

interstices with a special composition. The tube is then accommodated on a rack shelf having magnetic line and frame deflection coils, together with the usual form of cylindrical focusing coil. When fed with the usual electrical supplies, the nickel plate under these conditions is scanned by a focused beam of electrons. During the course of this process more electrons are released by the exposed metallic portions of the picture than by the composition filling the interstices. Naturally, the number of electrons released during the whole scan period will be in accordance with the picture employed, and this varying secondary emission which, of course, constitutes the dissected picture signal, is picked up by a collector anode formed by an interior metallising of the tube wall, as seen clearly in Fig. 2. It has been found by experiment that a potential difference of 100 volts between the nickel plate and the tube's metallic deposit is sufficient for this purpose.

### Monitoring

Under normal working conditions, therefore, the picture generator tube is accommodated on the top shelf of a rack as seen in Fig. 1, complete with its magnetic focusing and deflection equipment, and the television signal formed in this way is passed through a two-stage vision amplifier built on the same shelf by the side of the tube. The output from this is fed to the appropriate sources according to requirements. Immediately below this top shelf is mounted vertically with its screen facing downwards a standard 12in. Baird "Cathovisor" cathode-ray tube, together with its time-base generator, and that for generating the pulses required for the picture tube. This acts as a monitor, and the picture built up in the usual way on the screen is observed by the operator on a horizontal mirror mounted on a shelf about one foot below. An aperture in the rack panel gives a clear view of this picture, and in this way it is a simple matter for the conveniently placed controls to be adjusted to give the picture standard desired. At the base of the rack are the necessary power packs for feeding the supplies through to the equipment above.

### A Second Rack

Used in conjunction with this rack is a second one, which is built to house both the line and frame synchronising pulse generators. These pulses are then fed to the appropriate sections of the time-base generators of the picture, and monitor tubes, so as to lock them. When employing the apparatus in the Baird factory for normal test purposes, the generated picture signal is made to modulate a special transmitter, fed with 405-line interlaced synchronising pulses, so that there is available a still picture which simulates in every characteristic that otherwise provided by the present-day B.B.C. standard television transmissions.

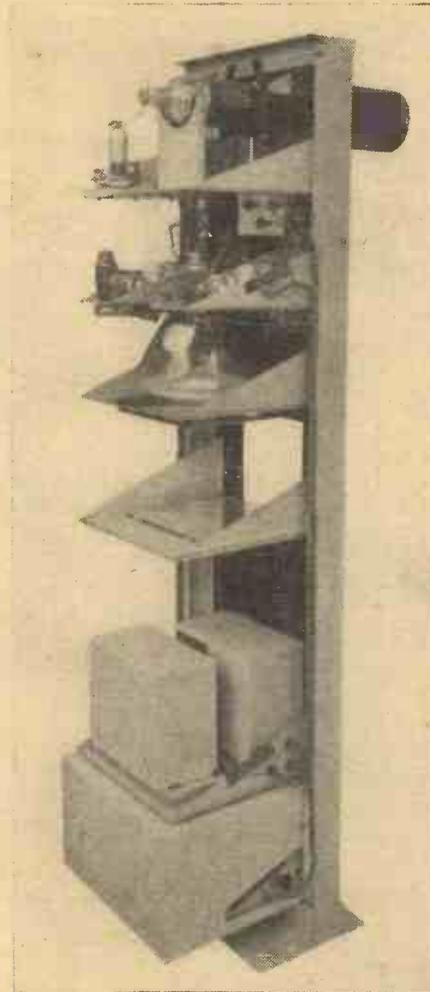


Fig. 1. The complete rack with picture tube, amplifier, time-base generators, power supplies, and monitor.

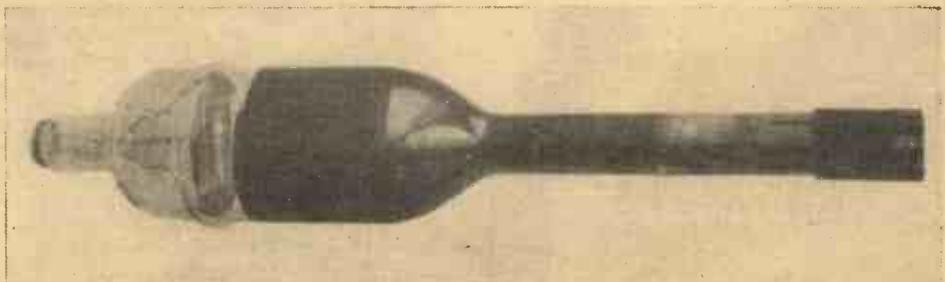


Fig. 2.—Showing the special picture tube, with the picture itself printed on a metal plate.

## TELEVIEWS

### A D.C. Light Device

ANYONE who has examined carefully a modern television receiver cannot fail to have appreciated the value of an incorporated D.C. light device. In addition to the ordinary light and shade of the picture which is synthesised to provide the television signal modulation, the average level of the signal alters to conform to the degree of overall brightness which is present in the picture. This enables the picture to have its proper pictorial value, and shows whether the scene is one of, say, brilliant sunlight or represents evening shadows. Most modern sets include circuit arrangements to allow these transmission effects to be simulated, and if at the outset the screen illumination is set so that the picture area is just faintly seen, then when the signal is radiated, the brightness level will adjust itself automatically to the value embodied in the radiated picture. Many schemes can be employed to ensure that this criterion is operative at the transmitting end, and one simple arrangement uses a photo-electric cell for this purpose. With the mosaic of a photo-electric camera screen the slow changes of average illumination can quite easily be masked and are, therefore, not present in the signal. By using a compensating cell in conjunction with the main camera, however, the mosaic is then free to respond to both rapid light and shade variations brought about by the usual scanning beam scheme, and also to the much slower illumination alterations corresponding to the lighting of the background.

### Special Aerials

OF late there has been quite a spate of long-distance records for successful television reception of the pictures radiated by the B.B.C. At Birmingham the reception has been markedly consistent, and this also applies to many towns on the south coast of England, even when the distance separating the receiver from the Alexandra Palace is over 100 miles. While a good deal of this work can be attributed to the improved sensitivity of the superheterodyne vision receivers which have been employed, it is certain that aerial investigation has played its part in no small measure. One of the new designs has been called the tilted-wire aerial, and this has unidirectional qualities, thus obviating any of the unpleasant pick-up in the form of reflected radiations from neighbouring metallic structures. Naturally, with any directional television aerial very great care has to be taken in securing the correct bearings, otherwise much of its value would be lost. On the other hand, if sources of electrical interference or reflections come from the same direction as the picture signals, then the scheme is useless, for the "mush level" of the final signal will be too high to give satisfactory picture quality. An enormous amount of work by both amateur and professional research is now being undertaken on these aerial problems, and quite radical deviations from the standard form of dipole or dipole with reflector are being tried, both in this country and abroad, in an effort to find one or more solutions to the intriguing vagaries of ultra-short-wave reception. The fact that the B.B.C. are now radiating exceptionally fine quality sound transmissions on the ultra-short wave-band used for television, at times when television

signals are not on the air, as a dual sound and vision service, is giving an added incentive to work of this nature. Since this experiment is likely to be extended there is every inducement for readers of this journal to undertake work of their own in this field, even if they are situated well outside what is frequently regarded as the Alexandra Palace service area.

### Good News

WITH a view to being ready for the anticipated programme improvements before the opening of the radio show at Olympia, work on the provision of more studio accommodation at the Alexandra Palace has now started. The large temporary studio is being altered, re-wired and re-equipped, and it is understood that four new cameras of the improved Emitron type will be used as soon as everything is

scheme materialises then arrangements of a parallel character to those in force at St. George's Hall may come into effect.

### Correcting Distortion

IF a standard type of cathode-ray tube was scanned in the usual way at the correct line and frame frequencies without any form of correction being applied, then the resultant scanning field seen on the tube's screen would exhibit a form of pincushion distortion due to the convex nature of the tube end. The glass shaping is necessary in order to withstand the high pressures to which the exhausted tube is subjected. By electrical or magnetic means, however, it is possible to correct this distortion so that it is almost imperceptible to the human eye. Another proposal put forward to avoid this difficulty is to incorporate a flat plate complete with its

fluorescent powder sprayed on inside the tube and quite close to the normal belled-out end. As a measure of protection the space between the glass envelope and the added plane screen is partially exhausted of air, thus relieving the glass of some of its previous pressure. Since the new screen surface is quite flat, pincushion distortion is absent, and the built-up picture is observed through the transparent glass tube end in the usual way.

### Limiting Modulation Effects

WHILE it is admitted quite readily that the perfect cathode-ray tube is not yet made, it is conceded on every side that the improvements in manufacture over the last twelve months have resulted in

the production of really good quality products. One of the theoretical standards which is aimed at by designers is a tube which has a spot of light on the screen completely independent of all effects except picture signal modulation for its changes in brightness. If any modern tube is examined very carefully it will be seen that changes of brightness bring about a corresponding change in spot size. Increased brightness causes increased size and vice-versa, and this tends to destroy, partially the sharpness and detail of the picture. Since the tracing beam is a collection of electrons, they have a field of repulsion one with the other, and when increased signal modulation brings about an increase in their number they tend to spread farther apart slightly, and so give a larger spot in spite of the focusing action which is effected either electrostatically or electromagnetically. Several

(Continued on page 320)



Mr. Middleton, the famous broadcasting gardener (right), describing potted plants during the television programme, at the Chelsea Flower Show recently.

completed. From tests already undertaken, it is known that these cameras are capable of producing pictures having a much clearer definition, greater freedom from mush, and more depth of focus. During the period that this work is being carried out it will be necessary to revert to single studio working for a period of six to eight weeks, and this will mean rather cramped conditions for artists, engineers and officials. To help matters, however, the mobile unit will be in evidence to provide some extremely interesting and very ambitious outside broadcasts. In addition, it is also learned that the large theatre at Alexandra Palace is to be used by the B.B.C. for television purposes so that theatrical productions can be undertaken with an audience. A small number of visitors are nearly always present in the studio when television transmissions are being undertaken, although the numbers are very strictly limited, but if the proposed

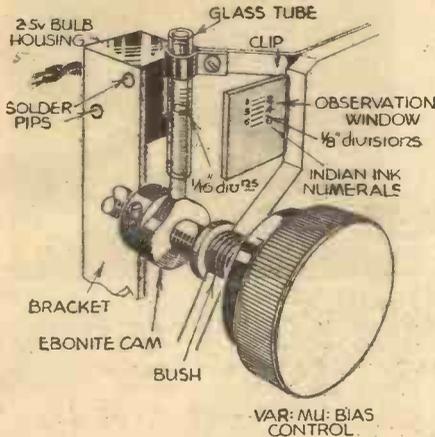
A PAGE OF PRACTICAL HINTS

**SUBMIT YOUR IDEA**

**READERS WRINKLES**

**THE HALF-GUINEA PAGE**

**A Calibrated Bias Control Indicator**  
 IN some new test apparatus I have constructed, the necessity for some form of visible control for logging purposes caused me to devise the rather novel idea

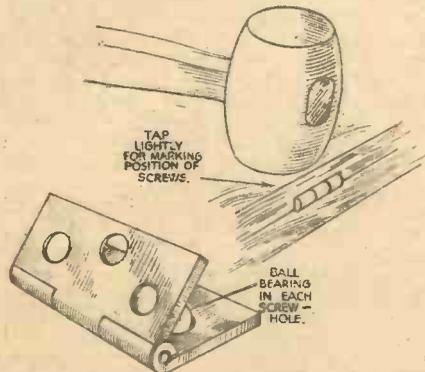


A novel calibrated bias control.

shown in the sketch. The projected calibrations on the glass tube to the observation window are magnified, and a clear reading is obtainable. The 1/16 in. brass rod which slides in the tube, serves admirably as a means of light control, whilst an old switch cam modified to the requirements of the valve tests effected a simple means of control. The frosted glass window is glued to the aperture in the ebonite front panel of the tester, and the glass tube is secured to the back of the panel by a simple brass clip.—R. A. L. NORMAN (Wells).

**A Method of Positioning Screw Holes**

A HANDY device for marking on the lid of a cabinet the screw holes for a hinge is shown in the accompanying sketch. A ball-bearing is placed in each screw hole and the hinge closed. After placing the



A useful dodge for positioning holes for hinge screws.

**THAT DODGE OF YOURS!**

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

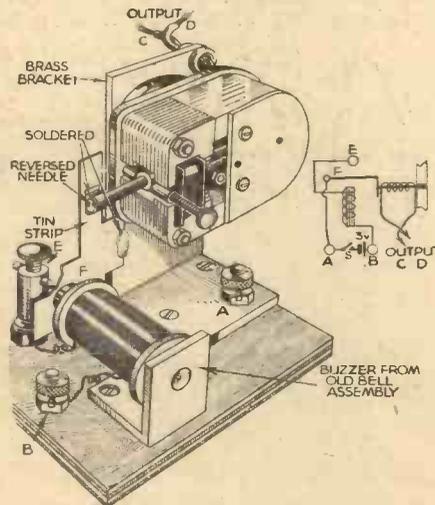
**SPECIAL NOTICE**

All wrinkles in future must be accompanied by the coupon cut from page 328.

lid in the correct position tap lightly with a mallet and then remove. This simple process will leave dents ready for brad-awling, and the screws will then go in the correct positions.—D. K. POWELL (Hereford).

**A Simple Signal Generator**

THE simple signal generator shown in the sketch consists of a buzzer made from a disused electric bell movement. The armature is coupled to the armature of the P.U., thus the reverberations are



An easily-made signal generator.

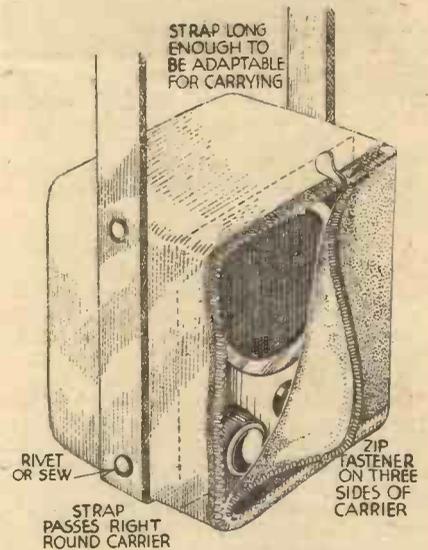
transmitted to the P.U., and regenerated, giving a note which, of course, is modulated; when desired, by the adjustment of the buzzer pitch through the back contact, E.

The simplicity of the whole arrangement will no doubt appeal to many interested readers, and its usefulness certainly warrants the little time spent in its construction.

Continuity tests and stage gain tests in L.F. amplifiers can be made, whilst the only current required for its operation is derived from a 3 to 4.5v. dry battery, which operates the buzzer. One method of mounting the unit is shown in the pictorial sketch, and the circuit diagram shows clearly the wiring connections.—E. A. COLINS (Southend).

**A Carrier for a Small Portable**

THE accompanying sketch shows how I made a neat and serviceable carrier for my portable radio. A suede jacket (the suede being worn on the outside and the zipp fastening in good condition) was cut and turned right side in to make the carrier. Care is needed, of course, in cutting



Material taken from an old suede jacket was used to make this carrier.

according to the amount of wear on the suede.

The "zipper" will run smoothly round the edge when in use, as the clearance necessary for the control knobs on the set make a flexible joint, thus doing away with the angle trouble. A strap long enough to run round the carrier in one piece can be arranged either to hang from the shoulder, or carried by hand.—G. WINCH (Dudley).

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# RADIO SERVICING WITH THE CATHODE RAY-4

Searching for a "Lost" Signal is Dealt With in this  
Concluding Article of the Series

**I**N the case of a dead receiver, with no signal coming through, the common procedure of stage jumping can often be superseded by the process of searching

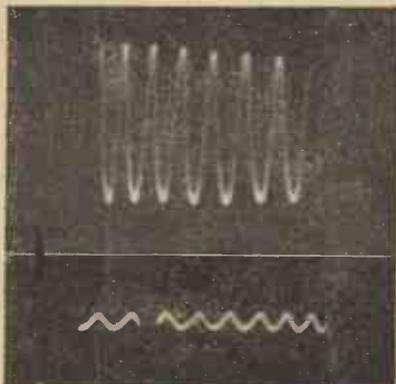


Fig. 13 (Top).—"Looking" at the signal at the anode of the output valve, and in (Fig. 14 (Bottom)), at the grid of the output valve.

for the "lost" signal with the Y amplifier test with the lead of the C.R.O. time-base switched on.

Within limitations it is even possible to probe around the H.F. section of a receiver and to detect the presence of H.F. oscillations. The actual appearance of the screen "picture" produced by modulated high frequency will depend upon the time-base frequency and the type of oscillograph. With the usual servicing type of oscillograph and a comparatively low time-base frequency the H.F. trace will appear as a blur of light shaped within an outline corresponding to the audio modulation of the H.F. We have used the word limitations in connection with this method of H.F. circuit testing. Obviously, the amplification provided by the Y amplifier will be the deciding factor as to how small an amplitude of H.F. will be the minimum that will show any signs on the C.R.O. screen.

Figs. 13 to 16 reproduce the tracking of a modulated test signal, starting from the anode of the output valve of a superhet and working forward for a certain distance through the receiver. Fig. 13 was obtained from the anode of the output valve, and Fig. 14 from the grid of this valve. For Fig. 15 the Y amplifier lead was taken to the grid of the double-diode-triode which preceded the output valve. The amplitudes of the traces of Figs. 13 and 14 should not be compared with those of Figs. 15 and 16. The gain of the Y amplifier was kept well down for the traces of Figs. 13 and 14, but was brought up for the remainder of the tests. Fig. 16 shows the signal at the signal diode.

## Performance over a Waveband

If an overall H.F. response curve of a receiver is taken on a "wobbled" test signal at one end of a waveband and the

receiver tuning control is turned, the curve on the screen will shift along towards the edge of the screen (and disappear if the receiver tuning is altered too much). By a corresponding change of test oscillator tuning the "picture" can be pulled back in position. It should be obvious that by appropriate changes of both receiver and test oscillator tuning the H.F. sensitivity and selectivity of the receiver can be studied at every point over the whole waveband. The test oscillator output amplitude should be constant.

## Receiver Comparisons

By arranging a convenient form of change-over switching for the test oscillator output and the Y amplifier input leads, the relative performances of two receivers can be very readily determined. The use of overall H.F. response-curve indications will give all the information that is required as regards comparisons between the H.F. sensitivity and selectivity of the two receivers.

To allow for overall sensitivity, the C.R.O. could be used as an output meter. If it becomes necessary to compare L.F. gains only, then an audio test voltage could be applied to the appropriate points of the two receivers.

## In Conclusion

It is hoped that readers who have not yet used C.R.O. apparatus will have gathered some idea from the foregoing of the versatility of the C.R.O. from the

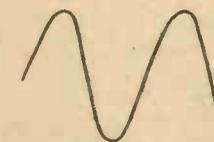


Fig. 17

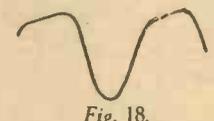


Fig. 18.

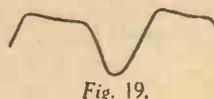


Fig. 19.

The CRO as a fault "tell-tale" when used as an output meter.

Fig. 17.—A signal trace taken from No. 1 anode of a Class B output valve. Allwell. Fig. 18.—What happens at No. 1 anode with a high resistance in No. 2 anode circuit. Fig. 19.—The effect at No. 1 anode of a break in No. 2 anode circuit. These curves represent potential variations, not current.

servicing point of view, even when it is associated with no more than a "wobbulator oscillator."

There are many test applications that must suggest themselves to the reader who understands the principles of the C.R.O. Obvious possibilities associated with the waveform obtained on an output meter test will come to mind. Figs. 17, 18 and 19 are given just to emphasise the fact that even when the C.R.O. is acting as an output meter it is still a fault "tell-tale." The reader will no doubt consider the idea of a study of output waveform giving a

clue as to the type of any distortion that may be caused by a fault, although it is to be remembered that the ear of an experienced man will take some beating when it

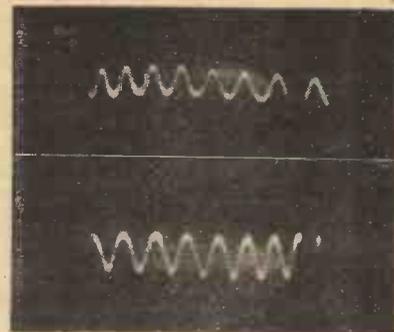


Fig. 15 (Top).—The signal at the grid of a double-diode-triode. Fig. 16 (Bottom).—The signal at the detector diode anode. The decrease of amplitude of Fig. 16, with respect to Fig. 15, is due to loss in the resistance-capacity network between diode and grid.

comes to a matter of drawing a quick distinction between one form of distortion and another.

## AMERICAN TELEVISION PROGRAMMES

**O**NE of the excuses put forward in America for the apparent slow development of television towards the provision of a public service is that of complete standard settlement, so that all the radio networks operating in that country can give programmes comparable in their range of choice to that now existing in sound broadcasting. Channel widths over a definite range have been laid down by co-ordinating committees in the United States, and whereas in England there is one station, and sets can therefore be designed without a tuning range, in America it is proposed to give a selection of programmes. While this may complicate receiver design it is undoubtedly a very sound idea, and should do much towards popularising any service if the proposed schemes materialise. Experience has shown with the Alexandra Palace station that every good purpose would be served if there was at least one alternative programme for viewers. Already complaints have been made that the excellence of several items included in a week's programme has emphasised the feebleness and poor quality of many supporting items. This is a matter for investigation, and even making allowances for cramped studio conditions there is surely no absence of artist talent to provide consistently good programme and entertainment quality. This should be a factor demanding careful attention, for the growth of interest, and consequent building up of a fine British industry, hinges almost entirely at the moment on programme quality.

# Cutting Out Crackles

Some of the Causes of Crackling Noises Revealed, and Hints on Locating and Curing the Trouble. By W. J. Delaney

ONE of the commonest troubles met with in receivers is a background of crackles accompanying every programme. It must be realised at the outset that normal atmospheric disturbances can give rise to this trouble, and local electrical apparatus or machinery may also cause crackles, and thus the listener often puts up with the trouble in the mistaken belief that it is beyond his control. Unfortunately, normal atmospheric disturbances of the type mentioned cannot be cured, and the more powerful the receiver the more prominent become these noises. It is a simple matter, however, for the listener to ascertain in a few moments whether the trouble comes from an outside source or is due to a defect in his equipment, and all that is necessary for this purpose is to disconnect both aerial and earth leads. Signals will naturally cease, and if at the same time the crackling noises also cease then a cure is probably beyond you, or some special type of aerial will have to be employed. We are not concerned with this at the moment, but rather with the generation of the noises in the set, although perhaps it would be as well to remember that a defective aerial or earth lead may be the cause of the trouble. Therefore, the first step, if removal of the aerial and earth stops the noise, is to replace them singly. Should one of them alone restore the noise, then carefully examine that lead from one end to the other and search for a defect.

## Broken Strands

If a stranded wire is used in either position the noises may be caused merely by a single broken strand. The two ends at the break, when vibrated, will make and break, and the result is a crackle in the loudspeaker or headphones. A similar fracture in a battery lead, or in fact, in any flexible lead, will give rise to the same trouble, as will

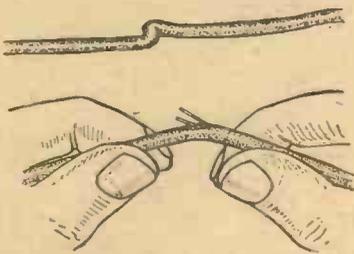


Fig. 3.—Kinks in flex often result in a broken strand, which may be located as shown here.

be explained later. If the earth wire is bare, or an insulated covering is bared in one place, and it comes into contact with an earth point, it may also result in a crackle should the point of juncture be made and broken. If the earth lead from the receiver is attached to a gas or water pipe and this runs through the house there is also a possibility of crackling background noises being produced if the pipe in question touches any other pipe, but it may also be found in such a case that a reduction in volume will accompany the crackles, due to the effects of the tuning shift resulting from the doubling of the earth connection.

## Faulty Components

If, as already mentioned, removal of the aerial and earth make no difference to the noises, then the source will be found in the receiver or speaker and they must accordingly be examined stage by stage. It is a simple matter to connect 'phones in the detector stage to cut out L.F. stages, and to transfer the aerial to a detector stage to cut out H.F. stages, and this will, in most cases, enable the stage in which the fault exists to be located. On the other hand, meters will sometimes assist as they will show the source of the crackles by indicating a fluctuating current. It is



Fig. 1.—A broken strand in an aerial can cause crackling noises.

not always possible, however, to see the results of an intermittent connection on a meter, as in some cases the L.F. circuit may be the source of the trouble, and no



Fig. 2.—Badly soldered flex leads are a common cause of crackling.

current may be present. It must be assumed, however, that in the majority of cases the crackles will only be caused when the intermittent circuit is one in which a current is flowing. This narrows down the tracking of the trouble, and the first components to be suspected are fixed or variable resistors, chokes and transformers. Condensers are hardly likely to give rise to the trouble, except in the case of certain types of tubular fixed condenser where a leading-out wire is provided, and this may have come partly adrift from the internal plates. In some cases the faulty item may be identified by gently tapping each component in turn, but some types of fixed resistor, for instance, will not have any loose part which will indicate by tapping that they are the cause of the crackles.

## Connections

Among some of the unsuspecting details which may be mentioned as causing crackling, we will quote a few taken from our laboratory notes. A very common cause is where a flexible lead has been soldered to the tag of a component. It is difficult to make a really sound soldered connection to old flex, or some types of flex, owing to the fact that the sulphur in the rubber has made the wire dirty and prevented it from taking the

solder. Each strand has to be scraped or otherwise cleaned in order to make a clean connection, and it has been found that a blob of solder will sometimes run right round such a joint, but one or more wires inside the joint will not be attached and they will vibrate inside the solder and thus give rise to the crackling noise.

In other cases a dirty bolt or nut on the chassis will vibrate by speaker or other sounds impinging on it, and this will cause an intermittent earth connection which will cause crackles, although as mentioned in the case of the double earth this sometimes leads to tuning shift.

## Plugs and Sockets

Plug and socket connections, or any similar arrangement where electrical continuity is provided by touching metallic parts, may be the source of the trouble, and therefore these should receive attention. These general rules cover practically every part of a standard receiver, and before concluding it may be mentioned that there are two or three outside sources which can give rise to crackles, although not connected with the receiver. One very difficult case which was recently experienced was where crackling was noticed intermittently. The usual procedure was adopted, namely, removal of aerial and earth, but the noise continued. When the detector stage alone was in use the noise was still there and every component and the valve was tested without success. The mains section was substituted, and after each component had been replaced, in case of some fault which was not revealed by standard test methods, it was found that it still existed. Obviously, then, it was outside the set, and eventually it was found that an electric-light switch was causing it. The spring arm into which the contact presses was opened, and

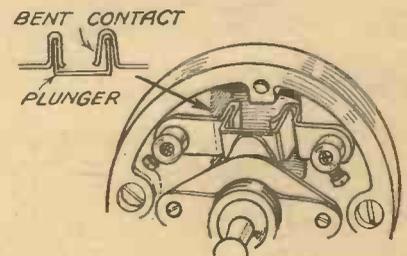


Fig. 4.—Bent contact springs on an electric-light switch are often troublesome to the listener.

vibration from passing traffic caused the contact to be made and broken in such a manner that before it could come to rest from one passing vehicle, another had passed, and this produced a continuous crackle. The small arc which resulted radiated sufficient energy to be picked up by the wiring of the detector stage in the same room, and this was eventually proved by placing the stage in a metal box, when all noise stopped. The contacts in the switch were, of course, made good, and the trouble was cured.

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**T**O avoid having to turn up the issue for May 28th, the diagram showing the theoretical circuit of the tritet oscillator is given below as reference will be made to the components and their operation.

Before commencing any tests, go over all wiring and make quite sure that all connections are perfect, and that the coils and valve are pressed securely in their holders.

When this check has been made, the L.T. supply for the 6L6 must be switched on, and a few seconds allowed for the heater to reach its normal working temperature. This operation is followed by completing the H.T. circuit, when the anode and the screening grid should receive their correct voltages. Tests should now be applied, with a high-resistance voltmeter, to verify the exact voltages on these two electrodes, making, if necessary, any adjustments to bring them to the values specified by the valve-makers' details.

With the voltmeter removed, the milliammeter can now be plugged into the anode circuit jack, care being taken to see—if shunts are used—that it is adjusted to a suitable scale reading, thus avoiding the chance of a burn out.

It is not possible to give any exact value of the reading to be expected; as it will be governed by factors which might not be identical in all cases and, incidentally, the setting of the variable condensers C1 and C2.

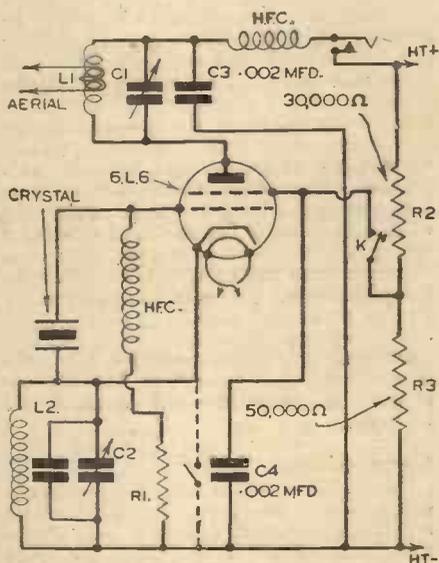
However, we will assume that the reading is the normal standing anode current for the valve concerned in this tritet arrangement, and this will indicate that the circuit is "off tune" or, in other words, that no radio-frequency oscillations are being generated. This point will be made more clear later on. The first tuned circuit to be adjusted is C2 L2, which forms the cathode section. The condenser C2 should be set at maximum capacity, and then very slowly rotated towards minimum until a point is reached when the anode current meter will indicate a sudden change in current value. Actually, the current will drop to a comparatively low value, and as soon as this state is reached, C2 should be left and attention turned to the other variable condenser C1, which with L1 forms the anode tank circuit.

#### Anode Tank Circuit

If C1 is now rotated from maximum downwards, it will be noted that the meter needle will dip at various settings of the condenser. These dips represent the points

at which the anode tank circuit is tuned to the harmonics of the fundamental frequency and if careful observation is made, it will be seen that the deflections are not all of the same value. For instance, when the circuit is tuned to the second harmonic the dip will be the greatest, and for each successive harmonic the amount of dip or deflection will decrease indicating, as explained before, that the power falls off as the frequency multiplying is increased.

As these dips may lead to some confusion in tuning the anode circuit to the correct frequency, it is very essential to employ some form of wavemeter to check the output frequency, especially above the second harmonic. The apparatus need not be elaborate; a simple absorption-type wavemeter will be quite efficient, provided that



The fundamental circuit of the tritet oscillator, modified to allow a key to be inserted in screen supply for Morse transmissions. The dotted line across L2 is switch position for shorting out coil for fundamental frequency.

reasonable care is taken in its manipulation. It has already been mentioned that care must be taken with the adjustment of C2 to prevent excessive radio-frequency currents being imposed on the crystal, otherwise undue strain and heating will be created. To this end, therefore, C2 should be set as near as possible towards its minimum position "off-tune" consistent

with, of course, satisfactory output. This is very important, so I would suggest that a beginner sacrifices a little of the output rather than run the risk of having to replace the crystal through trying to boost up the power.

#### Coupling to Aerial

When all the above conditions have been satisfied, the circuit is then ready for use; the oscillator is actually generating radio oscillations, so it is then a question of coupling it to a suitable radiating or artificial aerial according to one's requirements or, shall we say, licence.

For C.W. or Morse work, it will be necessary to arrange for the insertion of a "key" to enable the carrier to be interrupted in the required manner for the code.

Experiments can be carried out with various keying methods, but to enable as many wavelengths as possible to be covered, it may be desired to operate at the fundamental frequency of the crystal. As mentioned before, on no account must one attempt to tune the cathode circuit to that frequency, otherwise a T.P.T.G. arrangement will be set up and the desired object will not be achieved.

If the crystal frequency is required, the circuit is converted to an ordinary pentode oscillator simply by shorting the cathode coil L2 and tuning the anode tank circuit to the fundamental frequency, a suitable coil being connected in the position of L1.

When all the above conditions have been satisfied, the circuit is then ready for use, provided that a key has been inserted to allow the carrier to be controlled for the sending of Morse code, and the output fed into a suitable aerial arrangement the design of which will depend on one's requirements.

#### Keying Experiments

Experiments can be carried out with various keying systems, but for the beginner I would strongly advise the screening-grid method. In this arrangement the key is connected in series with the H.T. feed to the screening-grid, together with, of course, a suitable filter circuit to eliminate key interference. If the key is placed in the anode circuit, it must be appreciated that it will be handling a much higher current, therefore more care will have to be taken with the key filter, and as the voltage will be much higher than that of the screen, the possibility of shock to the operator must also be considered. Regarding the components used in the circuit, there is one item I did not stress in the article of May 28th, and that is, all by-pass condensers must be of the mica dielectric type to reduce H.F. losses to a minimum.

#### A Query

A reader raises the question of voltage control on the anodes of the valves used in the modulating amplifier, as the H.T. positive feed is shown taken straight to the smoothing choke of the mains unit. Under normal conditions, the anode resistances specified will reduce the voltage to the required figure, but if for any reasons voltages appear to be on the high side the individual resistances can be increased in value to bring about the required values.

The same reader also raises another point which may be of general interest, therefore I give it here. He states that as many operators may wish to change over from pick-up to microphone without going to the trouble of disconnecting the input, it would be advisable to embody a Dubilier "fader" volume control.

# Leaves from a Short-wave Log

## Good Reception of Quito Broadcast

**H**CJB, *La Voz de los Andes*, which the announcer gives out as "H as in Harry, C, Chicago, J, Jones and B as in broadcast," on 33.53 m. (8.83 mc/s), opens its transmissions with a march, *Patria*, and punctuates intervals with a signal of four chimes. The station is on the air from G.M.T. 23.00-03.30, or even 04.00. Address: Casilla Postal (P.O. Box) 691, Quito, Ecuador.

## ... and Immediately Above

COBZ, Havana (Cuba), on a slightly higher frequency, namely, 9.03 mc/s (33.52 m.), relaying CMBZ, was also picked up recently in the early morning hours, closing down later with a colourable imitation of Big Ben at G.M.T. 05.00. Address: Apartado Postal (P.O. Box) 866, or to the owners: Señores Manuel y Guillermo Salas, San Rafael, 14, Havana, Cuba.

## More Broadcasts from Switzerland

During the summer months through the Prangins (Geneva) transmitter the League of Nations will broadcast as under:

To North and South America through HBJ (20.64 m.—14.535 mc/s) and HBO (26.31 m.—11.402 mc/s) every Tuesday night at midnight G.M.T.

To Australia, New Zealand and Southern Asia, through the same stations, every first Sunday in the month at G.M.T. 06.00.

To the Far East, through HBF (16.26 m.—18.45 mc/s) and HBJ, every first Sunday in the month at G.M.T. 12.00. Also to Africa through HBJ and HBO on the same day at G.M.T. 17.00.

## A Misleading Call

Many of the Cuban stations would appear to alter their calls with a view to fitting them to the particular sponsored programme broadcast at the time. COJK, Camaguey (Cuba), on 34.62 m. (8.655 mc/s), to which the announcer couples CMJK, the medium-wave station, will often be heard using the slogan: *La Voz del Camagueyan*, but occasionally, when boosting the qualities of a U.S.A. wireless receiver, informs you that you are listening to *Radio Zenith*. Three chimes and, sometimes, a bugle call with the closing-down melody, *Over the Waves*, will help you to identify the transmitter. Address: P.O. Box 64, or direct to La Compania Cubana Nacional de Radio (S.A.), Finlay, 3, Camaguey (Cuba).

## New Short-waver at Tunis

French listeners report having picked up a broadcast from a station calling itself *Radio Tunis, Poste Experimental privé* (Private experimental transmitter), and operating on 49.12 m. (6.107 mc/s). It was stated to be working to a fairly regular schedule (with, however, possible deviations daily between G.M.T. 13.20-14.00, and from 21.00-22.00. The interval signal used is a commonplace gong.

## Second Delhi S.W. Station

The new 5-kilowatt short-wave station, which All India Radio will shortly be inaugurating, will work on 31.41 m. (9.55 mc/s) during daylight hours and

on 19.62 m. (15.29 m.) during the night. The call-sign allotted is VUD4.

## To Replace Radio Garata

It is reported from Berlin that the Yugoslavian broadcasting authorities have recently placed an order with the Lorenz Company, in the German capital, for the delivery and installation of a 10-kilowatt short-wave transmitter to be built in the neighbourhood of Batajnice. It will be equipped with a beam aerial system for the direction of the transmissions towards North and South America.

## Persia to Work on Short Waves

For the Iranian (Persian) Government the Telefunken Company (Berlin) is constructing a 20-kilowatt transmitter to be installed near Teheran. Beam aerials are to be used for broadcasts specially destined to North America, Australia and Europe.

## Bombay Changes Its Night Wave

For its evening transmissions, VUB2, Bombay (British India), has abandoned the 90.77 channel to adopt 61.16 m. (4.905 mc/s). The broadcast is carried out between G.M.T. 12.00 and 17.30.

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Demonstrations daily. Make a point of calling also at Holborn branch, our great REBUILDING SALE offering hundreds of amazing bargains in everything radio.

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THE WORLD'S MOST POPULAR SHORT-WAVE RECEIVERS



Most efficient and low-priced self-contained short-wave sets ever offered. Ideal second set for the home and for experiencing real short-wave thrills. Covers Television sound 6.2 metres to 550 metres. Built-in speaker. Phone jack. Supplied with self-locating inductors for 12-52 metres. Fully guaranteed.

BATTERY MODEL

(Less Batteries)

£5 : 15 : 0

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A.C. MODEL

200/240v. 40/100 cycles.

£6 : 0 : 0

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If extra coils required for complete coverage 6-550 metres, add 17/- to cash price or 1/- to deposit and payments.

## NEW B.T.S. TROPHY 5 COMMUNICATION RECEIVER

CONTINUOUS WAVE RANGE 10-550 METRES BAND-SPREAD TUNING

A wonderful 5-valve A.C. set for the short-wave "ham."

Note these important features:

● Illuminated and calibrated scale. ● Mechanical Band-spread giving equivalent to 8 ft. scale length. ● Triode-hexode frequency changer. ● Beat frequency oscillator for C.W. ● A.V.C. on-off switch. ● Provision for doublet aerial. ● Built-in speaker. ● Jack for 'phones. ● Pleasing black crinkle metal cabinet.

10/9 DOWN

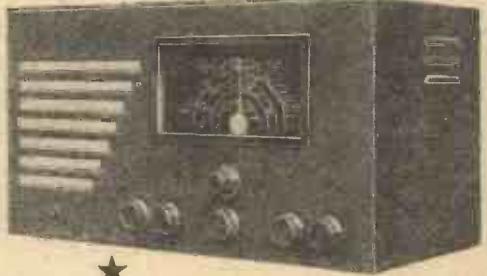
Secure this wonderful set for maximum short-wave results. £9 cash or C.O.D. or yours immediately for 10/9 down and 18 monthly payments of 10/9.

## PETO-SCOTT NEW DUAL PURPOSE SHORT-WAVE COMMUNICATION RECEIVER 10-2000 METRES

An entirely new amazingly efficient 6-valve superheterodyne receiver with all essential short-wave communication advantages and in addition a highly sensitive and selective set for general medium and long-wave reception. Available also in chassis form.

14/6 DOWN

Covers 4 waveranges. Band 1, 10-25; band 2, 25-65; band 3, 200-550; band 4, 800-2,000 metres. Large illuminated metre and station-name scale. Highly efficient 6-valve circuit for A.C. mains, with triode hexode frequency changer, I.F. Amplifier and Double diode output Pentode. Output 3 Watts. A.V.C. and B.F.O. switches. Tone, R.F. and A.F. gain controls. High fidelity speaker. Phone jack. Pleasing black crinkle metal cabinet.



This Peto-Scott D.P. Model is a set you will be proud to own.

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★ ORDER EARLY and send for your copy of the "Short-wave Experimenter."

Terms 14/6 down and 18 monthly payments of 14/7.

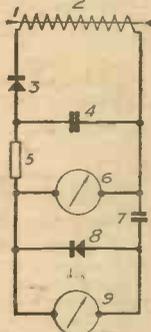
**PETO-SCOTT Co. Ltd.** 67 (Pr.W.41) City Road, London, E.C.1  
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Clissold 9875 — Holborn 3248

# LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

**WIRELESS SIGNALLING.**—Siemens and Halske, Akt.—Ges. No. 479993.

In an arrangement for measuring the modulation of the current in an aerial 1, the secondary 2, of a current transformer, of which 1 is considered to be the primary, feeds a condenser 4 through a rectifier 3. A direct current instrument 6 in series with a resistance 5 is connected across 4, and gives an indication corresponding to the mean aerial current. A rectifier 8 in series with condenser 7 is connected across the instrument 6; a second direct current instrument 9 across 8 gives an indication of the rectified modulation current. The actual depth of modulation may be obtained from a comparison of the two meter readings. In modifications a single meter provided with a change-over switch is used; or a single meter, with two coupled moving coils, which gives a direct indication of modulation depth.

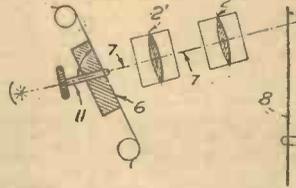


This is the arrangement described in Pat. 479993.

**TELEVISION.** Radioakt. —Ges. D. S. Loewe. Pat. 479993. No. 479305.

A rectangular plane 6 is imaged as a trapezium on a scanning device 8 by two lenses 2<sup>1</sup>, 2<sup>2</sup>, relatively movable along their common

axis 7, the distance between object and image also being variable, so that the trapezium can be modified as desired. The lower edges of the object and image are positioned at twice the focal distance of the lens system so that the magnification is unity. As the focal length of the system is varied by the spacing of lenses, the magnification of the upper edge varies to vary the trapezium. As shown, the



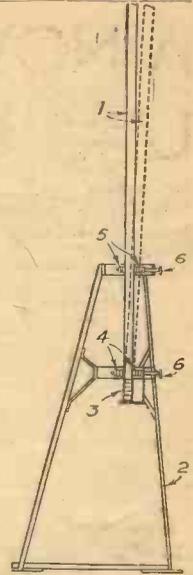
An interesting television suggestion.

object area is a film gate movable by a screw 11, while the scanning device is a disc. The image area may be the mosaic screen of an iconoscope. The arrangement is also applied to a cathode-ray receiver, the distance between the trapezium produced by the scanning beam on an inclined fluorescent screen and the rectangular image thus being variable, while the image is maintained at the same size and rectangular.

**DIRECTIVE WIRELESS SIGNALLING.** Lorenz Akt.—Ges., C. No. 479330.

In order to offset any lack of uniformity in the electrical characteristics of the earth

in the neighbourhood of directional aerials, particularly in an Adcock system, each aerial is mounted in a tripod so that it can be slanted or inclined to the normal. As shown in the Figure, the aerial 1 is mounted in a tripod 2 by insulators 3, 4, 5, the two latter of which can be adjusted by screws 6 so as to give the aerial the inclination required.



The Lorenz scheme for moving the aerial.

## GERMAN TELEVISION ACTIVITY

IN readiness for the initiation of their television service the Germans are busy designing the necessary equipment. One of the most interesting pieces of apparatus they employ is a compact monitor and mixing desk. In one section the person in charge supervises the outgoing signal, while a second monitor serves to observe the camera picture which is to be faded into the circuit subsequently. In this way a satisfactory blending and smooth transference between cameras, without any break in the programme, is brought about. The various controls for this purpose are within easy reach of the person seated at the desk, and by carefully positioning the desk in relation to the studios providing the transmissions, it is possible to compare the full scene with its counterpart in miniature on the cathode-ray-tube screen. It is also interesting to note that with this particular design the same unit houses the electrical synchronising pulse generator which is connected either to the 50-cycle A.C. mains or a slotted-disc pulse generator. In the case of the former the necessary line pulse frequency is produced by a form of harmonic selection and multiplication, whereas the frame pulse is "de-multiplied" from the higher generated frequency. The desk also accommodates the vision and synchronising sub-modulators, and has provision for injecting the line and frame pulses into the picture signal in order that the combined modulation can be sent over a single length of cable to the ultra-short-wave radio transmitter for broadcasting purposes.

### TELEVIEWS

(Continued from page 314)

schemes have been proposed to compensate for this defect, and in one of these where electromagnetic operation was employed, the current through the focusing coil was increased at the same time as beam intensity was increased. It was claimed that this would nullify spot-spreading. Another proposal was to limit the modulation characteristic of the tube itself, so that beyond a certain predetermined brightness there was a sharp cut-off. This has the effect of preventing the defocusing in the highlights of the picture so that the lines are still sharp, with the result that in no part of the picture is there a tendency towards blurring.

## NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office and the Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2., price 1s. weekly (annual subscription £2 10s.).

### Latest Patent Applications.

- 13787.—Felgate Radio, Ltd., and Williams, A.S.—Radio receiving-apparatus. May 9.
- 13447.—General Electric Co., Ltd., Benjamin, M., and Smithells, C. J.—Thermionic cathodes. May 5.
- 13707.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Radio receivers. May 7.
- 13769.—Radioakt.—Ges. D. S. Loewe. Television tube. May 9th.
- 13963.—Telefunken Ges. für Drahtlose Telegraphie.—Thermionic valves, etc. May 10.
- 13900.—Voigt, C. A.—Wireless installations in vehicles. May 10.
- 12871.—Aga-Baltic Radio Aktiebolag.—Volume control apparatus for radio receivers. May 29.
- 12789.—Bosch Ges., R.—Wireless receiving-apparatus. April 29.
- 12904.—Detrola Corporation. Tuning devices for radio receivers. April 29th.
- 13289.—General Electric Co., Ltd., and Hunter, S. G.—Driving means for the tuning-indicators of wireless receivers. May 4.
- 12667.—Jackson, H.—Tuning control apparatus for radio receivers. April 28.

13065.—Kallmann, H. E.—Wireless receivers. May 2.

### Specifications Published.

- 484201.—Allgemeine Electricitats-Ges.—Push-pull modulators employing electron-discharge tubes.
  - 484404.—Percival, W.S.—Radio receivers.
  - 484412.—Murphy Radio, Ltd., and Fair-Hurst, H.A.—Television receivers.
  - 484598.—Fernseh Akt.—Ges.—Electron-discharge devices for use in television and like systems.
  - 484524.—General Electric Co., Ltd., and Foot, J.B.L.—Suppressing radio interference from electric discharge devices.
  - 484251.—Radio Corporation of America.—Sound-recording.
  - 483745.—Murphy Radio, Ltd., and Brayshaw, G.S.—Cabinets for sound-reproducing instruments.
  - 483841.—General Electric Co., Ltd., and Bloch, A.—Apparatus for receiving a television or like image on a receiving screen.
  - 483869.—Priecheufried, G.—Wireless receiving-apparatus.
  - 483480.—Oxley, R.F.—Electric condensers.
  - 483385.—Traub, E.—Television receiving apparatus.
  - 483332.—Traub, E., and Goddard, M.J.—Television receiving and transmitting apparatus.
- Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

# A NOVEL DIAL SUGGESTION

USERS of short-wave receivers, and especially of all-wave receivers in which a large capacity is employed for tuning, will have experienced the difficulty of providing adequate station name indications due to the close proximity of the stations in small sections of the waveband. Thus, in a modern all-wave set it will be found in most cases that between the 30- and 32-metre mark there are approximately 14 stations, and this means that the dial becomes very confused owing to the large number of names and the lines to the various indicating points. It is often found, however, that the latter cannot be given owing to the fact that the settings are so close together. The

following idea will be found of value to constructors who are making a dial for such receivers, and it will be seen that the improvement consists in drawing up a list of stations received with an alpha-

betical reference. These are set out clearly on top of the dial, and then the indicating points on the wave-length scale are merely given the alphabetical reference, in order of reception, from the beginning of the dial. In this way each station may be accurately indicated by a very fine line and the tuning will thereby be greatly simplified.

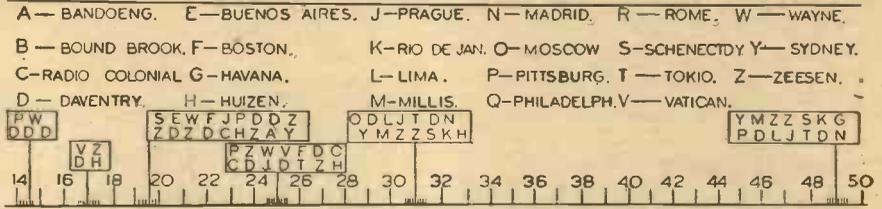


Diagram of a short-wave tuning dial marked out in accordance with the idea suggested here.

*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.

- H. L. (Manchester).** The trouble will be removed at your new address as the supply will be D.C. No other alteration is necessary as the choke and condensers are suitable for the mains voltage.
- C. E. (Harrow).** A good transformer is to be preferred, but overloading must be guarded against.
- J. K. (Hanley).** You do not state what type of set you are testing, and therefore we cannot say whether the tests indicate faults or the normal features of, for instance, an A.C./D.C. set. The articles on Set Testing explain the various points you raise and it would be too involved to deal with them all in a reply.
- S. B. (Forest Gate).** As the set is a commercial model you should communicate with the makers or their nearest local service agent.
- T. W. G. (Templemore).** As explained recently in our pages the transformer cannot be used for the purpose outlined. You need an output of at least eight volts to allow for losses in rectification.
- D. A. S. (Sutton Coldfield).** We have not dealt with a particular receiver but have given general articles on the design of sets of the type indicated. The most recent was in our issue dated November 20th, 1937.
- T. C. G. (Hythe).** So far as we can trace the firm is no longer in business.
- R. E. F. (Kent).** The set will take practically the same current no matter what the position of the control you mention. A great deal depends, however, upon the type of control and we cannot advise definitely without a circuit diagram.
- J. T. (New Barnet).** The trouble is difficult to overcome in your locality and you will have to experiment with directional aerials to cut out the interference. A short aerial is essential, preferably a dipole. This will also, no doubt, clear your reaction difficulties.
- H. J. C. (Oxford).** The set was the Parvo Midget, described in our issue dated June 19th, 1937. A blueprint is available, No. P.W. 77.
- J. F. W. (Sattley).** We are unable to supply blueprints or circuit details of S.T. receivers.
- C. M. (Glasgow, N.).** The issue in question is the latest. We have also now introduced the sixth edition of the "Wireless Constructor's Encyclopedia." Blueprints of short-wave receivers will be found in the Blueprint list in this issue.
- R. A. D. (Barry).** The receiver is naturally a compromise. It is impossible to design a set of this type to give maximum performance on all wavebands. The size of the tuning condensers alone, renders efficiency rather low on the short-waves, but most constructors consider these disadvantages are offset by the fact that they have a short-wave range in addition to the broadcast wavelengths.
- J. T. (E. 16.).** We cannot supply a blueprint of the type you require. The Listener's 5-watt amplifier is the nearest.
- G. F. C. D. (Highgate, N.6).** We suggest you write to Messrs. E. Gray and Son, Ltd., 18-20, Clerkenwell Road, E.C.1.
- A. C. (Reading).** We can only supply blueprints in accordance with the list given in this issue.
- F. H. M. (E. 12.).** As the set is a commercial Universal model, it would be safest to have it examined by the makers or their nearest local service agent. There are many possible causes of the trouble mentioned.
- L. J. B. (Nr. Bury St. Edmunds).** As you are only a beginner you would be unable to obtain the necessary licence and should therefore carry out more experiments in order to familiarise yourself with the working of the combined apparatus.
- J. D. M. (Kinsale).** As you have apparently modified the set we cannot advise definitely. The I.F. transformers may have become mistuned and we advise you to check these.

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**SCOOP No. 1. 3 MATCHED VALVES BRAND NEW BATTERY WITH 3 VALVEHOLDERS**  
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An investment for every set owner and constructor. 3 matched, brand new world-famous Philco 2-volt valves, comprising 2 S.G. H.F.'s and 1 Output Pentode, packed in original cartons. Three different valve types indispensable for modern constructors' circuits (available on request) using any number of valves, invaluable also for replacement purposes. Offered to you at a fraction of manufacturing cost. . . .

**SCOOP No. 2. N.T.S. WORLD S.G.3 VALVES FREE!!**  
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A triumph in Receiver design. Two S.G. and Pentode Output stages. For the enthusiast who requires maximum efficiency and those extra stations on the Short, Medium and Long Waves. 3-Short-wave ranges. Employs famous B.T.S. One-shot inductors or N.T.S. 6-pin coils. Slow-motion Tuning. Complete Kit for Battery use with steel chassis, Twin-gang condenser, Slow-motion Tuning, Degree dial, Transformer, Resistances, etc., and assembling instructions. Less coils, 27/8 only. Cash or C.O.D. or 2/6 down, and 12 monthly payments of 2/6.

**COMPLETE KIT.** Comprising above kit with set of 6 N.T.S. Coils, 9-2,000 metres. Cash or C.O.D. 41/6 or 2/6 down and 12 monthly payments of 4/-. **VALVES GIVEN FREE.**

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 The ideal set for the short-wave enthusiast, provides an unsurpassed performance on the medium and long waves. Efficient circuit comprises Pre-H.F. S.G. Detector, Screened-Grid Audio and Pentode output stages, 2-gang condenser. Slow-motion tuning. Station-named dial for Broadcast and calibrated for short-wave bands. Designed specially for B.T.S. 6-pin One-shot Inductors or N.T.S. 6-pin coils. Only N.T.S. are in the position to offer such an amazing bargain. Complete Kit with highest grade components only, with drilled metal chassis, transformer, condensers and all instructions. Less Coils, 37/6 only or yours for 2/6 down and 12 monthly payments of 3/5. 4 VALVES GIVEN FREE. Kit with 3 pairs of 6-pin coils 51/8 or 4/6 down and 12 monthly payments of 4/6.

**SCOOP No. 4. N.T.S. AMPLIFIER**  
 Hire out at a profit . . . Ideal for sports and public meetings.  
**7-WATT A.C. AMPLIFIER** only. 4-valve push-pull circuit. Undistorted output 7 watts. For microphone or pick-up. Consumption 60 watts. Steel chassis. Size: 7 1/2 in. high, 4 in. wide, 10 in. long. For A.C. Mains 200/250 volts, 40/80 cycles. Complete with 4 valves, ready for immediate use. List Value, £4/19/6. **BARGAIN**, Cash or C.O.D., £3/10/0, or 5/- down and 12 monthly payments of 6/3.  
**BATTERY 4-WATT AMPLIFIER**  
 Entirely new 4-valve amplifier with Class "B" outputs providing full output when using 150v. type H.T. battery. For microphone or gram use or by plug attachment for boosting existing battery set. **Bargain 55/- or 4/6 down and 12 monthly payments of 4/9. Complete with 4 valves.**  
**MICROPHONES.** Transverse current type for use with above amplifier, OR FOR USE WITH YOUR PRESENT RADIO. Faithful reproduction at all musical and speech frequencies. Complete with transformer and ready for instant attachment.  
**2/6 DOWN** Table Model, 25/-, or 2/6 down and 10 monthly payments of 2/6. Telescopic Floor Model, 2 Gns., or 2/6 down and 12 monthly payments of 4/-.

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# IMPORTANT BROADCASTS OF THE WEEK

**NATIONAL (261.1 m. and 1,500 m.)**  
 Wednesday, June 8th.—Aldershot Tattoo.  
 Thursday, June 9th.—Old Time Music Hall.  
 Friday, June 10th.—London Music Festival, 1938, last concert, from Queen's Hall, London.  
 Saturday, June 11th.—Palace of Varieties.

**REGIONAL (342.1 m.)**  
 Wednesday, June 8th.—Musical Comedy: *The Silent Melody*.  
 Thursday, June 9th.—Under London: *Heat, Light and Sound*.  
 Friday, June 10th.—A commentary on the First Test Match from Trent Bridge, Nottingham.  
 Saturday, June 11th.—A Bride for the Unicorn: a play by Denis Johnston.

**MIDLAND (296.2 m.)**  
 Wednesday, June 8th.—General Release: *Current Film Music*.  
 Thursday, June 9th.—Franz Josef Haydn: *A Musical Biography—4, Maturity (1781-1791)*.  
 Friday, June 10th.—Variety from a studio.  
 Saturday, June 11th.—Late Night Dance Music from Nottingham.

**WEST OF ENGLAND (285.7 m.)**  
 Wednesday, June 8th.—Visit to Quarterly Meeting of Federation of West Country Farmers.  
 Thursday, June 9th.—Choral programme.  
 Friday, June 10th.—*The House that Came Back*: a picture of Barrington Court, Somerset, written and devised by Norah Richardson.  
 Saturday, June 11th.—Tennis: eye-witness account of West of England Tennis Tournament, from Bristol.

**WELSH (373.1 m.)**  
 Wednesday, June 8th.—*Beyond the Dyke: Welshmen as Settlers*: a talk.  
 Thursday, June 9th.—*Day of Days*, a dramatic feature by Jack Jones.  
 Friday, June 10th.—Cystadlaueth Gwybodaeth Cyffredinol (General Knowledge Competition).  
 Saturday, June 11th.—National Eisteddfod of the Welsh League of Youth.

**NORTHERN (449.1 m.)**  
 Wednesday, June 8th.—*Northern Notions*.  
 Thursday, June 9th.—*Safe Deposit*, a play by J. Eaton and N. Hillas.  
 Friday, June 10th.—*Heigh-Ho*, Come to the Shows, Blackpool summer season opens.  
 Saturday, June 11th.—*Not Very Long Ago*: a talk on Local Government One Hundred Years Ago.

**SCOTTISH (391.1 m.)**  
 Wednesday, June 8th.—A Recital of Scots Songs.  
 Thursday, June 9th.—*From Father to Son*. Four Generations of Alchemy, a talk.  
 Friday, June 10th.—*The Lass wi' The Lantern*: a radio play by Andrew P. Wilson.  
 Saturday, June 11th.—Violoncello recital.

**NORTHERN IRELAND (307.1 m.)**  
 Wednesday, June 8th.—*Felling a Chimney*: feature programme (recorded).  
 Thursday, June 9th.—*Instrumental programme*.  
 Friday, June 10th.—*Belfast Harbour*: feature programme (recorded).  
 Saturday, June 11th.—*Orchestral programme*.

## COMING TELEVISION PROGRAMMES

### Wimbledon Tennis and the Test Match

THE Wimbledon tennis tournaments and the Test Match at Lord's are both being covered by the B.B.C. mobile television unit.

On June 20th and 21st the television cameras will be installed at the All-England Lawn Tennis Club's ground to show some of the preliminary matches on the Centre Court on both afternoons. The unit will then go to Lord's for the second Test Match beginning on Friday, June 24th, and play will be televised daily from 11.30 a.m. to 12.30 p.m., 2.30 to 3.30 p.m., and 3.50 to 5 p.m. It is expected that the whole field will be brought into the picture. Two cameras will be mounted on the main stand at the "Nursery" end, and a third on the "Tavern." Telephoto lenses should enable viewers to see bowlers and batsmen in close-ups.

Following the Test Match the television unit will return to Wimbledon to show the semi-finals and finals on the centre court on June 30th, July 1st and 2nd.

### Trooping the Colour

TWO television cameras peering down from the roof of the Horse Guards building in Whitehall will give commanding views of the Trooping of the Colour ceremony on June 9th. The third camera, installed close to the saluting base, will give close-ups of the King. The television transmission will be accompanied by the National commentary by John Snagge and Major Bourne-May.

### Northolt Derby

VIEWERS will spend an hour at Northolt Park racecourse on the afternoon of June 13th to see the Northolt "Derby." Three cameras will be used. One camera on top of the Members' Stand will follow the race from start to finish, and another situated close to the saddling and unsaddling paddocks will give close-ups of the winning horse and its owner. The third camera in the parade ring will show the crowd scenes, the jockeys mounting, and a number of interesting visitors who will be interviewed by Miss Jasmine Bligh, the television announcer.

"Julius Caesar" in Modern Dress  
 DALLAS BOWER will present "Julius Caesar" in modern dress in the Sunday evening television programme, on June 26th.

## IMPRESSIONS ON THE WAX

### Dance Records

FILM hits are well represented this month, Roy Fox's titles are "Always and Always" from the film "Mannequin," and "Sweet Someone" from the film "Love and Hisses," on H.M.V. BD 5353, whilst Jack Harris has chosen two attractive numbers from the film "Manhattan Music Box"—"Have you ever been in Heaven" and "Mama, I wanna make Rhythm," on H.M.V. BD 5356. His second record contains the favourite from Walt Disney's "Snow White and the Seven Dwarfs," namely "Some day my Prince will Come" (arranged as a fox-trot), coupled with "The One I Love," from the film "Everybody Sing," on H.M.V. BD 5357. "Ti-Pi-Tin," a new waltz, which is becoming a favourite, is recorded by Guy Lombardo, with a reverse side—"Goodnight, Sweet Dreams, Goodnight," played by Tommy Dorsey on H.M.V. BD 5355. The additions to the correct dance tempo series are "Tears in my Heart" (slow fox-trot), and "Why Talk About Love" (quick step), played by Henry Jacques on H.M.V. BD 5358 and a Quick Step Medley coupled with a Waltz Medley played by Jack Dent and Norris Moore on H.M.V. BD 5337.

### Vocalion

ARTIE SHAW and his New Music make a fine recording on Vocalion S 131 of "Sweet Adeline" and "Fee Fi Fo Fum." "Sweet Adeline" provides an excellent basis for swing interpretation, with the clarinet of Artie Shaw and the tenor saxophone and vocal of Tony Pastor as features. The backing, composed by Shaw and his guitarist, has no vocal and is a particularly catchy composition.

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

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

2d.—Every Wednesday

## GEORGE ELRICK

### A Brief Biography

**H**IS short, rubicund and shrewdly good humoured, with that alert and cheery manner that always results from the alliance of first-rate health and a naturally happy temperament. "Wee" Georgie, they call him—not because he's much under the normal height, but because he came from Aberdeen. Dance hall, restaurant, night club, recording and broadcasting, singing, teaching, writing, talking and thinking modern music—that has been George Elrick's life for several years past.

Originally he played in a local band at home. There was a band competition—and the judges tipped George as an odds-on chance in the percussionist stakes. He hasn't looked back since. Once George played at a job that started at seven and finished at eleven! The week after this resort closed down, he commenced at a night club where he began at eleven, and occasionally finished at seven.

A useful vocalist with a distinct "personality" style, and an academy training behind him, his singing has been in extensive demand. For a time he was with the



George Elrick

famous Bert Ambrose Rhythm Brothers. Parsons Green is the pleasant quarter of London to which you'll have to penetrate to find George at home. Maybe you'll catch him out walking with Mrs. Elrick, baby Ian enjoying an airing.

Most sports, especially swimming, are George's sport—if only he had more time. Somewhere in that modern flat of his you'll find a set of rusting golf clubs! Practice and work are really his hobbies. He's for ever trying out new song material. During the last few months Elrick has been touring the halls with great success with his own combination known as "George Elrick and his Music Makers," and has broadcast with this same band on many occasions.

He has made two sensational discoveries, one Shirley Lenner—his vocalist (young sister of Judy Shirley and Anne Lenner), who is only thirteen years of age, and who is proving as great a success as her two famous sisters. Number two discovery is Francis Walker who plays the piano, mouth-organ and accordion so brilliantly that it is hard to believe that he is blind.

George Elrick records for Columbia records, and is a frequent broadcaster. First made his name with Henry Hall as a drummer vocalist; since leaving, has been in "Music Hall," "Monday at Seven," and "Palace of Varieties." Possesses one of the biggest fan mails of any broadcasting star.

## NEWS FROM THE TRADE

### Tungram Transmitting Pentode

**A** NEW pentode is announced by Tungram and is designed for short-wave transmitters. It has a ceramic base and is known as type OS12/500. The heater is rated at 12.6 volts 7 amps, and is of the indirectly-heated type. The maximum anode rating is 500 volts and the screen 200 volts at which the total anode current is about 40 mA. A 7-pin American type base is fitted and the anode is taken to the top cap. The price is 30s.

### New Cossor Receiver

**T**HE accompanying illustration shows a new Cossor table receiver fitted with Teledial tuning. This is a 6-valve A.C. model with a performance well above the average. The specification includes variable selectivity, 3-valve controlled A.V.C., 10in. moving-coil loudspeaker and the new automatic dial tuning which enables any one of ten selected stations to be accurately tuned-in in a fraction of a second. Tuning covers three bands, 16 to 52.5, 195 to 560 and 810 to 2,085 metres, the minimum and maximum ranges on the medium and long-waves being rather unusual for modern receivers. Forty-four station-names are given on the flood-lit escutcheon, and any ten may be selected by the special dial system. There are six valves, which include an H.F. amplifier which works on all wavebands. The price of this model, No. 397, is 11½ guineas, and it is for A.C. mains only.

### Beethoven Portable

**A**N all-occasion portable, Model P.555, is announced by Beethoven Electric Equipment Company. In common with this season's portable receivers this is of very small dimensions, although employing full-size H.T. and L.T. batteries. The controls are completely hidden from view

by means of a hinged lid, and a handle is provided which is detachable so that it may be removed when the receiver is fitted in the home as a standard receiver. A special snap action hinge keeps the lid in position when closed, and a calibrated wavelength scale has the pointer travelling behind a transparent window. The overall dimensions are 9½in. by 8½in. by 5½in., the speaker is a 6½in. permanent magnet, and four full-size valves are employed in the circuit. The price is £6 15s. complete, and a baize-lined carrying case with shoulder-strap may be obtained for 10s. 6d. extra.

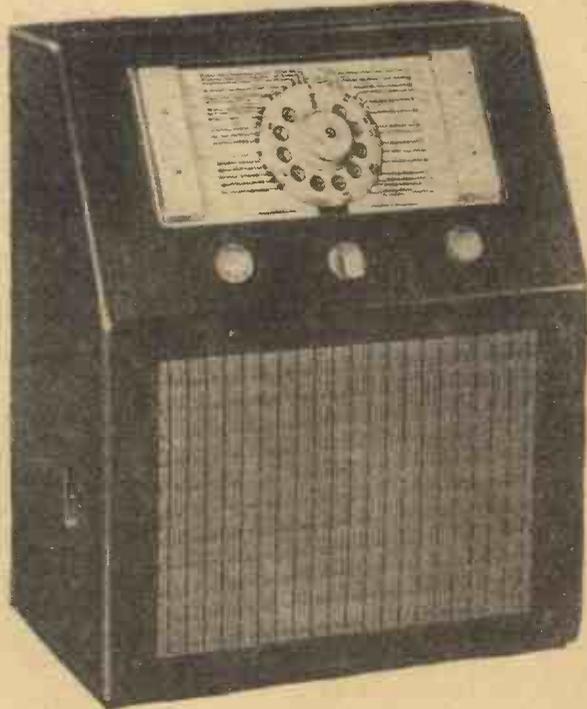
### Celestion Valveholders

**A**RRANGEMENTS have now been completed for the well-known Celestion Company to manufacture in this country valveholders of Amphenol. Under agreement with the American Phenolic Corporation these holders, together with other moulded components, will shortly be placed on the market, although at the moment these are available for set manufacturers only. Full details of the complete range will be published when they become available.

### McCarthy Chassis

**A** UNIQUE chassis is now available from McCarthy Radio, consisting of a dual unit embodying a 5-stage, 4-valve

"Tuning Heart," and a high-fidelity amplifier. The former consists of all the essentials of a modern superhet, with A.V.C., etc., and tunes from 4.5 up to 2,000 metres in 6 wavebands. The amplifier comprises 5 valves and has a phase-reversed high-gain circuit providing 10 watts undistorted output incorporating 10 per



The new Cossor Model 397

cent. negative feed-back. The response is claimed to be flat from 10 to 20,000 cycles, plus or minus 1.5 db. Unit A (the radio section) costs £7 10s. less valves, and Unit B £11 10s. complete with valves. Further details are available from the manufacturers.



# 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).

## Double Earths

SIR,—I noticed in a recent issue of PRACTICAL AND AMATEUR WIRELESS, under the heading of "Queries and Enquiries," the answer given to J. D. (N.W.5) entitled "Double Earths." In view of this, perhaps an experience of mine about a week ago might prove interesting. I was called in to investigate a mysterious crackling, positively deafening in volume, which emanated from an all-mains set every time a hall door was either opened or shut. My thoughts immediately focused on an iron-clad dis-board in the vicinity, but a test proved that this was not the cause. A switch on the wall by the side of the door was next suspected. Occasionally, a live pair of wires are fed to a switch, and the black joined behind the block before passing on to the light. It did not prove to be the case in this instance. I examined the switch itself, however, for a broken fork spring, thus enabling the forks to make a partial contact, but failed to find any trouble. The telephone bell was next inspected, and here was the cause of the trouble. The lead-covered conductors feeding this were rubbing against each other. These were bonded by a G.P.O. official and the trouble ceased. Perhaps this experience might prove useful to others.

To turn to another subject. Have you ever conducted any experiments where a Class B valve was used as a frequency changer? There must be quite a number of experimenters with one of these lying idle, and they might possibly jump at the chance of using it once more.—CEDRIC C. MARKHAM (Bury St. Edmunds).

SIR,—With reference to the query from J. D. (N.W.5) you may be interested to know that I have just had the same trouble with my mains.

Having just installed a mains set in an upstairs room, it was annoying to find that severe crackles occurred whenever anybody walked across the room. I examined all switches and bulb fittings, but that didn't cure it. I even went so far as to check the lighting system for leaks and found one! (Incidentally, it is a good plan for anybody to switch off all light and power points and see if there is any movement on the meter disc. If there is, look for a leak!) I put in some new wiring in place of the faulty lead, but still the crackles and buzzes went on. I then found that the noises were caused by two adjacent lead cables vibrating together. I cured the noises by bonding the two cables together with copper wire.

I might suggest that all lead cables are not effectively earthed, especially in old houses, and a kind of high-frequency discharge occurs when two cables or one cable and a metal part come in contact.

Anyway, in our case, the noises were

picked up via the aerial, and not through the mains leads.—A. W. SEWELL (London, S.W.).

## Correspondent Wanted

SIR,—Very many thanks for sending on the reply coupons, which I have just received. You may be interested to know that I am only 15 years of age. I should be very pleased to get in touch with another reader about my own age who is really interested in 7, 14, and 28 m/c amateur band listening, and who has a good two or three-valve S.W. receiver.—J. STEWART, 37, Dillichip Terrace, Bonhill, Alexandria, Dumbartonshire.

## Service!

SIR,—Referring to the letter in the May 14th issue from T. H. G. (London) he appears to think that 15s. 6d. is a large sum to pay for repairing a meter. Does he realise that he is paying for a skilled instrument-maker's time and knowledge, and that a good instrument-worker does not work for 1s. per hour. T. H. G. has got the idea that all the makers do is just take off the back of the meter, have a quick

CUT THIS OUT EACH WEEK.

## Do you know

- THAT a high-resistance contact in the on-off switch can cause distortion.
- THAT care should be taken to prevent the metallised coating of indirectly-heated valves from coming into contact with earthed surfaces.
- THAT the field-strength of a station may be measured by means of a single-valve detector arranged to form a field-strength meter.
- THAT a differential condenser across the aerial coil forms a very good volume control which does not affect tuning.
- THAT the tapings on the primary side of a mains transformer provide useful low-voltage A.C. ranges for test purposes.
- THAT it is often found that with an induction motor, a hum-bucked pick-up is the only way of removing the hum.

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.

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glance, then write to him for 15s. 6d. for just two bits of wire. If that were so, then instrument-makers would be living on the fat of the land. But no! When T. H. G.'s meter was received this is what would happen. The meter would first of all be stripped right down to examine all the shunts for faults, e.g., burn outs, shorted turns, bad insulation, etc. Then all the pivots, balance and brittle hair springs. Don't forget that T. H. G.'s voltage might have taken all the life out of the hair springs, and therefore thrown the meter out on all ranges, or even caused bad balancing and sticky action. T. H. G. has repaired his meter with two bits of wire, but what is the result? As he himself says, "everything worked except for a difference in reading." That would not do for an instrument-maker. I strongly suspect other faults in T. H. G.'s meter. I have repaired a good many meters of T. H. G.'s type, and believe me, it is not a case of just "two bits of wire" but patience and about three hours' work. No, 15s. 6d., in my opinion, is not excessive. I would add that I myself am a radio engineer with a good experience of meters.—K. M. BAILEY (Cheetham, M/c).

## Rola Employees' Annual Holiday

SIR,—Will you please note that our office and factory will be closed from Friday evening the 22nd July, 1938, until Monday morning the 8th August, 1938. We respectfully request our customers to anticipate their requirements for this period as early as possible in order to enable us to make delivery prior to the closure.

Suppliers are requested to deliver goods prior to the 22nd July, as no goods can be accepted during the closure.—THE BRITISH ROLA COMPANY, LTD., Park Royal, London, N.W.10.

## Speaker Experiments

SIR,—Some time ago you published an article on speaker experiments and I derived much pleasure from carrying out some of the tests therein indicated. I have found that the internal shape of the cabinet, as well as the shape and thickness of an enclosed back, have a great effect upon the reproduction. I have tried internal resonating devices, such as tubes, shaped wood, etc., but none of these seem to have the same effect as opening the bottom, placing internal baffling plates, and enclosing the back. I wonder if any other readers have carried out experiments in this direction and could let us have the advantage of the knowledge of the results of their experiments. It would be a good plan, I think, if you ran a suggestion corner in this manner, so that those of us who are interested in quality reproduction could carry out tests on lines which might not present themselves to us in the ordinary way. Incidentally, the introduction of the high-quality ultra-short wave transmissions by the B.B.C. lend an added interest to this type of experiment.—H. D. WATTS (Hendon, N.W.9).

## Echo Effects

SIR,—Many thanks for your article on the Argon charger. I had been looking for a unit of this type for some time, and had begun to think that there was no simple way out of my difficulty. I have made it up, and find that this meets my requirements to a nicety. I hope to obtain many months of valuable service from this particular charger.—J. E. RINOS (Harlingay).

# 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 EXETER AND DISTRICT WIRELESS SOCIETY

ON Sunday, May 22nd, members of the above society, by kind permission of Messrs. Odeon Theatres, Limited, were conducted over the Exeter Odeon Theatre by the Chief Operator, Mr. Vicary, and the Area Sound Engineer, Mr. F. Saunders.

Members were taken to the operating room and shown the B.T.H. machines, each of which works twenty minutes before the other is switched in. Films were threaded through and the machines set in motion. Members also saw the turntables and pick-ups, beside which stood the amplifiers, also duplicated. These amplifiers are constructed by the B.T.H. Company, and an ingenious device enables the current consumption of each valve to be read. The system of ventilation was also thoroughly explained, and the apparatus was set in motion showing how the air is washed, and heated, before passing into the theatre.

Behind the screen (which is made of aluminium and slotted to allow the sound to pass through) stand the loud-speakers which reproduce the low audio-frequencies. The high-frequency speakers are in a loft above the screen. Several records were played giving various sound effects, also illustrating the remarkable quality of the amplifying system in general.

The next meeting of the society will not be held until September, when the autumn session starts and full details will be published together with the syllabus for the coming season. Intending members should get in touch with Mr. W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

## LONDON TRANSMITTING SOCIETY

THE above society recently had the pleasure of testing one of the latest receivers of Messrs. Lissen, Ltd., the HI-Q 4-Valve superbet S.W. receiver, and it has been decided to purchase one for club use. Agreement has been reached on the apparatus to be built for the new laboratory. Morse lessons are given every Thursday by 2DWS, and a junk sale is being held on June 9th when anything from a receiver to a transmitting valve will be sold, or given away. We would be glad if our members would bring along any junk they may have for disposal. Application for membership should be made on QSL card only, enclosing 1d. stamp, to National Sec., 40, Raeburn Road, Edgware. Club night is held every Thursday, 8 p.m., at this address.

## THE STAFFORD AND DISTRICT SHORT-WAVE CLUB

ALTHOUGH only quite recently formed the above club is in an extremely flourishing condition. On Monday, May 23rd, an interesting lecture was given by Mr. W. G. J. Nixon, of the Osram valve technical department of the G.E.C., who gave a brief history of the valve, and the evolution of the dull emitter and multi-electrode valve. A particularly interesting film was then shown depicting the intricate manufacture of a modern Osram valve. Mr. Nixon completed his lecture with a few experiments with photo-electric cells, and by means of a photo-electric cell, in conjunction with a gas-filled relay, an electric motor was controlled entirely by the light from a small torch. Finally, the application of the photo-electric cell to timing devices was briefly outlined.—Hon. sec., G. L. Wale, "Branksome," Acton Gate, Stafford.

## THE EAST SURREY SHORT-WAVE CLUB

THE club was very fortunate, on May 26th, to secure the services of Mr. White, who is a member of the R.S.G.B. council. He gave an interesting talk on the construction and reception of single signal receivers, also their comparison with ordinary straight receivers.

Advance dates for fixtures are as follows:—  
June 9th. Discussion Night. 8 p.m.  
June 23rd. Junk Sale. 8 p.m.  
Each of these will be preceded by Morse practice at 7.30 p.m. Club H.Q., 111, Station Road, Redhill. Hon. sec., Leslie Knight (G5LK), 13A, Hatchlands Road, Redhill.

## WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB

A SUCCESSFUL junk sale was held at the club on May 25th, when a large amount of transmitting and receiving components changed hands, the club funds also deriving benefit from "commission" on sales. Mr. R. Cumberlidge (G3CK) was the auctioneer. There is much activity in the preparation of the first issue of the club magazine.

The club will pay a visit to Speke Airport to view the radio equipment on Saturday, June 11th. Members and friends will meet at the corner of Water Street

and Cunard Buildings, Liverpool, in time for the 3.30 p.m. bus.

Secretary: J. R. Williamson, 13, Harrow Grove, Bromborough.

## THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

MEMBERS of the above society held their first 5-metre field day on Saturday, May 21st, when 22 members assembled at our headquarters. We divided into two parties, one party going to Hazelwood, nr. Wirksworth, and the other going to Crich Stand, nr. Matlock. During the afternoon contact was made with 8SM of Ilkeston, 8VU of Nottingham, 8FSP of Derby, and 8AZ of Derby, whilst contact was also made between the two parties. Both parties assembled at the Black Swan, Crich, for tea, and then back to headquarters.

Since our last report we have had lectures on metallurgy, 5-metre transmitting, lantern lecture with coloured slides of beautiful gardens of England, and a visit to the Derbyshire Royal Infirmary for a demonstration of X-ray apparatus.

H. Turner, secretary, Nunsfield House, Boulton Lane, Alvaston, Derby.

## BOOK RECEIVED

**PROBLEMS IN RADIO ENGINEERING**, by E. T. A. Rapson, A.C.G.I., D.I.C., etc. 117 pp. (Third Edition). Published by Pitman. Price 3s. 6d.

The third edition of this book which has been written to facilitate class-work has been brought up to date by including some of the later examination papers. The book is intended for students who are preparing for the Higher National Certificates in Electrical Engineering. It includes many problems and examples drawn from past examinations of the City and Guilds of London Institute in Radio Communication, the Institution of Electrical Engineers in Electrical Communications, and the University of London in Telegraphy and Telephony. Forty-three separate subjects are dealt with, varying from capacitance and inductance to television, and all the test questions which are set in each section are referenced with regard to the examination paper from which they are taken. Eleven pages are devoted at the back of the book to solutions to the examples given so that the student can check his answers. The book will prove invaluable to the student for either class or private study.

## CATALOGUE RECEIVED

### BULGIN COMPONENTS

A REPRESENTATIVE selection of Bulgin products is given in the latest abridged catalogue issued by Messrs. Bulgin. Indicating dimensions and technical data, particularly useful to manufacturers and home constructors, are given for all the components listed. In addition to chokes, coils, fuseholders, and resistors, there is a very comprehensive range of Q.M.B. switches of the semi-rotary and toggle type. Various television components, trimmers, transformers, valveholders, and the Bulgin "Electronic" Vibrator, are also included in this useful list.

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# NEW

## INDIRECTLY HEATED PENTODE DETECTOR

THE

# COSSOR

## 220 I.P.T.

FOR BATTERY OPERATION



The new Cossor 220 I.P.T. is a special Pentode Detector Valve designed for use in Battery Receivers. Due to its indirectly heated cathode it has remarkable anti-microphonic properties even under very adverse conditions. It is, therefore, particularly suitable for use in Portable Receivers where high L.F. gain is usually provided. The base used on the 220 I.P.T. is of the 7-pin type with standard H.F. Pentode connections.

### Characteristics

Heater voltage:	2.0	PRICE 11/-
Heater current (amps.):	0.2	
Max. Anode volts:	150	
Max. Aux. Grid volts:	80	
Slope:	1.0 mA/V	

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# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		No. of	D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Date of Issue.		Blueprint	Universal £5 Superhet (Three-valve)		PW44
CRYSTAL SETS			F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
Blueprint, 6d.			F. J. Camm's Universal £4 Superhet 4		PW60
1937 Crystal Receiver	9.1.37	PW71	"Qualitone" Universal Four	16.1.37	PW73
<b>STRAIGHT SETS. Battery Operated.</b>					
One-valve : Blueprints, 1s. each.			<b>SHORT-WAVE SETS.</b>		
All-wave Unipen (Pentode) ..	—	PW31A	One-valve : Blueprint, 1s.		PW88
Beginner's One-valve ..	19.2.38	PW85	Simple S.W. One-valver ..	9.4.38	PW88
Two-valve : Blueprints, 1s. each.			Two-valve : Blueprint, 1s.		PW38A
Four-range Super Mag Two (D, Pen)	—	PW36D	Midget Short-wave Two (D, Pen)		PW38A
The Signet Two (D & LF)	29.8.36	PW76	Three-valve : Blueprints, 1s. each.		
Three-valve : Blueprints, 1s. each.			Experimenter's Short-Wave Three		PW30A
The Long-range Express Three	—	PW2	(SG, D, Pow)		PW30A
(SG, D, Pen)	24.4.37	PW2	The Prefect 3 (D, 2LF (RC and		PW63
Selectone Battery Three (D, 2 LF	—	PW10	Trans)	7.8.37	PW63
(Trans)	—	PW10	The Band-Spread S.W. Three		PW68
Sixty Shilling Three (D, 2 LF	—	PW34A	(HF Pen, D (Pen) Pen)	20.8.36	PW68
(RC & Trans)	—	PW34A	<b>PORTABLES.</b>		
Leader Three (SG, D, Pow)	22.5.37	PW35	Three-valve : Blueprints, 1s. each.		PW65
Summit Three (HF Pen, D, Pen)	—	PW37	F. J. Camm's ELF Three-valve		PW77
All Pentode Three (HF Pen, D	—	PW39	Portable (HF Pen, D, Pen)	—	PW77
(Pen), Pen)	29.5.37	PW39	Parvo Flyweight Midget Portable		PW12
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41	(SG, D, Pen)	19.6.37	PW12
Hall-Mark Cadet (D, LF, Pen (RC)	16.3.35	PW48	Four-valve : Blueprints, 1s. each.		PW36
F. J. Camm's Silver Souvenir (HF	—	PW49	Featherweight Portable Four (SG,		PW36
Pen, D (Pen), Pen) (All-wave	—	PW49	D, LF, Cl B)	15.5.37	PW36
Three)	13.4.35	PW49	"Imp" Portable 4 (D, LF, LF,		PW48A
Genet Midget (D, 2 LF Trans)	—	PW1	Pen)	10.3.33	PW48A
Cameo Midget Three (D, 2 LF	—	PW53	<b>MISCELLANEOUS.</b>		
(Trans)	8.6.35	PW53	S.W. Converter-Adapter (1 valve)	—	PW48A
1936 Sonotone Three-Four (HF	—	PW55	<b>CRYSTAL SETS</b>		
Pen, HF Pen, Westcopter, Pen)	—	PW55	Blueprints, 6d. each.		PW55
Battery All-Wave Three (D, 2 LF	—	PW62	Four-station Crystal Set ..	12.12.36	PW62
(RC)	—	PW62	1934 Crystal Set ..	—	PW62
The Monitor (HF Pen, D, Pen)	—	PW01	150-mill Crystal Set ..	—	PW04
The Tutor Three (HF Pen, D, Pen)	21.3.34	PW02	<b>STRAIGHT SETS. Battery Operated.</b>		
The Centaur Three (SG, D, P)	14.8.37	PW04	One-valve : Blueprints, 1s. each.		PW69
The Gladiator All-Wave Three	—	PW66	B.B.C. Special One-valver ..	—	PW72
(HF Pen, D (Pen), Pen)	29.8.36	PW66	Twenty-station Loudspeaker	—	PW82
F. J. Camm's Record All-Wave	—	PW69	One-valve (Class B)	—	PW82
Three (HF Pen, D, Pen)	31.10.36	PW69	Two-valve : Blueprints, 1s. each.		PW82
The "Colt" All-Wave Three (D,	—	PW72	Melody Ranger Two (D, Trans)	—	PW82
2 LF (RC & Trans)	5.12.36	PW72	Full-volume Two (SG det., Pen)	—	PW82
The "Rapid" Straight 3 (D,	—	PW82	B.B.C. National Two with Lucerne	—	PW82
2 LF (RC & Trans)	4.12.37	PW82	Coil (D, Trans)	—	PW82
F. J. Camm's Oracle All-Wave	—	PW78	Big-power Melod. Two with	—	PW82
Three (HF, Det. Pen)	28.8.37	PW78	Lucerne Coil (SG, Trans)	—	PW82
1938 "Triband" All-Wave Three	—	PW84	Lucerne Minor (D, Pen)	—	PW82
(HF Pen, D, Pen)	22.1.38	PW84	A Modern Two-valver ..	—	PW82
F. J. Camm's "Sprite" Three	—	PW87	Three-valve : Blueprints, 1s. each.		PW82
(HF Pen, D, Det.)	26.3.33	PW87	Class B Three (D, Trans, Class B)	—	PW82
The "Hurricane" All-Wave Three	—	PW89	New Britain's Favourite Three	—	PW82
(SG, D (Pen), Pen)	30.4.38	PW89	(D, Trans, Class B)	15.7.33	PW82
Four-valve : Blueprints, 1s. each.		PW4	Home-built Coil Three (SG, D,	—	PW82
Sonotone Four (SG, D, LF, P)	1.5.37	PW4	Trans)	—	PW82
Fury Four (SG, D, Pen)	8.5.37	PW11	Fan and Family Three (D, Trans,	—	PW82
Beta Universal Four (SG, D, LF,	—	PW17	Class B)	25.11.33	PW82
Cl. B)	—	PW17	£5 5s. S.G.S. (SG, D, Trans)	2.12.33	PW82
Nucleon Class B Four (SG, D,	—	PW34B	1934 Eth. Searcher; Baseboard	—	PW82
(SO), LF, Cl. B)	6.1.34	PW34B	Model (SG, D, Pen)	—	PW82
Fury Four Super (SG, SG, D, Pen)	—	PW34C	1934 Eth. Searcher; Chassis	—	PW82
Battery Hall-Mark 4 (HF, Pen,	—	PW46	Model (SG, D, Pen)	—	PW82
D, Push-Pull)	—	PW46	Lucerne Ranger (SG, D, Trans)	—	PW82
F. J. Camm's "Limit" All-Wave	—	PW67	Cosmo Melody Maker with Lucerne	—	PW82
Four (HF Pen, D, LF, P)	26.9.36	PW67	Coils	—	PW82
All-Wave "Corona" 4 (HF Pen,	—	PW79	Mullard Master Three with	—	PW82
D, LF, Pow)	9.10.37	PW79	Lucerne Coils	—	PW82
"Acme" All-Wave 4 (HF Pen, D	—	PW93	£5 5s. Three; De Luxe Version	—	PW82
(Pen), LF, Cl. B)	12.2.38	PW93	(SG, D, Trans)	19.5.34	PW82
<b>Mains Operated.</b>					
Two-valve : Blueprints, 1s. each.		PW18	Lucerne Straight Three (D, RC,	—	PW82
A.C. Twin (D Pen), Pen)	—	PW18	Trans)	—	PW82
A.C.-D.C. Two (SG, Pow)	—	PW31	All-Britain Three (HF Pen, D, Pen)	—	PW82
Selectone A.C. Radiogram Two	—	PW10	"Wireless League" Three (HF	—	PW82
(D, Pow)	—	PW10	Pen, D, Pen)	3.11.34	PW82
Three-valve : Blueprints, 1s. each.		PW23	Transportable Three (SG, D, Pen)	—	PW82
Double-Diode-Triode Three (HF	—	PW23	£6 6s. Radiogram (D, RC, Trans)	—	PW82
Pen, DDT, Pen)	—	PW25	Simple-tune Three (SG, D, Pen)	—	PW82
D.C. Ace (SG, D, Pen)	—	PW29	Economy-Pentode Three (SG, D,	—	PW82
A.C. Three (SG, D, Pen)	—	PW35C	Pen)	—	PW82
A.C. Leader (HF Pen, D, Pow)	—	PW35B	"W.M." 1934 Standard Three	—	PW82
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B	(SG, D, Pen)	—	PW82
Urbane (HF Pen, D, (Pen), Pen)	28.7.34	PW36A	£3 3s. Three (SG, D, Trans)	—	PW82
Armada Mains Three (HF Pen, D,	—	PW38	Iron-core Band-pass Three (SG,	—	PW82
Pen)	—	PW38	D, QP21)	—	PW82
F. J. Camm's A.C. All-Wave Silver	—	PW50	1935 £6 6s. Battery Three (SG, D,	—	PW82
Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50	Pen)	—	PW82
"All-Wave" A.C. Three (D, 2	—	PW54	PTP Three (Pen, D, Pen)	—	PW82
LF (RC)	—	PW54	Certainty Three (SG, D, Pen)	—	PW82
A.C. 1936 Sonotone (HF Pen, HF	—	PW50	Miniature Three (SG, D, Trans)	—	PW82
Pen, Westcopter, Pen)	—	PW50	All-Wave Winning Three (SG, D,	—	PW82
Mains Record All-Wave 3 (HF	—	PW70	Pen)	—	PW82
Pen, D, Pen)	5.12.36	PW70	Four-valve : Blueprints, 1s. 6d. each.		PW82
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80	05a. Four (SG, D, RC, Trans)	—	PW82
Four-valve : Blueprints, 1s. each.		PW20	"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	PW82
A.C. Fury Four (SG, SG, D, Pen)	—	PW34D	2HF Four (2SG, D, Pen)	—	PW82
A.C. Fury Four Super (SG, SG, D,	—	PW34D	Crusader's A.V.C.4 (2HF, D, QP21)	18.8.34	PW82
Pen)	—	PW34D	(Pentode and Class B Outputs for	—	PW82
A.C. Hall-Mark (HF Pen, D,	—	PW45	above: Blueprints 6d. each)	25.8.35	PW82
Push-Pull)	24.7.37	PW45	Self-contained Four (SG, D, LF,	—	PW82
Universal Hall-Mark (HF Pen, D,	—	PW47	Class B)	—	PW82
Push-Pull)	9.2.35	PW47	Lucerne Straight Four (SG, D,	—	PW82
A.C. All-Wave Corona Four	6.11.37	PW81	LF, Trans)	—	PW82
<b>SUPERHETS.</b>					
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£5 Superhet (Three-valve)	5.6.37	PW40	The H.K. Four (SG, SG, D, Pen)	—	PW82
F. J. Camm's 2-valve Superhet ..	13.7.35	PW52	The Auto Straight Four (HF Pen,	—	PW82
F. J. Camm's £4 Superhet ..	—	PW58	HF Pen, DDT, Pen)	—	PW82
F. J. Camm's "Vitesse" All-	—	PW75	Five-valve : Blueprints, 1s. 6d. each.		PW82
Waver (5-valver)	27.2.37	PW75	Super-quality Five (2HF, D, RC,	—	PW82
Mains Sets : Blueprints, 1s. each.	—	PW43	Trans)	—	PW82
A.C. £5 Superhot (Three-valve) ..	—	PW43	Class B Quadradynic (2 SG, D, LF,	—	PW82
Class B)	—	PW43	Class B)	—	PW82

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

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plier) (1/2)	—	WM390
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The W.M. A.C. Short-Wave Con-	—	WM403
verter (1/2)	—	WM403



# QUERIES and ENQUIRIES

## Earphone as Mike

"I have an earphone in my 'spares' box, and I wondered if it would be possible to use it as a microphone if I obtained a suitable transformer. Can you also inform me of the address of Evrizon Radio Company?"—L. R. P. (Framlingham College).

THE earpiece would not need a transformer unless it were of the low-resistance type. A component of this nature, however, has a very rigid diaphragm, and this renders it insensitive for use as a mike. It is possible to convert it by replacing the diaphragm by thin mica or similar material, with a disc of soft iron attached to the centre above the pole pieces. You can experiment with it by cutting various types of diaphragm, but in general we do not recommend the use of an earpiece, and you would find, if cost is a consideration, that a cheap carbon component is much more useful. The address of the company mentioned is now 2, Southlands Road, Bromley, Kent.

## H.F. Pentode and Bias

"I have a variable- $\mu$  pentode. Can the bias be applied to the grid through the H.F. choke which is included in the grid circuit in an untuned stage. Also, if I use the valve in a standard H.F. circuit, but without the bias potentiometer, i.e., disregarding its variable- $\mu$  characteristics, will any of the valve's performance be lost?"—O. K. (W.10).

THE bias may be applied in the manner you indicate, which is quite standard. With regard to your second point, the variable- $\mu$  valve has maximum amplification at minimum bias, and, therefore, if you ignore bias entirely, the valve will be working at maximum efficiency, which means that the set may be unstable. A small fixed bias would probably be desirable, but this depends upon your circuit design, and, therefore, some experiments should be made with a view to finding the best value for general results if the volume control or bias adjustment is to be removed entirely.

## Duplex Coil

"Can you tell me where I can obtain the Duplex coil for the three-valve circuit described in your 'Television and Short-wave Handbook'?"—R. D. (Ilford).

THE coil is made and supplied by J. J. Eastick and Sons, of Eelex House, 118, Bunhill Row, London, E.C.1.

## Extension Speaker

"My commercial set has four sockets on the back not marked except for small letters in pencil on the bakelite strip upon which the sockets are mounted. As far as I can make out these letters are G and Ex, which I take it mean gramophone (pick-up) and extension speaker. I have looked carefully but cannot locate a switch or plug which will silence the built-in speaker. How can I do this?"—J. H. C. (Hayes).

A NUMBER of commercial receivers are produced without a silencing switch, and, therefore, you will have to fit such an arrangement. The only way of doing this without upsetting various adjustments is to cut the leads to the speech coil on the speaker and fit an ordinary on-off switch in the lead. The extension speaker may then be fed from the anode of the output valve through a 2mfd. fixed condenser, retaining the speaker transformer as a choke. You could, of course, if the circuit is suitable, fit a change-over switch so that the self-contained speaker is cut out and the extension speaker is switched in; but it must be remembered that in the ordinary way the H.T. for the output valve flows through the speaker transformer primary, and, therefore, if an extension lead is fitted in that position there will be a voltage drop through the extension leads.

## 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 journalists.

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

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

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

## Ganged Switching

"I am building a new receiver with three tuned circuits, one of which is in the H.F. and the other two for band-pass in the detector stage. The coils are not provided with self-contained switches, and I wonder if it will be necessary to use a sectional switch and fit screens between the H.F. and detector sections. Can you suggest

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

the best method of carrying out my idea?"—H. T. (Kenton).

SOME trouble may be expected if a single multi-point switch is used. In addition to interaction between leads it may be difficult to arrange for switching without introducing a short-circuit in the H.T. supply, but this will depend upon the method of feeding the intervalve coils. Probably the best plan would be to use the special small baseboard-mounting toggle switches supplied by Bulgin (type S.80.B). These may be screwed immediately beneath the coils and all operated by a single rod and panel control. If there are many contacts to be operated, then one of the five-way multiple switches may have to be introduced.

## Superhet Whistles

"I have built a small superhet but am finding great difficulty in getting it stable. It produces a violent whistle, and when I trim the I.F.s the whistle may be cut out, but at the silent point there are no stations. As soon as I upset one trimmer, the stations come back but are then accompanied by the whistle. Is it possible from this to say what is wrong and how to get the set into working condition?"—J. M. (Long Eaton).

WHEN the circuits are out of line whistles are generally experienced. If, however, when the I.F.s are lined up, the whistles cease, and at the same time signals disappear, it will indicate either serious instability (self-oscillation), or incorrect adjustment of the oscillator trimmer. You will therefore have to make quite certain that the oscillator section is adjusted to the correct frequency, and if then signals are unobtainable when all circuits are lined up attention must be paid to the screening or layout of the I.F. and second-detector wiring.

## Fitting a Pick-up

"Will you please inform me how to connect a pick-up to an S.G. Three battery set, and what type of volume control I should use?"—S. C. (Tooting).

THE pick-up should be joined to the grid of the detector valve, and the other side of the pick-up should be connected to the 1.5 volt tapping on your grid-bias battery. To prevent the radio programmes from breaking through you can either detune, or disconnect the grid-leak and condenser from the grid of the valve. A single-pole change-over switch will enable you to connect the pick-up and cut out the radio, the connections being arm of switch to grid, one side of switch to grid-leak and condenser and other side of switch to pick-up. A 250,000 to 500,000 ohms volume control should be suitable if you find it necessary to use such a component, but with only two stages you will probably find that it is not needed.

## Morse Key

"I am interested in the purchase of a cheap and efficient morse key complete with buzzer and battery. Also a decent pair of cheap earphones. I wonder if you could let me know where I could obtain these?"—O. J. L. (R. A. F., Cranwell).

THE parts in question may be obtained from Electradix Radios, of 218, Upper Thames Street, E.C.4, who hold a large supply of such items, and you will, no doubt, find a suitable component at the price you desire.

The coupon on page 328 must be attached to every query.

# ELECTRADIX

**HAND COMBINATION MICROTELEPHONE** Transmitter and Receiver. These will speak over any bell circuit 7/6.

**POCKET HEADPHONES**, W.D. all leather headband, strap and cords, 2/6 pair. Wireless type with aluminium headbands, 2/9. 4,000 ohms, 4/6. House, Office and Field Telephones, wall and table, 10/- and 15/-.

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THE DIX-ONEMETER 55/-.

The Dix-Onemeter with only 6 Terminals, but 50 Ranges, is a valuable instrument for laboratory work. It is of portable size to go in the pocket, but big enough to cover the whole range of D.C. electrical measurements, 50 microamps, to 20 amps, and 20 millivolts to 2,000 volts.

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A wonderfully versatile moving-iron multirange meter for service on A.C. jobs. No projecting terminals. THREE ranges of volts: 0-7.5, 0-150, 0-300. Used for MILLIAMPS, reads: 0-124 m/a and 0-75 m/a. In black bakelite case. Measures only 2 1/2 in. by 2 1/2 in.

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**UNIVERSAL SUPREME PORTABLE A.C.-D.C. ANALYSER**, has M.C. Meter with rectifier for A.C. All ranges. Adaptor on cable, a £10 set for £4/10.

**EXPERIMENTERS 150 WATT TRANSFORMERS**. 150 watts. For any input or output 40 v. to 300 v. 19 taps, fitted 2 panels with 11 stud switch, 25/-.

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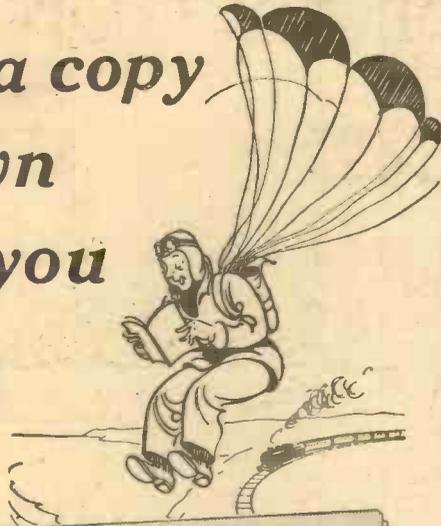
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## ROUND *the* WORLD of WIRELESS

### Battery Amplifiers

THE battery user is generally restricted as to the power he can deal with, and thus is not in such a fortunate position as those who have mains facilities. We are continually receiving requests for designs of battery amplifiers with 5 and even 10 watts output, and it is, of course, practically impossible to obtain such outputs with ordinary battery apparatus. Super capacity battery supplies would have to be used, and although this would not be an insurmountable difficulty, the types of valve available provide a serious restriction in the design of the apparatus. A maximum of about 2½ to 3 watts is all that the normal battery user may obtain, and in this issue we describe a design which will be found quite a good match for many small public-address mains outfits. An input mixing circuit is provided so that two pick-ups, a mike and a pick-up, or radio and a mike or pick-up may be employed. The output consists of a pair of pentodes in quiescent push-pull, and the rated output is of the order of 2½ watts. Tone control is provided on the input side, and the amplifier is simple to build and operate. The output is, of course, more than adequate for all ordinary purposes, and when fed to a really good speaker this amplifier will prove of real service to those who are unable to take advantage of mains working.

### New Finnish Stations

THREE new stations are now working in Finland: Lahti, on 31.58 and 25.47 metres, with a power of 1 kW (to be replaced at a later date by a high-power transmitter); Helsinki, on 197.15 metres, and Joensuu (wavelength not announced). Further changes are to be made in the near future, but these notes may prove of value to those who keep a careful log of Continental stations.

### Television Improvements

SEVERAL listeners who live in outlying districts and have television receivers improved results on the Derby relay by an unusual use of a reflector aerial. Interference, which at the distance of reception, caused serious fading and distortion, was completely removed by placing a reflector aerial between the receiving aerial and the source of interference. The reflector was not used in its correct position as a reflector behind the aerial.

### For Philatelists

AN unusual relay will take place on June 21st, when B.B.C. microphones will be present in Harmer's Auction Rooms, in New Bond Street. The occasion will be the sale of the Baron de Worms' Collection of Ceylon stamps, which is one of the most famous in existence. Exceptional bidding and prices are likely.

### The Story of the Sundial

ON June 24th, in the West of England programme, a broadcast arranged round the sundial will be given.

who will be taking part in the most spectacular of the ten scenes which are packed into the two and a half hours programme. The main theme of the display will be the interpretation of traditional ceremony and traditional efficiency by the younger members of the Services.

### The Open Road

IN the National programme on June 17th. It will be an interesting programme bearing the above title. This is the radio story, not of any one road in particular, but of all roads in general. There will be references to Macadam, father of the modern road, and to the Romans, fathers of all real roads.

### French Broadcasting House

PARIS is to have a building to coincide with our own B.B.C. Broadcasting House, and a site has been chosen and work begun on the Boulevard des Invalides. The building is expected to be completed by 1941.

### Changes at Addis Ababa

THE new transmitter at Addis Ababa should be ready in about 12 months, and in the meantime a new announcer has been appointed to the temporary station. She is Signorina Luisa Gasparini, and fills the post of chief announcer. The wavelength at present in use is 31.25 metres, but a change may be introduced when the new station comes on the air.

### New Station at Tripoli

THE station being erected by the Italian Government on the Oasis of Zanzur is to be officially opened on October 28th. This station has special aerials directional to the east and to the west.

### Concert from Nottingham

FROM the Nottingham studio on June 20th a concert will be broadcast by artists belonging to the county. Mark Mellors, a professional singer who has often broadcast in the last dozen years, will sing two groups of baritone solos; May Cree, the Nottingham pianist who won a piano in a national competition, will play solos; and L. Hartley will conduct the Edwinstowe Choral Society in part-songs.

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Listeners will hear something of the history of the sundial, and a selection from some of the curious inscriptions which may be seen on them all over the country.

### United Services Tournament

SCOTTISH listeners will hear a half-hour's broadcast from the tournament which is being staged by the Royal Navy, the Army, and the Royal Air Force at Ibrox Park, Glasgow, on June 23rd. This display has been described as being largely an effort of youths, boys, recruits and young men with short periods of service,

# ROUND the WORLD of WIRELESS (Continued)

## Standardising Aerials

AS the municipal authorities of Amsterdam (Holland) were of the opinion that the diverse types of aerials used constituted an eyesore in the streets of the city, a decree was recently promulgated to the effect that one standard and recognised pattern of aerial, and mast, is to be employed in future. The same decision has now been taken in Poland, but in addition, the police have decided that in the case of flats and apartment houses a communal aerial must be used by the tenants.

## INTERESTING and TOPICAL NEWS and NOTES

Dickens, while another dramatic interlude will take listeners back to a Soho of more stately days when the Duke of Monmouth lived in Soho Square, and the very name of the district was the whispered password of his followers.

June 22nd. The programme is devised by Doris Nichols; with her will be Dorothy Paul, Dorothy Summers, Marjorie Astbury, Mary Pollock, Marjorie Westbury and two pianists, Jane Minton and Leila Brittain. The producer will be Martyn C. Webster.

## Variety from Southampton

LISTENERS to the Regional and West of England programmes on June 21st will hear a popular variety broadcast from the stage of the Hippodrome, Southampton, in the feature entitled "Theatres of Variety."

## New Director of National Physical Laboratory

THE Lord President of the Council of the Department of Scientific and Industrial Research has appointed Professor R. H. Fowler, O.B.E., M.A., F.R.S., at present Plummer Professor of Applied Mathematics in the University of Cambridge, to be Director of the National Physical Laboratory with effect as from October 1st, 1938. Professor Fowler will succeed Dr. W. H. Bragg, who has been elected to the Cavendish Professorship of Experimental Physics in the University of Cambridge.

## Just Gentle Persuasion . . .

IN Germany, where all nationals are exhorted to listen to official speeches and pronouncements, the authorities are far from lenient in the case of radio pirates. During the first quarter of 1938, in the case of 253 prosecutions against persons found without a broadcasting licence, five were sentenced to terms of imprisonment ranging from thirty to eighty days, one hundred and eighty-eight to fines varying between three and one hundred marks, and one youth was merely warned "not to do it again!"



Carroll Lewis (left) and Michael Flome (right) who has engaged Sydney Gowan (a Lewis discovery) as regular vocalist with his dance orchestra at the May Fair Hotel, London. Gowan can now be heard on all Flome's broadcasts and records.

## A Novel Broadcast

ON the occasion of a duel recently fought out by two Paris celebrities, although necessarily of a strictly private character, not only were photographs of the event published in the French press, but both the *Radio Cité* and *Poste Parisien* broadcasting stations were able to transmit a commentary on this heroic display of valour. The commentator's observations were electrically recorded and broadcast to listeners within half an hour of the termination of the duel. Honour has been satisfied!

## Radio and Political Unrest

DURING the month of April, some fourteen thousand persons took out licences in Czechoslovakia; at the utmost in previous years a figure of 5,200 was reached. The Czech broadcasting authorities state that the great increase was doubtless due to the existing political troubles, and that the nation has been given a clear demonstration of the benefits of wireless in times of stress.

## Soho

IN a feature programme, written by Hugh Ross Williamson and produced by Leslie Stokes, National and Empire listeners will hear the story of Soho from the time it was built in the reign of Charles II up to the present day.

A dramatic adaptation of a scene from *Nicholas Nickleby* will show the sinister side of the neighbourhood as envisaged by

## Thirty-one Million Listeners

THE B.B.C. estimates that there are approximately 31,000,000 listeners in this country, excluding pirates. The figure is based on the total number of wireless licences (8,609,800) multiplied by the size of the average household, i.e., 3.6 persons.

## High-power Dutch Stations

IT is reported that the new 125-kW transmitter near Jaarsveld, in Holland, is expected to be ready in about eighteen months time. The wavelength used will be 301.5 metres, which at present is allotted to Hilversum 2.

## "Pleasure on Parade"

REGIONAL and Empire listeners will hear a broadcast on June 25th from the Frank A. Terry show, "Pleasure on Parade," at the Floral Pavilion, New Brighton.

## Recital from Cheltenham

MARIE HALL, the famous violinist, is always a popular visitor to Cheltenham, and on June 21st she and Philip Taylor, the Cheltenham organist, will give a recital at the College Chapel. The programme will include the sonata in D minor by Joseph Gibbs, the eighteenth-century composer.

## Midland Marionettes

THE all-women concert party known as the Midland Marionettes is to broadcast again from the Midland Regional on

## SOLVE THIS!

### PROBLEM No. 300

Atkins had a receiver employing H.F., Detector, L.F. and Q.P.P. stages, and he had the opportunity of obtaining some A.C. mains units at low prices. During the morning, therefore, he inserted a milliammeter in the H.T. negative lead and found that the total current was approximately 9 mA and he accordingly selected a mains unit rated at 10-15 mA as being suitable for the set. He took the unit home, connected it to his set and when he switched on to the programmes in the evening was very disappointed at the poor volume and distortion which was provided. The unit was guaranteed to be in working order. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 300 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, June 20th, 1938.

### Solution to Problem No. 299

The volume control which Hawkins obtained was of the "straight" type, and he should have obtained a graded track to provide even variation of volume in his circuit. The following three readers successfully solved Problem No. 298 and books have accordingly been forwarded to them: R. Welch, 17, Bryn Melyd Road, Meliden, nr. Prestatyn. A. Holmes, 40, Steeley Lane, Chorley, Lancs. B. Sealey, 14, New Winchelsea Road, Rye, Sussex.

# About Coil Connections

Details Concerning Some Obsolescent Coils which are Still in Use or on Sale By W. J. DELANEY

WE are continually receiving inquiries from readers for details of connections of coils which are not now in normal circulation, and as we have repeatedly pointed out it is not advisable to try out modern circuits with old parts. The recent introduction of all-wave tuning has, however, led many constructors to dig out from their junk boxes all-wave coils which were produced back in 1933, and in the lapse of time the connection details have become mislaid. Certain of these coils are also still being sold in certain stores. It must be pointed out that coil connections have never been standardised, as have certain other components, and thus the fact that a certain coil may have six terminals does not mean anything. Even the numbering of these terminals bears no indication to its type or the method of using it, and thus we may find that one coil will have terminal number 1 joined to the grid, whilst another will have terminal 6 taken to the same point.

### All-wave Coils

In 1933 the Lissen Four-range coil and the British General all-wave Tuner were in

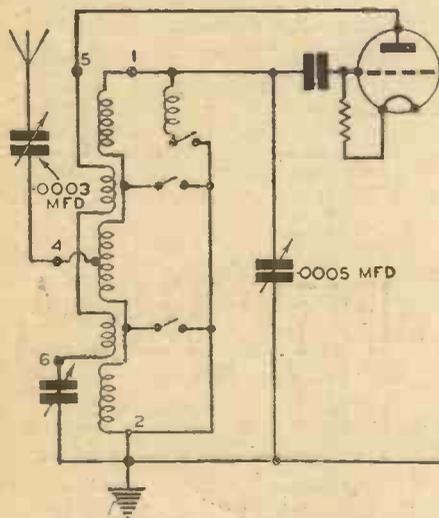


Fig. 1.—The Lissen 4-range coil.

common use and these are very popular with home constructors. The circuit of the Lissen coil is given in Fig. 1 and it will be seen that in this component the various sections are short-circuited by means of the self-contained wave-change switch as the ranges are lowered. The four bands covered are from 12 to 38, from 22 to 90, from 190 to 555, and from 800 to 2,000 metres, and the coil may be used in a simple detector stage or as an H.F. coupling coil—in this case taking the preceding anode to the coupling condenser in place of the series aerial condenser. The efficiency of this coil will not be found so high as modern all-wave coils, and it is, of course, of much larger dimensions.

The British General Tuner is of a different type, having a transfer aerial tapping for each range, and incorporating the circuit shown in Fig. 2. In this case the ranges are

14.5 to 40, 32 to 90, 200 to 550, and 900 to 2,000 metres, and for this, as well as the Lissen coil already mentioned, a standard .0005 mfd. tuning condenser should be used. It must be pointed out that several different types of British General Tuner were produced and the reference letters given in Fig. 2 may not apply to all of them. The coil illustrated was used in our All-wave Unipen receiver described in 1933.

### Telsen Variable Selectivity Coil

Another very popular coil of its time, and one which is still in common use, is the Telsen component which had a small self-contained condenser mounted on top of it for aerial tuning purposes. It was known

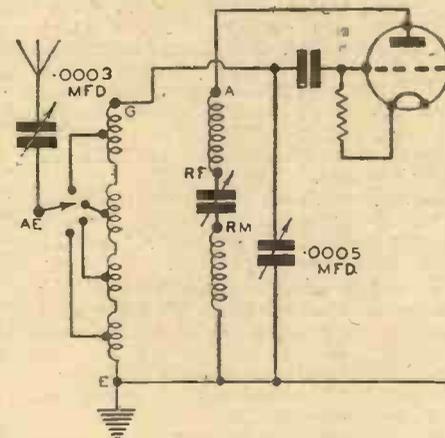


Fig. 2.—This is the circuit of the British General Tuner.

as a variable selectivity coil, and the circuit and connection numbers are shown in Fig. 3. In some cases it may be found desirable with this particular coil to include a fixed condenser having a maximum capacity of .0003 mfd. across points 4 and 6 to prevent medium-wave breakthrough. With this coil a separate wave-change switch has to be employed and this should be of the three-point type.

Another Telsen coil about which we still receive requests is the Type 349—one of the first miniature screened iron-core coils

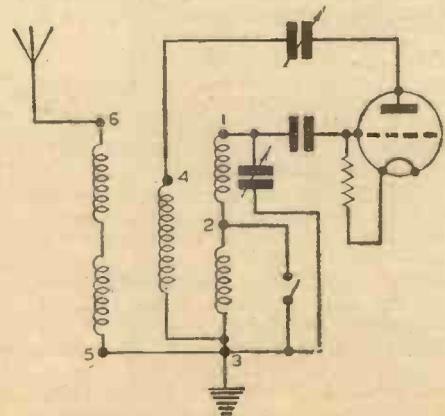


Fig. 4.—This is the Telsen Iron-core Coil, Type 349.

to be produced. This has six terminals only, and they are wired as shown in Fig. 4. With this, as with most other coils described, it is possible to employ a simple detector stage, or to use them in an H.F. stage as H.F. coupling components. In each case the anode takes the place of the aerial lead.

### Band-pass Coils

An early Lewcos coil of interest was the

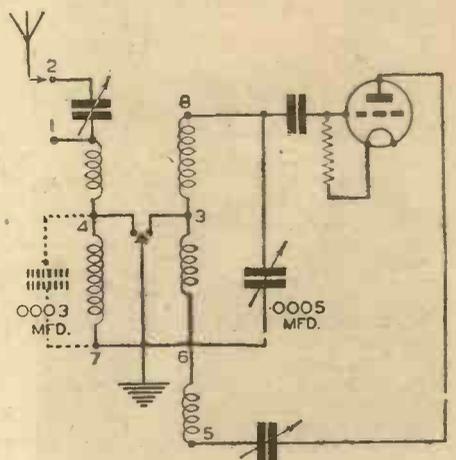


Fig. 3.—The Telsen Variable Selectivity Coil.

unscreened band-pass filter, built up round two small formers mounted on a base in a "V" formation. This coil also contained a switch in the base, and the terminals, instead of being numbered bear reference letters. These are shown in the circuit in Fig. 5, and it will be seen that a coupling condenser has to be employed. This should be of the non-inductive type having a maximum capacity of .02 mfd. and if possible a mica condenser should be employed. In this particular coil unit the series aerial condenser is included in the coil mount and thus, when used as an intervalve coil, the anode would be joined to terminal A direct. This coil is not ideal for modern conditions owing to the fact that

(Continued on next page)

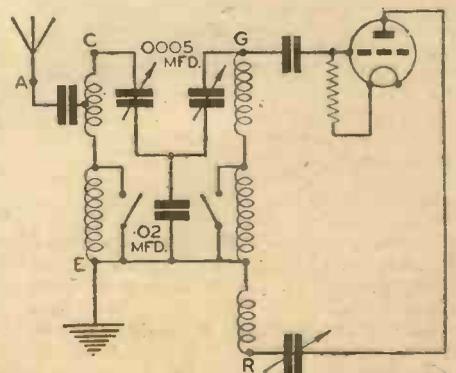


Fig. 5.—An early band-pass coil—the Lewcos component.

# "ON WITH THE SHOW"

The Return to Blackpool of an Old Favourite, and an All-star Cast

SO Bertini is going back "home" again. Thousands of Blackpool dance-music addicts will be content now that one of their idols is with them once more. It created a major bombshell when, three years ago, Bertini casually announced that he was leaving the town where he was an institution.

Though London-born, Bertini was, for



Lawrence Wright (Horatio Nicholls), who is responsible for the great Blackpool show.

something like nine years, as important a part of Blackpool as the Tower itself. Then he developed an itching foot. He and his band took the high road, and started what has been a very successful country-wide variety tour. But Bertini owes Blackpool a debt. It not only established him as a No. 1 dance-music attraction, but its crisp refreshing air cured him of a perpetual cough which was the legacy of war-gassing.

Yes, Bertini will be glad to be "home." It was a shrewd stroke of showmanship which prompted Lawrence Wright to sign up Bertini and his Band as a top-line attraction for his current "On With the Show" entertainment on North Pier. But then nothing but shrewd strokes of showmanship could have built up Lawrence Wright from a poor boy demonstrating his own songs on a cracked piano in Leicester market-place, to a position of wealth and power in the entertainment business.

The signature-tune of Blackpool is "Pleasure." It's as much a local commodity as lace is at Nottingham, cotton in Manchester. It's true to say that if you can't have fun in Blackpool, you're either not trying or dead. And Lawrence Wright, song writer and showman, has done more than his bit to take the "black" out of Blackpool with his annual summer show on North Pier.

"On With the Show" recently made its bow again for the fourteenth consecutive year.

Fifteen hundred people will be packed into the North Pier Pavilion twice daily

for twenty weeks and the "House Full" notices will be in constant use. 3,000 people a day . . . 18,000 a week . . . 360,000 during the season. Allowing for a few empty seats on occasional matinees, and it's safe to assume that 350,000 people will see "On With the Show" this summer.

By the time the curtain rings down for the last time, it will have cost Lawrie Wright every penny of £10,000. There are fifty people in the show, which means a weekly salary list of nearly £600. There are 200 dresses in the show. One fan of real ostrich feathers which, built in sections of 20ft. high, will occupy the entire stage in one lavish scene has set Lawrence Wright back £300.

But it's no use having a packed house and a lavishly dressed stage, if you haven't a decent cast. In the past, such stars as Florence Oldham, Norman Long, Walter Williams, Jan Ralfini and His Band, Sylvia Cecil, Fred Walmsley, Revnell and West, Phyllis Robins (when half of the Iris and Phyllis act), Mona Vivian, Hal Swain, Rose Perfect, Lance Fairfax, Trevor Watkins, Winnie Collins and Roy Barbour have all served under the "On With the Show" banner.

Even if you aren't going to Blackpool yourself this summer you will be interested because "On With the Show" will be broadcast at least three times.

From past experience Lawrence Wright has discovered that what Blackpool likes is plenty of good, colourful scenes, good singing ("I dare not put on a spot of crooning in the show," Lawrie confided to me), a touch of military pageantry, and lashings of clean, wholesome, knockabout comedy.

The musical side of it looks after itself, with Bertini and His Boys on the stage throughout. His singers are Robert Naylor and Marietta. Naylor, of "Land of Smiles" fame, is a tenor with a voice as rich as Lord Nuffield. I've promised not to reveal the identity of the soprano, Marietta. All I can say is that she has been a well-known concert party soprano for some years. She suddenly had a brain-wave. She changed her name, got herself an accordion, an Italian rig-out, and a pet monkey which sits on her shoulder, and blossomed out as something new, fresh and appealing.

It is interesting to know the big numbers that will be heard, because what Blackpool sings to-day, the rest of the country has a habit of whistling to-morrow.

High spot of the show will be a scene illustrating the number, "When Granny Wore Her Crinoline." A giant crinoline which will occupy the entire stage has been built to provoke "Ooohs and Aaahs" from the audience.

Robert Naylor's big number will be that smash hit, "Tears In My Heart." Leslie Saroni has contributed a military song, called "Follow the Band," and Lawrie's new team, Bob Dale and Art Strauss, have provided, among others, a song called "Indian Summer."

Horatio Nicholls, who is Lawrence Wright himself, has written the opening chorus, which is called "Laugh Thro' Life." He wrote it on the *Atlantis en route* for West Africa at a time when he was feeling so miserable that even the sight of

an envelope marked "O.H.M.S." couldn't have depressed him further.

But, on board, was one of those almost aggressively hearty women who have never known a moment's despondency in their life. Horatio asked her the secret of her cheerfulness. "Because I've learned to laugh through life," was her reply. Snap! the idea clicked in the songwriter's brain. He rushed to his cabin, wrote the song, had it printed on board, and it was played by Jack Hylton's Band throughout the cruise.

Equally snappy was the birth of another Horatio Nicholls' number. Called "I'm Saving the Last Waltz for You," it was written at Easter in the lounge of the Hotel Metropole, Blackpool, and played that same night by the band.

## ABOUT COIL CONNECTIONS

(Continued from previous page)

the wave-range on the medium band is from 235 to 550 metres and thus it is not possible to tune down to a large number of popular stations. Turns can be stripped from the former, but some difficulty may be experienced in balancing the two windings, and if this is done then a separate panel trimmer should be connected across one of the condensers to enable the two circuits to be balanced for distant station work.

### Lissen Type L.N. 5101

A screened coil in the Lissen range which is still popular is type L.N. 5101, but it must be remembered that this firm has produced dozens of screened coils and unless the type number is given on the coil

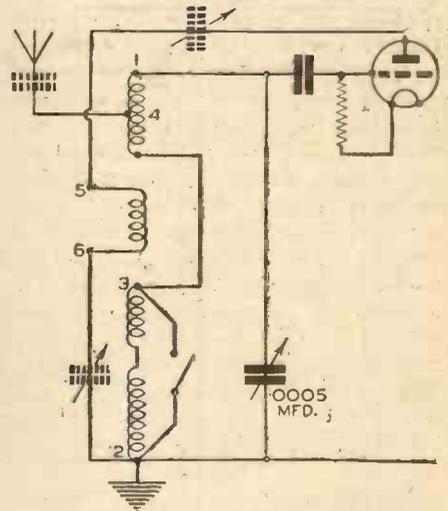


Fig. 6.—This was a popular Lissen coil—type L.N. 5101.

screening can these reference numbers cannot be followed. The circuit is shown in Fig. 6, and the wave-range covered is from 200 to 550 and from 800 to 2,100 metres. It will be noticed in the circuit that the reaction condenser is shown joined between the anode and the terminal 5, or between terminal 6 and earth, and this enables a metal panel or an insulated panel to be used at will. The latter connection is preferable as it puts the reaction condenser moving vanes direct at earth potential and this avoids tuning difficulties when critical reaction adjustments are being made. If a metal panel is employed and the condenser is joined between the anode and the reaction winding, in any type of coil, the condenser must be insulated from the panel (if this is earthed in the usual way), otherwise the reaction coil is short-circuited.

# ON YOUR WAVELENGTH



## Second-hand Sets

H. E. F., of Gravesend, joins issue with me on the question of the disposal of second-hand sets. He says that he wishes to contradict some of my statements in last week's issue. As he is a dealer I must accept his word for it that sets sold by his firm, whether at 50s. or £10, all carry a three-months warranty, and any set taken in part-exchange is subjected to a thorough overhaul. If it is found not up to the required standard it is dismantled, and any parts suitable are kept for spares.

A set passing all tests is offered for sale and maybe at an absurd price, but my reader thinks that in this they are helping the public, for there are many people about who will have nothing to do with hire purchase, but find it difficult to save up for a new set, although they can manage £3 to £4. Admittedly there is the problem of repairs at a later date, but, he says, even 1938 sets will give trouble, and if a firm has a service engineer worthy of the name, and good test equipment, there are few troubles that cannot be remedied. Providing reasonable second-hand exchange prices are allowed, a useful market can be found for second-hand sets, and the public can buy with a feeling of safety. If this reader will go through my paragraphs again he will find that I said that very few dealers have the knowledge, and the equipment (the knowledge being the most important), to test a set, so they have to resort to the gentle art of "coddling" the public that a certain set will do what they know it will not do.

## Prize Biscuit

MY attention has been drawn to an illustration in a Provincial paper, the caption to which reads: "The new B.B.C. Transmitting Station at Penmon, Anglesey, which enables many North Wales listeners with small radio sets to get distant stations." The B.B.C. has been holding out on me. I must certainly move near to Penmon where, with merely a pair of 'phones, I shall be able to listen-in to the local.

## Poetry

HAROLD CARR, rotund master of ceremonies on the WLW "Truly American" programme, 5 to 5.30 p.m., E.S.T., Saturdays, re-

## By Thermion

cently turned poet. Whether it was the spring weather or disappointment in a recent fishing expedition, Carr did not divulge.

There's an old verse that goes like this:—

When the wind is from the south,  
It blows the bait in the fish's mouth.  
When the wind is from the north,  
Fishermen should not fare forth.  
When the wind is from the east,  
It's neither fit for man nor beast.  
When the wind is from the west,  
That's when fishing is the best.

Carr, back from a fishing expedition with the usual "they all got away" story, wrote a verse which was heard on "Truly American," and for which scores of listeners have written for copies. Here's his poem:—

When the wind is from the side,  
Rent a boat and take a ride,  
When the wind is from the back,  
Stay inside your cosy shack.  
When the wind is from the front,  
Load your gun and start to hunt.  
When the wind is from the bottom,  
Fishing luck is good and rotten.  
When the wind is from the top,  
Buy your fish in a butcher shop.

## Mixed Bag

HEREWITH a letter from G. H. of Bourne End: "I saw an article in a daily newspaper by the Radio Expert in which he gives vent to his dislike of the frequent gramophone records broadcast by the B.B.C. He says that he is not getting his 10s. worth. I wonder how much it would cost him if he bought as many records as we hear from the B.B.C. in a year. In other articles this expert criticises the B.B.C. Sunday Programmes, comparing them with those of Continental stations, who use nothing but records for their sponsored programmes. I have been reading the stories of readers' most embarrassing moments. I have a non-technical friend who likes theatre

organs. I was hurrying past his house when he called me in, and asked me to mend a fuse as he wanted to listen to Reginald Foort. I opened the box and seeing a couple of blank holders I put some wire in, shut the fuse box and hurried off. Before I had gone far, he caught me, and said there were still no lights or radio. I said something unpleasant, and returned to discover that I had repaired two spare fuse holders which were not even in circuit!"

## A New Handbook

SEE in our companion journal, *Practical Mechanics*, that readers may obtain for 2s. and two coupons cut from consecutive issues, a fine book entitled *The Practical Mechanics Handbook*. This book compares in size and contents with one standard engineering book which in my apprenticeship days cost me a guinea. The *Practical Mechanics Handbook* contains information on turning, fitting, screw-cutting, mechanical drawings, the dividing head, mensuration, logarithms, trigonometrical functions, screw-thread standards, the metric system, hardening and tempering, soldering, brazing, silver soldering, making battery and mains spot welders, colouring metals, filing, marking out, how to obtain a patent, glues, cements and adhesives, drills and drilling, nuts, bolts and screws, battery charging, rust-proofing iron and steel, riveting, etc., etc. I recommend every reader of this journal to obtain a copy of this book, which, after the presentation edition is exhausted, will be sold for 5/-. Get yours now and save money.

## Receiver Design

TO an outsider the trend of design of modern commercial receivers must be a continual puzzle. At last year's radio exhibition we had the all-wave receivers, and at this year's show it will no doubt be all push-buttons. But I am interested to note that there is a change creeping in and that quality is being gradually introduced by several well-known manufacturers. This was noticed at last year's show on only two stands, but I have received advance details of two or three new schemes and it would certainly appear that there will be a serious attempt to revise present ideas and to make quality a

really high-spot of future design. This tendency is, of course, strengthened by the B.B.C. ultra-short-wave broadcasts. Many listeners still do not realise what this high quality means. Those who have listened to the special television broadcast, however, will have noted several interesting points in this direction and the improved frequency response is particularly noticeable (especially to those who do not possess a keen musical ear) in sound effects. For instance, when M. Boulestin is giving his cookery hints there are many little sounds which could not come over faithfully on normal broadcast wavelengths. Take, for example, the noise of the burning gas-ring on his gas-stove. There is a quality about this sound which is most remarkable, as also is the sound of water as he rinses some item in a bowl before using it. To the ordinary listener these small facts alone emphasise the improvement in quality, as he is able to recall the tests and puzzle corner sounds broadcast on the medium waves.

#### Chess!

I ALWAYS thought there was something rather out-of-the-ordinary regarding chess, especially when I read how people send letters to one another describing moves, and how a master plays fifty people at once. I do not know what to say about the latest B.B.C. broadcast where listeners are to be asked to spend money describing the move they would make in reply to that given out over the radio.

The match will last a long time. I shall be bored in having to switch off when the move is announced, and I am sure hundreds will agree that it would be much more fun to hear a good musical comedy or play in place of a broadcast of this nature. What entertainment value can be attached to this type of broadcast? Spelling-bees are bad enough but I can see visions of something even worse now that delayed chess has been introduced.

#### A Financial Problem

A READER has written to me with tears in his pen, asking for a solution to his dilemma. It appears that this reader lives in one of the magnificent(?) new blocks of flats which have sprung up in various parts of London, and he required a new set to match the new furnishings he had bought for the residence. He selected a modern all-waver, and when tried out in his home the results were very disappointing, and, upon reporting the matter to the makers, they sent along a service engineer. After a test he reported that results were all that could be expected under the circumstances. When asked for an

## Notes from the Test Bench

### Argon Charging Valve

CONSTRUCTORS of the Argon Charger, recently described, may be surprised when switching on to note that the cathode of the special rectifying valve glows only in one spot. The general appearance is that there is a "hot spot" on the cathode and that the valve is defective. It will be found, however, that this is a standard characteristic of the valve and in some cases, for some unaccountable reason, the position of the spot may be shifted merely by changing round the leads to the two anodes. If the meter is fitted it is a simple matter to check that the output is normal and no attention should be paid, therefore, to the glow of the cathode.

### Combined Volume On/Off Control

A VERY commonly used control in modern sets is the combined on/off switch and volume control, and some difficulty seems to be experienced in understanding the method of using the switch. In some components only two points are provided on this section, and in this case it is a simple matter to make the connections. In some circuits, however, a three-point switch is needed, and the component is often supplied with four contacts on the switch section. To use the switch as a three-point component two of these contacts have to be linked and treated as one, and if any doubt exists (due to the layout of the contacts) as to which are the necessary two, a simple test with a battery and meter will soon identify the appropriate points.

### Variable Selectivity

IT is not often realised that an existing superhet receiver which does not possess the variable selectivity feature, may be adapted in a very simple manner. All that is necessary is to connect a very small pre-set condenser (or a high-class air-dielectric model) between the primary and secondary of one of the I.F. transformers—preferably the first one. The condenser should be joined between the anode end of the primary and the grid end of the secondary. To enable panel control to be carried out an extension spindle should be used so that the condenser is placed close to the transformer to avoid losses or instability which might be introduced by long leads to the condenser and transformer.

#### NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.  
Edited by F. J. Camm.

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

explanation, the circumstances were that the building was all-steel, being in square formation the set was screened on all sides, and under his agreement he could not erect an outside aerial. I must admit that this case appears particularly hard, but here is a case where the owner of the flats could serve a very useful purpose by fitting one of the many "community" aerials which are now available and often provide even better results than are obtainable by the ordinary householders. The height of these buildings enables a really good aerial to be placed on the roof, and any number of receivers may be fed from it without interaction. The cost would be trifling, and a very small additional sum could be placed on the rent to cover the cost of installation. I therefore suggest that anyone similarly placed makes a suitable recommendation to the owners.

### Encouraging South African Music

IT is interesting to note that in connection with the scholarship of £200 per annum offered by the Performing Right Society for tuition in musical composition, in order to encourage South African composers, a Selection Board to adjudicate on the works sent in has now been appointed, including Professor M. C. Botha, Chairman, Union Secretary for Education and Chairman of the South African Broadcasting Corporation, and Sir Carruthers Beattie, a Director of the South African Broadcasting Corporation.

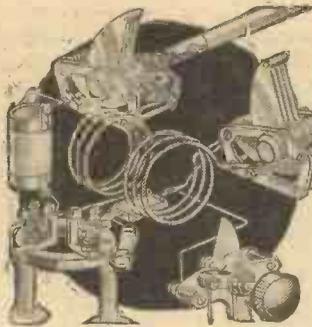
Mr. W. J. Pickerill, Director of the Cape Town Orchestra, will serve on the Committee during the temporary absence of Sir Carruthers Beattie.

Amongst the conditions governing the scholarship are the following:—

Any South African-born person resident within the Union to be eligible, and the scholarship to be tenable in London at one of the principal Academies.

### The V.A.F. and Television

I learn that the variety artistes and kindred managements have requested the V.A.F. to repeat the warning to actors and actresses that the televising of their performances can be a breach of the barring restrictions contained in their contracts. Artistes are warned that they should not enter into arrangements for the televising of their act, without having protected themselves by obtaining permission from the managements issuing their contracts. A trade paper comments: "This is apart from the general question whether such reproduction of artistes' personalities and their material is to their advantage."



# Short Wave Section

## A SIMPLE EXPERIMENTAL PORTABLE

A Small Set which is Convenient for Outdoor Reception on the 20 and 40-metre Bands

WE have frequently received requests from readers for details of an ultra-simple, though reasonably efficient, short-wave portable. It appears that most of those who ask for these details require the set purely for experimental use—comparing reception conditions in different localities and the like. Programme reception is not necessary and headphones will be used.

Some time ago we made up a little set of this kind, using only a single valve, and it behaved very well. In open country sensitivity was sufficient to bring in the

### Small Tuning Condenser

One unusual feature that will be noticed when examining the circuit is that the tuning condenser has a capacity of only

*by The Experimenters*

45 mmfd. We chose this value deliberately, because it was considered desirable to avoid the need for a slow-motion control if at all possible. By

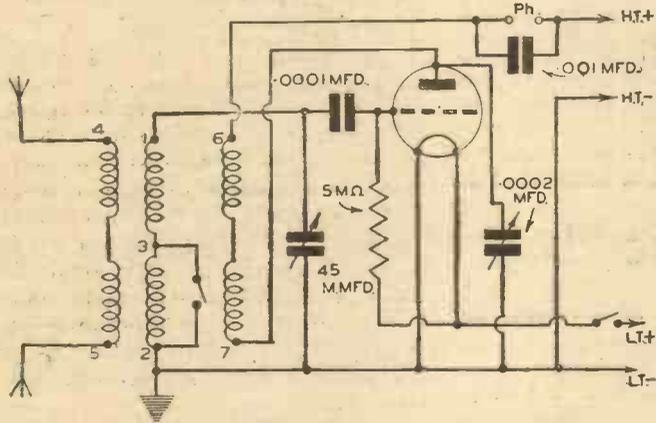


Fig. 1.—The circuit is not unusual. Throttle-control reaction is used.

more powerful Continental stations and several amateurs. It was, however, intended mainly for the reception of amateur transmissions on the 20- and 40-metre bands.

### Doublet Aerial

Fig. 1 shows the circuit adopted. Obviously, there is nothing sensational in this and nothing for which we claim any originality. It will be seen that provision is made for using a doublet or similar type of aerial, but an ordinary single-wire aerial can be used if preferred, simply by joining together one of the aerial terminals and the earth terminal. A throw-out aerial was employed, and it was generally found that a couple of insulated leads arranged approximately in line with each other were preferable to a single wire. We actually used a 15ft. length of twin flex, of which 10ft. was untwisted. Crocodile clips were fitted at the two extreme ends, but these were, naturally, attached so that they were insulated from the wires by the rubber and cotton covering. The clips simplified the "erection" of the aerial on top of a fence or between two sticks. To make the wire easier to handle, a knot was made at the end of the 5ft. twisted portion, and the two separate lengths were stretched so that they did not tend to re-twist together. Ordinary banana plugs were fitted to the ends of the twisted portion for easy connection to the set.

the grid windings of the coil.

The coil is, in effect, a double one consisting of six separate windings: two each for aerial, grid and reaction. There is no provision for short-circuiting a portion of the aerial and reaction windings (this was

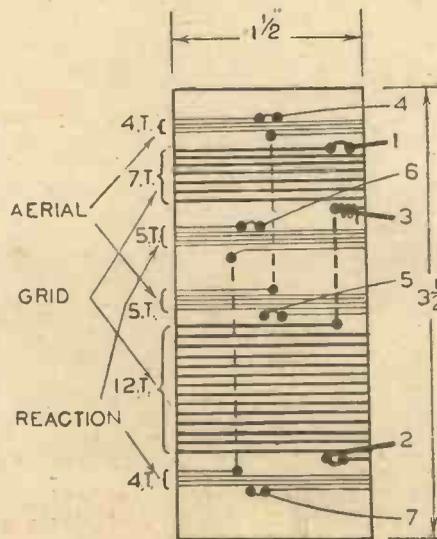


Fig. 3.—Winding details of the home-made two-range coil.

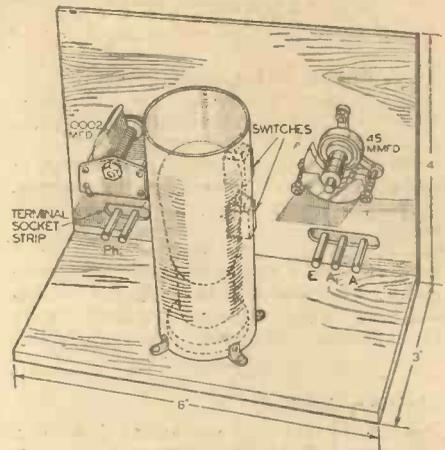


Fig. 2.—A suitable arrangement of the principal components.

not found to be necessary), but an on-off type of switch is provided for short-circuiting the lower grid winding when 20-metre reception is required.

### Throttle-control Reaction

Another not very common feature of the circuit is the use of throttle-control reaction. This was adopted after a few preliminary tests because it was found to be less prone to cause troublesome hand-capacity effects. A .0002-mfd. condenser is used, this being of the pattern developed for smooth reaction control, and fitted with a pointer, scale and reduction drive of about 10 to 1. Readers who have previously used this form of reaction control will remember that the condenser works in the opposite direction to that which applies with Reinartz reaction; in other words, an increase in capacity brings about a reduction in reaction coupling. The reason is that the condenser serves to by-pass H.F. from the anode of the detector valve, instead of allowing it to pass freely through the reaction winding on the coil. Coupling is increased by reducing the capacity of the condenser.

### Assembly

The very few component parts required were assembled on a small baseboard measuring 6in. by 3in., as shown in Fig. 2—actually a smaller board than this could be used if space were at a premium. A paxolin panel was fitted in front of the baseboard, this measuring 6in. by 4in. It carries the two condensers—one toward each side—two switches in the centre, and a terminal-socket strip under each of the condensers. Single sockets could be used in place of the strips, or even terminals would serve, but they are less convenient. It will be noticed that the tubular coil, wound on a paxolin or cardboard former, fits over the valve and baseboard-type holder, leaving ample space for the few other components on the baseboard.

This unit was fitted inside a plywood box, the four battery leads being brought through a hole and connected to a valve plug adapter. A chassis-mounting valve-holder to correspond was fitted on the small plywood battery box, so that connection between the two could easily be made. It might be thought that the complete outfit is a good deal larger than it need be, but as it was generally carried in a small attache case this did not matter. Additionally, the parts were not cramped, and, therefore, experiment was more convenient.

(Continued overleaf)

## SHORT-WAVE SECTION

(Continued from previous page)

## H.T. and L.T. Supply

H.T. current was taken from a couple of 18-volt G.B. batteries wired in series, but a midget H.T. battery could be used if preferred. The G.B. batteries take up more space but have a longer life and are noticeably less expensive in use. A very small unspillable accumulator was used, and since the total drain on this was only .1 amp. it would operate the set for thirty hours or more on a charge. Details of the box used to hold the battery are not being given, because the size is entirely dependent upon the particular batteries used.

## Making the Coil

A home-made coil was used, this being wound on a 1½ in. diameter paxolin former, as shown in Fig. 3. The method of winding is perfectly straightforward, and the grid windings should first be applied. Start by making a couple of small holes with a fine bradawl, or the point of a pair of compasses, and pass the end of a reel of 20-gauge enamelled wire through these so that it is securely anchored. Then wind on seven turns, spacing them slightly. Make a single hole near the end of this short winding, cut off the wire and temporarily anchor it in the hole. An inch lower down the tube make another single hole, pass the end of a similar reel of wire through it, and then back through the first one. Scrape the two ends of wire clean, twist them together,

and apply a spot of solder. A length of rubber-covered flex can later be soldered to the junction to serve for connecting purposes.

Next wind on the second portion of the grid winding, this time putting on fourteen turns, slightly spaced. At the end of that make another pair of small holes, cut off the wire, and anchor the end in them. That completes the grid winding, except that it is better later to cut down the projecting ends of wire, clean them, and solder on short lengths of insulated flex for making connections. A coat of thin shellac varnish should be applied to hold the turns in place.

For the doublet aerial winding, wire of about 28-gauge is suitable, also enamelled. Make two holes about ¼ in. above the top of the first section of the grid winding, anchor the end of the wire and wind on four side-by-side turns. Make a single hole, cut off the wire and lightly anchor it. Then make a hole ¼ in. above the top of the lower grid winding, pass the end of the remaining wire through it and back up the tube so that it can be soldered to the lower end of the first section of the aerial winding. Then wind on five more turns, before making a pair of holes, and finishing off the end of that winding.

The two reaction windings are dealt with in a similar manner, again using 28-gauge enamelled wire, but starting about ¼ in. below the grid windings. Do not forget to leave sufficient wire at both ends of every winding to permit of a length of flex being soldered to it for making con-

nections. Also note carefully that all turns must be wound in the same direction; it does not matter whether they are put on clockwise or anti-clockwise as long as they all run the same way.

The coil is finished by bolting a small angle bracket at the bottom to serve for mounting on the baseboard with a screw. After the components have been mounted, put the coil loosely in position, and connect it by means of the flexible leads, which should be cut so that they are not much longer than is necessary for them to reach to the appropriate terminals. After testing the set and finding that it works properly the coil can be firmly screwed down to the baseboard.

## Suitable Valve

Almost any type of triode valve can be used, but it will probably be found that best results are obtained by using a detector (D) or a general purpose (H or HL). Any of these will operate efficiently with 36 volts H.T., whilst their current consumption will be extremely small.

If it is preferred to add an L.F. stage this can be done by using a baseboard slightly longer or deeper than that shown, along with a midget type of transformer; the anode current to the detector is so low that the primary winding will easily carry it. When using only 36 volts H.T. the L.F. valve—not one of the small-power type—will work best without grid bias and will give sufficient amplification to produce good 'phone signals, although not to work a speaker.

## Leaves from a Short-wave Log

## Listen to Tripoli

**O**CCASIONALLY you may now pick up a programme direct from this Italian colony in Northern Africa, as relays to Rome for re-broadcast through the Italian network are made through IQN, a 5 kilowatt transmitter at Tripoli working on 31.71 m. (9.46 mc/s).

## A Voice from East Africa

**A**LTHOUGH FZE8, Djibouti (French Somaliland), is primarily used for official traffic with France and the French Colonies overseas, a broadcast is carried out every first Thursday in the month between G.M.T. 13.00-13.30. The wavelength is 17.36 m. (1.728 mc/s), and the power of the transmitter 5 kilowatts. The station has been heard in the British Isles. All transmissions are given in the French language only.

## An Extra Channel for Paris

**N**OTWITHSTANDING the numerous frequencies used by the Paris Mondial short-wave station, for the benefit of French listeners in Egypt and Syria, the Paris daily news bulletins are specially relayed at G.M.T. 18.00 through TYC2, Pontoise, on 38.96 m. (7.7 mc/s).

## The June Boston Schedule

**W**IXAL, Boston (Mass.), U.S.A., on 25.45 m. (11.79 mc/s), possibly the only North American station which does not broadcast sponsored programmes, has made slight alterations in the timing of its radio entertainments. It is now on the air on weekdays from G.M.T. 21.15-23.30, with

the exception of Saturdays, when only a thirty-minute transmission is made, from G.M.T. 23.00. On Sundays the programme is a continuous one from G.M.T. 18.00-23.30. Address: University Club, Boston (Mass.), U.S.A.

## Those French Harmonics

**W**HEN tuning in on short waves a number of harmonics are encountered, in particular of French stations and in some instances the signal is so

strong that it can be easily mistaken for a direct transmission. Poste Parisien (Paris) may be heard on its 4th harmonic (78.2 m.—3.836 mc/s), 5th (62.56 m.—4.795 mc/s), 6th (52.1 m.—5.854 mc/s), 7th (44.69 m.—6.713 mc/s), 8th (39.1 m.—7.672 mc/s) and 9th (34.75 m.—8.631 mc/s). In the same way the programmes of Paris (P.T.T.) are picked up on the 5th (86.34 m.—3.475 mc/s) and 10th (43.17—6.95 mc/s); Bordeaux (P.T.T.) on the 3rd (92.9 m.—3.231 mc/s), 4th (69.65 m.—4.308 mc/s), 5th (55.72 m.—5.385 mc/s), 6th (46.43 m.—6.462 mc/s), and even on the 11th harmonic (25.325 m.—11.847 mc/s). Strasbourg (P.T.T.) provides the 4th (87.3 m.—3.436 mc/s), 5th (69.84 m.—4.295 mc/s), 7th (49.89 m.—6.013 mc/s), and also the

(Continued on page 349)



Members of the Derby Short-wave Radio Society during their first 5-metre field day, which was held on May 21st.



# Practical Television

June 18th, 1938. Vol. 3. No. 105.

## TELEVISION THE DERBY

**A**NOTHER landmark in the history of television was completed with the broadcasting of the Derby, which served further to emphasise the tremendous strides which have been made in television technique in this country. We witnessed the broadcast in a London cinema theatre which was specially taken over for this occasion, and a Baird big-screen apparatus was installed for the purpose. On a screen measuring 8ft. by 6ft. 6in. the entire scene was portrayed, from the preliminary examination of the complete course, to the saddling enclosure, the fun-fair, the tote, the bookmakers, and so to the "off." The course of the horses was followed from start to finish, and a fine close-up showed the spurt with which Bois Roussel took the lead to finish in remarkably fine style.

Except for a slight interference towards the middle of the transmission, due to some outside source between the course and the Alexandra Palace, the transmission could be regarded as faultless. The "long-shots" gave remarkable views of such crowded scenes as the fun-fair, where the movements of the people as well as of the roundabouts were vividly portrayed. If one wished to criticise it would only be from a photographic point of view, certain scenes suffering from a peculiar form of distortion which is always present with telephoto lenses of high power. This is evidenced by a peculiar foreshortening which destroys perspective to some extent. This is often apparent in newspaper illustrations of a cricket match, where the distance between the two wickets appears very small, although the players appear to be of normal size.

### A Comparison

The cinema was not darkened beyond the degree adopted for normal cinema technique, and as we watched the horses going down the course our memory flashed back 7 years to the first attempt by Mr. Baird to televise this classic racing event. We saw this in the early Baird studios in Long Acre, three or four of the experimental 30-line receivers being installed in a darkened room for the purpose, and in order to accommodate the limited audience we were carefully arranged before each receiver. Some of us had to sit on the floor and those behind had to kneel or stand so that everyone had a view of the very small lighted aperture in which the horses were to be seen. In spite of its crudity in those days we visualised the time when improvements would provide a larger picture, but we venture to think that no one present at that event could have had any conception of the remarkable strides which would be made in a comparatively few years. Obviously the day is not far distant when the television screen will take its place in the cinema, and current events of national importance will be seen by the audience as an every-day occurrence. The Baird company, and the Gaumont British com-

pany are to be congratulated upon their enterprise in providing this public demonstration to prove once again that British television leads the world.

### An Outstanding Event

**T**HERE is no doubt that the most recent outstanding event as far as television is concerned was the televising of the Derby. Handicapped a day or two before by having their aerial at Epsom completely wrecked as a result of a gale, the engineers worked at high speed to build another and



The first high-definition television transmission of the Derby took place on June 1st. In our illustration, the French horse, "Bois Roussel," the winner, is seen passing the winning post. Note the television camera in the foreground.

managed to erect it in time for the great race. As it is necessary to have the five-metre ultra-short-wave radio link beamed on Alexandra Palace to ensure an adequate signal strength pick-up with a low level of electrical interference, this aerial is rather cumbersome because of its multi-reflectors. It therefore offers a high wind resistance, and while sufficiently strong to meet normal weather conditions, when there are winds of gale force the framework suffers badly. On the actual day weather conditions conspired to spoil the show, but the good-quality cameras employed enabled the picture signals to rise well above mush level and give satis-

factory results. The main criticism was the too rapid panning over the scene prior to the race. When this was done with the telephoto lens in use, the pictures showed optical distortion at the edges, this being more marked when vertical panning was resorted to. Then again, when televising the start of the race a peculiar form of interference manifested itself, this showing as horizontal bars moving vertically up and down the picture at slow speed. These are minor criticisms, however, and the televised pictures of the exciting finish made up for any of the earlier defects. In all, three cameras were employed and reports of reception came in from a particularly wide area.

### Interference Suppression

**W**HEN fairly strong interference from a passing motor car affects a television receiver the result is generally seen as a series of splashes of white which form a band or bands across the picture screen, this band moving up or down according to the ignition rate of the car engine cylinders. When the interference is severe each splash of light takes a form something similar to a short, fat, pointed leaf whose stem or fat side faces the left of the picture, while the

point is directed towards the right. The reason for this is that the wide portion of the area represents the commencement of the cylinder ignition spark, and the energy picked up by the aerial and fed through the vision chassis is sufficient to cause the modulation electrode of a cathode-ray tube to become very much less negative than normal. This brings about a considerable increase in the electron beam current so that at the point of impact of the beam on the screen an intense light area is exhibited. The beam current is momentarily too large for either the focusing electrodes or the solenoidal coil to control, and the consequent defocusing of the beam makes the spot spread over an area which represents in depth anything from four to eight scanning lines. As the energy dies down in a manner similar to a heavily damped oscillatory circuit the beam is brought under focus, and finally there is not sufficient extraneous energy to produce any visible screen illumination. Apart from locating the aerial as far from the interfering source as possible and, where direction permits, resorting to reflectors to reduce interference pick-up, there are other methods which have been developed in a genuine effort to cure this annoying trouble. One of these is to electrically convert the splash of interference from light to dark, for a black spot would be invisible to the eye, and although picture quality may be

marred somewhat this is far preferable to a screen which is covered with a miniature snowstorm effect.

### An Effective Method

ANOTHER very effective method which has been incorporated in the latest Baird receivers is concerned with "interference suppression," the control knob for which is set in one or more positions over its full range according to the intensity of the interference experienced on the viewing site. As readers of this journal know, the modulation characteristic of a cathode-ray tube resembles somewhat that of an ordinary three electrode valve. The interference suppression control working in the output stage of the vision receiver has the effect of moving the static operational point of the tube up or down this characteristic. When interference is severe the working point is moved up the curve so that there is a definite brightness limit to the beam intensity, and the offending light areas as seen on the screen are thereby reduced very considerably. Picture detail suffers slightly, this being similar to distortion in an amplifier working too high on the output valve characteristic as the result of insufficient grid bias, but as stated before, this is preferable to a picture ruined by interference. Under normal operating conditions the control is set back to its fullest limit and only advanced for those sites where, for example, main road traffic tends to upset the picture standard for comfortable viewing purposes.

### A New Mast

ONE of the difficulties associated with outside broadcast television transmissions which the B.B.C. have experienced is linked up with the reception of the beamed picture signal from the site where the performance is occurring. This is brought about by different forms of interference picked up *en route*, coupled with the beating effect of different carrier waves which happened when the receiving aerial was positioned right at the summit of the Alexandra Palace lattice mast. This was offset recently by using the spire of a neighbouring church to accommodate the

receiving aerial, but the present aim of the B.B.C. is the erection of a mast towering about 150 feet over Highgate village. This mast is to be 16 feet square at the base, and will taper to four feet square at the top. There is a measure of local objection to this proposed scheme, but it is understood that negotiations are still proceeding and there is every likelihood of permission being given. Highgate village is the highest point in North London, and the actual site chosen is directly on the route of the special television cable linking Alexandra Palace with Broadcasting House.

### A Programme Proposal

OPINIONS may vary as to the type of programme which viewers consider the best, but it is freely admitted that while some productions have been on a very high level, there are many supporting items which do not bring credit to the B.B.C. service. A proposal has therefore been put forward that viewers be asked to record their opinion of programmes and give reasons for their preference to certain types. In this way the B.B.C. will be in possession of interesting data which will undoubtedly assist in compiling programme matter. The general level must be a high one if interest is to be stimulated and maintained, and it is learned that the Television Committee is to be presented with a viewers' report in which constructive criticism is being made, with emphasis on the

popularity of O.B.s of both local and national interest.

### Another Record

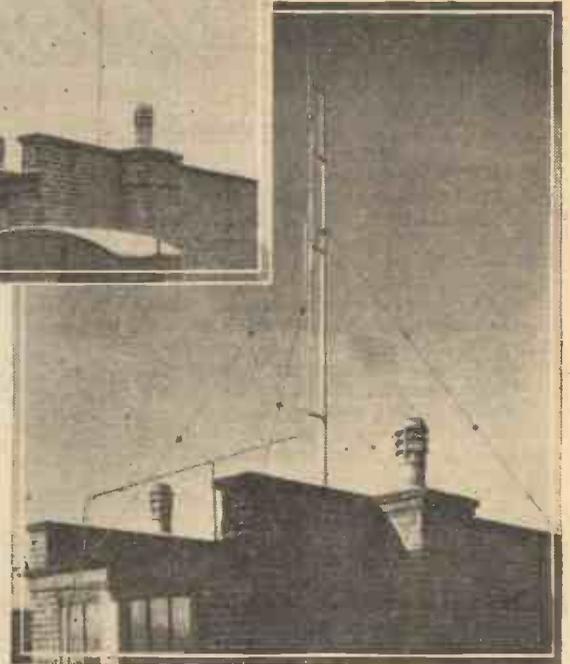
WITH television, record viewing distances seem to be made to be broken. This is really inevitable when dealing with such a subject as ultra-short waves, for knowledge is still small, and it is the pioneer bands of amateurs and professionals alike who are proving beyond all doubt that the original pessimistic B.B.C. estimate of a 25-mile radius for the service from Alexandra Palace is a long way from the truth. The latest place to establish a reception record is Ormesby Bank, which is about four miles from Middlesbrough and 220 miles from Alexandra Palace. Those engaged in making the experiment readily admit that the site is an ideal one, being 700 feet above sea level, while a steel lattice mast 80 feet high is used to accommodate the aerial. For the actual test a two-valve pre-amplifier was used in conjunction with a standard commercial set.

### Television and Education

ALTHOUGH any form of regular television service is as yet a remote possibility in America, the authorities of that country are already undertaking tests to ascertain the practical worth of television for educational purposes. Leading authorities in the teaching world saw recently a special programme conducted by the National Broadcasting Company. Running commentaries, laboratory experiments, and televised films were all combined to give an idea of how televised illustrations may help with future education. Such ideas are, of course, by no means new in this country, for the B.B.C. have quite successfully dovetailed items of an educational character into their normal daily programmes.



Television aerials on the original Baird Laboratories. Note the solid feeder and the meter inserted in the aerial.



The familiar appearance of Radiolympia will be changed at the forthcoming exhibition. Television is to play a large part and the familiar 'set piece' on the end wall is to be omitted this year. Television studios will take the place of the Theatre of former years.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA

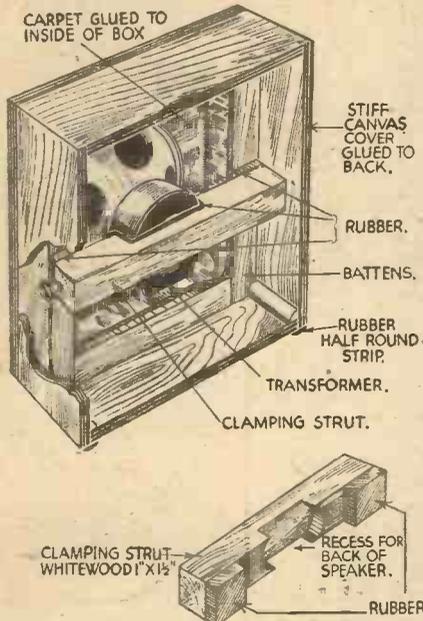
READERS WRINKLES

THE HALF-GUINEA PAGE

Lightweight Extension Speaker Cabinet

MY small speaker, having no fixing screw holes, had been attached to the chassis by a bracket. Wishing to use the speaker only as a separate unit, I made the cabinet illustrated and there is now absolutely no box resonance.

The framework is of 1in by 1½in. white wood, and glued to this is a front panel



A non-resonant cabinet for an extension speaker.

with a hole cut for a fret. The sides, top and bottom are of the same material, i.e., 3-ply wood. A piece of clean, old carpet is next glued on the edges and placed inside the box as padding, the speaker is held firmly in place by means of a wood strut shaped to fit snugly round the back of the speaker as illustrated. A few pieces of rubber and a coat of paint or varnish completes the cabinet.—E. WILLIAMSON (Bridlington).

An Efficient Midget-valve Screen

IN the construction of a midget receiver recently, I found that unless adequate screening was given to the screen-grid valve owing to its close proximity to other components, a percentage of instability arose which could not be overlooked; I therefore constructed the novel screen illustrated. Apart from deriving its chassis connection from two solder tags, I increased its efficiency on the short-wave bands by earthing again directly to the filament negative valve socket.

Having cut a piece of copper foil to the dimensions shown, all that remained was

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

SPECIAL NOTICE

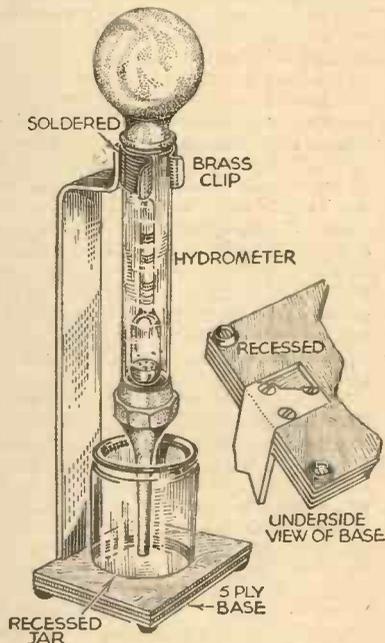
All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

for the top and bottom sections to be turned over, thus when fitting and removing the X.S.G. valve, the possible scratching of one's fingers on the otherwise sharp edge of copper was prevented.—V. G. HENCHWORTH (Norwich).

A Neat Hydrometer Drip Stand

THE accompanying sketch illustrates a rather novel hydrometer stand which I have recently constructed. A strip of mild steel constitutes the main support, and to this is soldered a brass clip made from a strip of 3/32in. brass. The main support is recessed into the base, and four small rubber feet, screwed on as shown, prevent the stand from slipping. The small jam jar is also recessed to the depth of three thicknesses of ply, and its fitment into

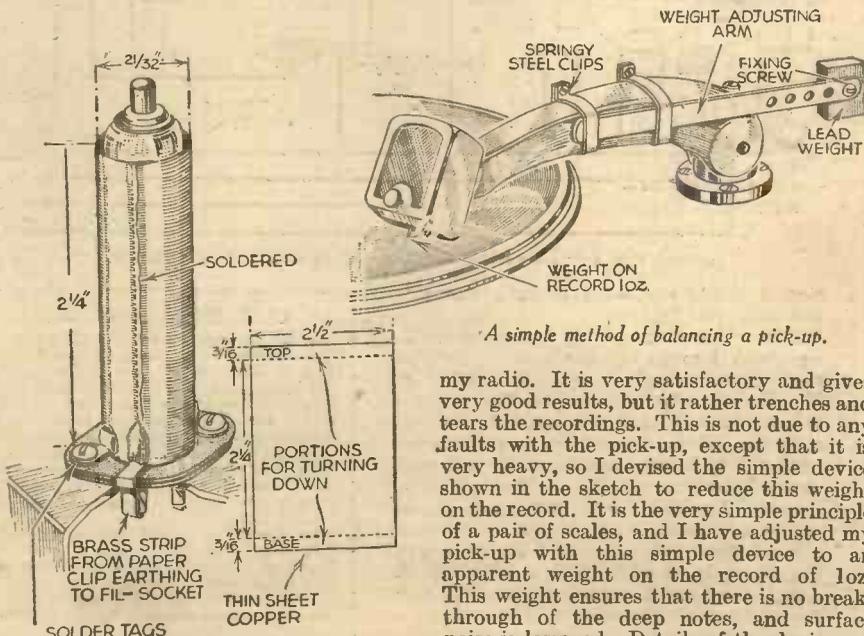
the base in this manner should be tight, yet providing ease of removal when required.—A. R. THORPE (Anerley).



An easily-made drip stand for a hydrometer

Balancing a Pick-up

FOR some time I have been using a cheap pick-up for gramo reproduction with



A simple method of balancing a pick-up.

my radio. It is very satisfactory and gives very good results, but it rather trenches and tears the recordings. This is not due to any faults with the pick-up, except that it is very heavy, so I devised the simple device shown in the sketch to reduce this weight on the record. It is the very simple principle of a pair of scales, and I have adjusted my pick-up with this simple device to an apparent weight on the record of 1oz. This weight ensures that there is no breakthrough of the deep notes, and surface noise is lessened. Details of the device are clearly shown in the illustration.—W. FEATHERSTAN-KIRK (Ferring-on-Sea).

This efficient midget-valve screen is made from a piece of copper foil.

Working to amplifiers being so often associated with high-power outputs, it has become common to think of them as being essentially mains operated, therefore, in view of this and the number of requests received for a battery-operated outfit, the unit mentioned above has been designed. To the many readers who have made such requests, and who may require something different from that given below, I would draw their attention to the latest edition of "Sixty Tested Wireless Circuits," wherein will be found much valuable information, together with complete circuits, concerning amplifiers and their design.

The first consideration with any battery-operated apparatus is current consumption. The second, at least so far as amplifiers are concerned, is the output obtainable. Bearing in mind the fact that these two requirements are very closely related to each other, and that dry H.T. batteries are likely to be the source of anode current supply, limits to suit both factors had to be selected, and it soon becomes apparent that it is absurd to think in terms of 4, 5, or 6 watts output, as so many constructors would desire.

If one can eliminate the question of dry H.T. batteries by, say, using large-capacity H.T. accumulators or, for example, a Milnes Unit, then the output can be raised considerably, but, even so, one cannot soar to the large outputs obtainable from some of the mains-operated "power" amplifiers.

So many pick-up enthusiasts appear to have the impression that unless an amplifier can deliver, say, 5 watts of undistorted output, it is not worth considering for record reproduction. Well, I suppose it is a matter of personal taste, but, bearing in mind that one is usually concerned with using the equipment in a room of average

# A 2½-WATT BATTERY-OPERATED A

A Simple, Compact and Very Efficient Amplifier for Pick-up and Microphone Work When Electricity Supplies are not Available

tions, and decided on an output of 2½ watts.

## The Circuit

The valve sequence is one L.L.2 which has an amplification factor of 30 feeding into two pentodes, P.P.225's, arranged in quiescent push-pull, the coupling being provided by a Varley Q.P.P. transformer type D.P.36 which is parallel fed to allow the utmost inductance to be obtained from the primary winding to ensure a good bass response.

The normal output of one P.P.225 with 135 volts on the anode and auxiliary grid, and with its grid biased 12 volts negative, is 1,000 milliwatts, or 1 watt, therefore, with two in the above output circuit, it is safe to estimate that at least 2½ watts will be obtained, providing the anode and bias voltages are correctly adjusted.

The current consumption of the L.L.2, with 135 volts on its anode, is approximately 3 m/As, while each P.P.225, under normal working conditions, will draw as much as 18 m/A in the anode circuit and 2 m/A in the auxiliary grid circuit. These figures, at first sight, seem rather drastic for battery operation, but one must not overlook the fact that with Q.P.P. output the two P.P.225's are so heavily biased that their

standing current becomes very low and large current surges only take place during the handling of powerful passages in the input signal.

It is impossible to go into the whys and wherefores of Q.P.P. operation in this article, but it will suffice to say that the whole secret of satisfactory output, and distortion-free reproduction, is the correct adjustment of the grid bias with relation to the actual anode potentials.

The output from a normal pick-up will provide adequate input for the output valves as the L.L.2 has a fairly high magnification factor, while the coupling

transformer has a ratio of 1:9. So far as microphones are concerned, a lot depends on the type and their actual efficiency, and with a high sensitivity model a satisfactory output will be obtained; but with others having a lower output, such as high quality transverse current and moving coil types, it will be advisable to provide a simple "head" amplifier in the form of, say, a good straight H.F. pentode resistance-capacity coupled to the L.L.2.

## Input Controls

Two variable controls are provided to allow two inputs to be controlled and

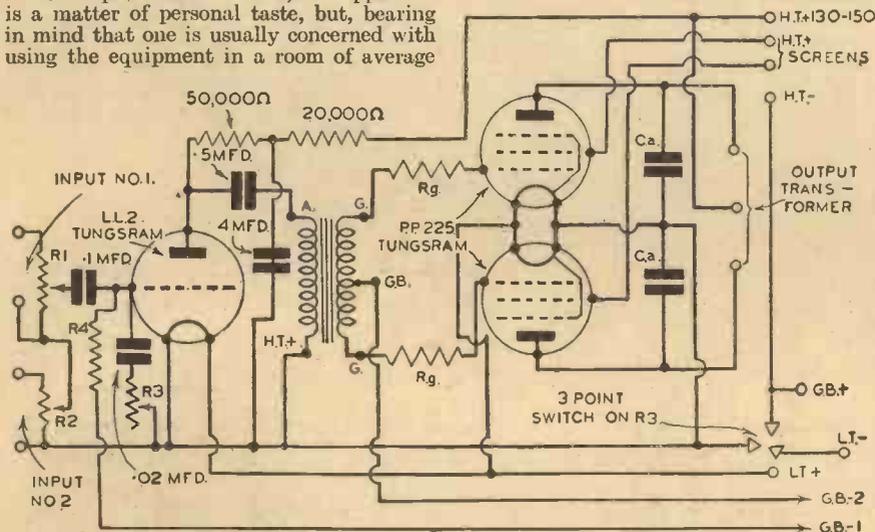


Fig. 1.—Theoretical circuit of the 2½-watt battery amplifier.

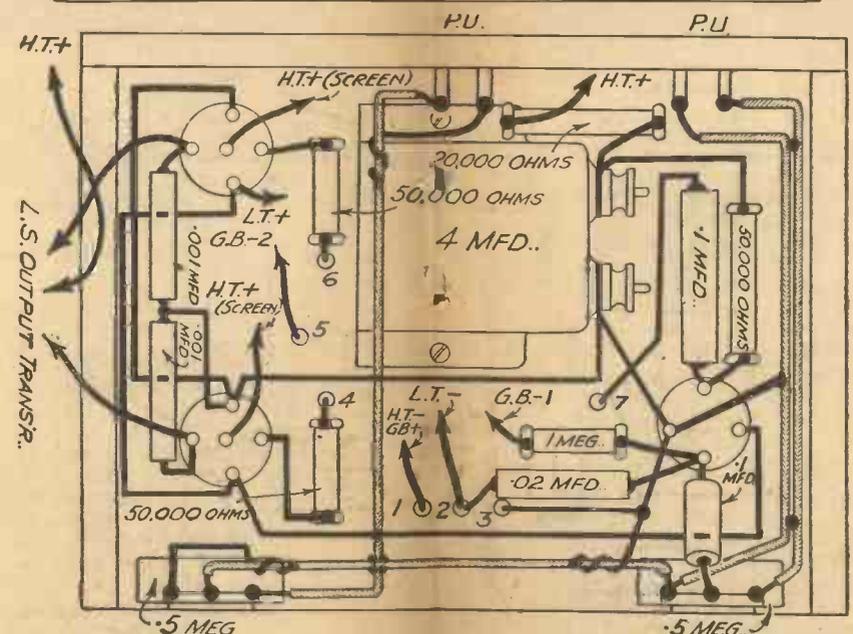
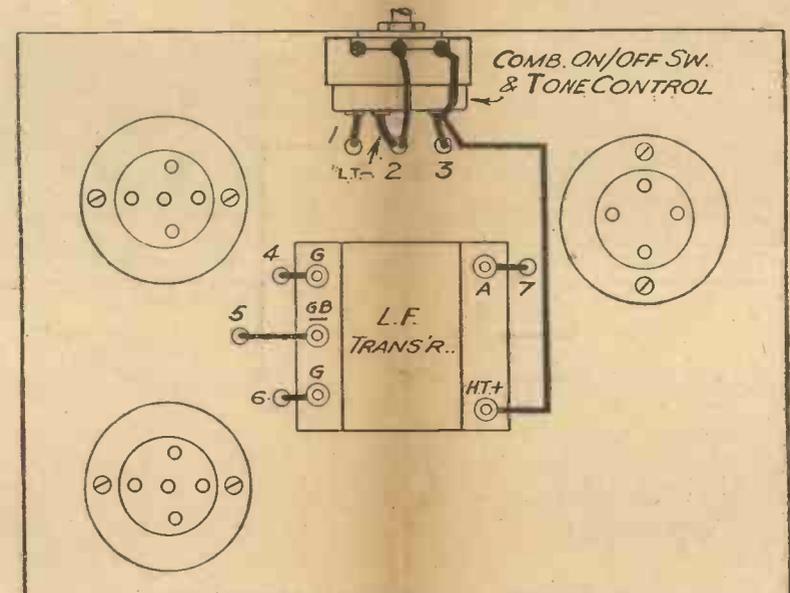
size, I would suggest that such power is out of all proportions.

From the reproduction point of view, by which I mean judging aurally, I maintain that an output system capable of handling 2 watts is more pleasing, when it is fully loaded, than a 5- or 8-watt outfit with the volume turned down to the same output. However, whatever the pros and cons of the case may be, it is always wise to remember that the ear is not too critical as regards intensity of sound when considered from the point of view of watts. For example, it would take a very experienced ear to differentiate between 3- and 5-watts output, therefore I have selected a happy medium, remembering other limita-

## LIST OF COMPONENTS

- One 50,000-ohm 1-watt resistance, Erie.
- One 20,000-ohm 1-watt resistance, Erie.
- Two 50,000-ohm half-watt resistances, Erie.
- One 1-megohm half-watt resistance, Erie.
- One 4 mfd. fixed condenser, type 50, T.C.C.
- Two .1 mfd. fixed condensers, type 250, T.C.C.
- One .02 mfd. fixed condenser, type 300, T.C.C.
- Two .001 mfd. fixed condensers, type 300, T.C.C.
- One 4-pin valveholder, chassis type, Clix.
- Two 5-pin valveholders, chassis type, Clix.
- One 25,000 ohm potentiometer, with three-point switch, Erie.
- Two .5-megohm potentiometers, Erie.
- Two socket strips, P.U., Clix.
- One Q.P.P. transformer, type 36, Varley.
- One L.L.2 valve, Tungstram.
- Two P.P.225 valves, Tungstram.
- Wooden chassis, screws, wire and Systoflex.

## WIRING DIAGRAMS



# AMPLIFIER

ork

"mixed" before being fed into the grid circuit of the L.L.2, thus allowing two pick-ups or one pick-up and a "mike" to be used according to individual requirements. This item is always very handy as it increases the uses of the amplifier considerably apart from giving the operator greater scope so far as results or effects are concerned.

The third control R.3 is a combined potentiometer and switch, the potentiometer section being used as a tone control while the switch is wired to cut off all batteries. It will be noted that the tone control is really a low note booster or high note cut-off, but the values have been selected to provide a most satisfactory variation in the tonal response and it will be found very useful for the elimination of record surface noise or needle scratch. It must be appreciated, when considering this arrangement, that the natural characteristics of the amplifier are on the high side, so any additional form of high note booster is not required, in fact, it would be detrimental.



Fig. 3.—The amplifier, with all parts in position ready for wiring.

The transformer is placed so that the grid leads to the two output valves are short and direct, the resistances  $R_g$  being included to prevent, in conjunction with the two fixed condensers  $C_a$  between each anode and the negative line, parasitic oscillations which are sometimes generated in symmetrical push-pull circuits.

The anode circuit of the L.L.2 is decoupled by means of a resistance and a condenser to eliminate any possible instability through battery coupling, but the anodes of the P.P.225's receive their H.T. via the output or speaker transformer. No output transformer is

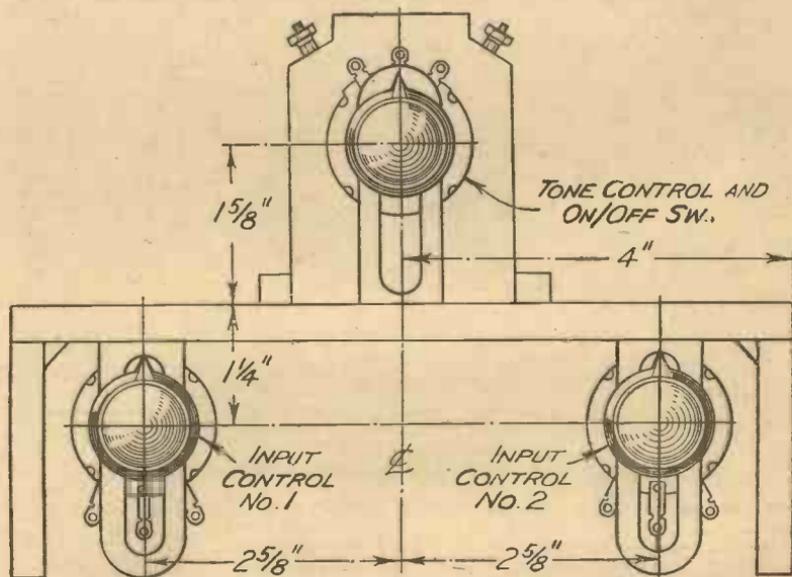


Fig. 2.—Panel layout or drilling diagram.

## Layout

It will be seen, from the illustrations, that a small simple chassis has been used to hold all components, as this allows a clean top deck to be obtained and facilitates wiring. It will be quite an easy matter to build a compact cabinet round the chassis or, if a more professional appearance is required, to make a cover to fit into the top of the chassis out of stout perforated zinc.

included in the amplifier as the majority of modern moving-coil speakers are fitted with a multi-ratio transformer which usually allows satisfactory matching to be secured.

Particular attention must be given to the connecting wires associated with the two input controls. As these potentiometers are in direct contact with the input grid, it is essential to cover all connecting wires with metallised braiding.

# Early Experiments in Car Radio

An Interesting Account of the First Radio Equipment Installed in a Motor-coach in 1923. By L. ORMOND SPARKS.

**A** BRIEF announcement stated recently that a fleet of 350 motor-coaches was being fitted with radio installations by one of the large radio manufacturers.

It is highly possible that the layman did not register any great interest or amazement in the statement. Why should he? Car radio is, to-day, quite a common thing. It has been fitted in aeroplanes and trains, so why not in motor-coaches?

To me, however, the announcement was of great interest. Not from the point of view of progress, as my remarks will show, but for the fact that it aroused memories, and made me wonder what the coach people had been doing since the early days of 1923, when I successfully equipped the first—so far as I have been able to ascertain—motor-charabanc with radio.

The radio receivers and transmissions of to-day are vastly different from those of 1923. With modern equipment, it is possible to receive radio programmes under almost any conditions, with little more trouble than switching on the average home receiver, therefore, it is, I suppose, quite natural for the public to take these additional applications of radio as part and parcel of the period in which we live.

In 1923 the passengers who patronised the charabanc mentioned above were so

would involve to-day.

## The Installation

When I first had the idea of equipping a motor-coach, I was fortunate enough in securing the whole-hearted co-operation of the largest local motor-coach firm, the Royal Blue Coaches, of Bournemouth, and of my then employers, Bright's Stores, of the same town.

I decided to use the "Gecophone" apparatus which was produced by the General Electric Company, but I was up against the trouble of obtaining sufficient amplification H.F. or L.F. under the conditions prevailing.

After several experimental trips to determine the best type of aerial to use, the circuit most suited to my requirements, and the elimination of interference from the car, I eventually fixed on the following:

The receiver consisted of a two-valve "Gecophone" receiver which employed a triode H.F. stage coupled to the triode detector by a tuned-anode coupling. This particular circuit had a rather neat reaction control, bearing in mind the P.M.G.'s limitations on reaction in those days, and I well remember how I used to have to set



The author adjusting the "Gecophone" receiver during the initial tests.

the coach. For compactness, I mounted all the apparatus in a long, stout wooden case provided with two clamps which allowed it to be fixed to the back of the seats immediately in front of the rear seating compartment, which then became the operating cabin. The batteries were all contained in a separate case on the floor below the receiver cabinet.

## Fitting the Headphones

To enable the output to be distributed throughout the coach, a two-pin plug was fitted in front of each seat, thus allowing every passenger to plug in their headphones at will, a small hook being provided so that the headphones could be hung up when not required. The aerial was eventually fixed in the manner shown in the photograph, its height being such that it did not interfere with the passengers getting in or out of the coach.

At the time these experiments, and when the trips were being carried out, the Bournemouth broadcasting station was not in being, so I had no alternative but to work to Cardiff which, it will be remembered by the older enthusiasts, did not radiate a fraction of the power in use to-day. However, I used to get her quite well and, what is more, hold her during the trip round the country.

After many final experiments the day or rather evening arrived for a demonstration trip; and I don't mind confessing that, as satisfied as I was with the outfit, I was not too sure about the evening in front of me. I must have switched on and off, checked batteries and adjusted the receiver a dozen times before the coach, all spick and span, complete with driver and conductor and myself in the "operating" compartment, drove up to the appointed spot to pick up our passengers, which included members of the local Council, the Press and directors of the two firms concerned. Needless to say, my directors were also rather anxious that the outfit would not let us all down, and feeling for them did not make it seem too much like a picnic for me. However, we drove off in style, complete with a large banner right across the front of the coach, and headed for Wimborne.

## The Trial Demonstration

A few miles out of Bournemouth the coach stopped and I was asked to switch on or, in other words, prove my stuff. I well remember the moment I switched on and donned my headphones, and my silent sigh of relief when, lo and behold, Cardiff was doing her share of the act and coming through really well. I signalled for the

(Continued on opposite page)



A halt while Cardiff was tuned in during the first demonstration run to Wimborne. The aerial system is supported by the four vertical rods.

frankly amazed and impressed with the results that they forgot, for once in their lives, the quaint old British characteristic of taking anything and everything as it comes, without showing the slightest surprise or emotion, and plied me with many questions concerning the outfit. One very sceptical old lady almost insisted that I had "a gramophone contraption" fitted under the seat or somewhere.

Some of the older radio enthusiasts will appreciate that the gear and valves available in 1923 made the whole matter very different from what the same achievement

it just so to get stable and consistent results.

The output from the detector had, of course, to be amplified. Well, there were no high-efficiency pentodes or high-gain amplifiers to be had then, so I had to experiment with two single-valve L.F. units, until I got them to work peaceably together with good quality output. Two transformer-coupled stages of that period, with the old "R" type valves, could cause some weird results; still, in the end everything turned out all right, and it was only a question of where to house the gear and how to equip

**EARLY EXPERIMENTS IN CAR RADIO**

(Continued from previous page)

others to put on their 'phones and watched their expressions of surprise and satisfaction as they listened to the programme.

I then passed the signal for the driver to start up and we proceeded towards our destination. The item being radiated was a selection from popular operas, and I suppose my luck was in, as the piece did not finish until we came to a stop in the quaint old market place of Wimborne. After a short stop for refreshments to celebrate the occasion, the return trip was commenced, a different route being taken, and I still remember the great feeling of satisfaction as Cardiff wished us "Good night" and concluded her programme, as did all stations in those days, with "God Save the King," which we heard perfectly as we sped homewards through the darkness.

There is little more to say regarding the equipment or its use, other than to add that it continued to function perfectly throughout the rest of the summer, the coach owners running special Radio trips

every night, and the way the seats were booked in advance proved that it was appreciated by all.

Fifteen years is a long time, and much has happened, so far as radio is concerned, since those pioneer days of broadcasting, therefore, it does seem rather strange that those responsible for the comfort of travellers, especially over long distances by road, have not exploited before that which I did, with the help of my co-operators, back in 1923.

**PRACTICAL MECHANICS' HANDBOOK**

ALL mechanics will be interested in the valuable gift book which has been produced by F. J. Camm for readers of "Practical Mechanics." This is a work such as has never been previously published. This book is available for only 2/- and coupons cut from two consecutive issues of "Practical Mechanics," which is published at 6d. monthly. Further details, and a reservation form, will be found in the May issue of "Practical Mechanics," now on sale. When the presentation edition is exhausted the "Practical Mechanics Handbook" will cost 5/-.

**COMING TELEVISION PROGRAMMES**

**Molière**

**MOLIÈRE'S** best known farce, "Le Médecin malgré lui," will be presented in the afternoon on June 17th, and again in the evening on June 21st. On Sunday, June 19th, "100 Years Old," the comedy of Spanish village life by Serafin and J. Alvarez Quintero, will be seen in the English version by Helen and Harley Granville-Barker.

**"Badger's Green"**

**VIEWERS** who remember the televising of "Journey's End" on Armistice Day, last year, will look forward with special pleasure to "Badger's Green," the cricket play by the same author, R. C. Sherriff, to be presented in the afternoon on June 22nd and again in the evening programme on June 28th. "The Thread of Scarlet," a thriller by J. J. Bell, will be televised with an all-male cast in the evening of June 25th.

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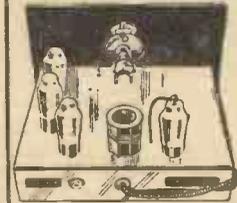
**THE PILOT SHORT WAVE EXPERIMENTER**

... booklet is recommended to every "Practical Wireless" reader. Fully describes the two following efficient short-wave sets and 6 others. Build a Pilot Short-Wave Set and be completely satisfied.

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Kit "A" Complete Kit of Parts for building this wonderful Short-Wave Receiver. Circuit is aperiodic H.F. followed by tuned detector grid, resistance capacity coupled to the 1st L.F. valve which is transformer coupled to high efficiency output pentode. Less valves, cabinet and coils, Cash or C.O.D. Carriage Paid £2/5/0 or 4/- deposit and 11 monthly payments of 4/2. KIT "B" As Kit "A" but including four matched valves. Cash or C.O.D. £3/2/8 or 8/7 Deposit and 11 monthly payments of 6/7. Set of 4 Coils, 8.5 to 97 metres. 10/- or add 11d. to deposit and each monthly payment.

**PILOT 8-IN-ONE S.W. KIT.** The most comprehensive Kit ever offered. Comprising all parts to build alternatively 8 Short-Wave Battery Receivers, 1-4 valve circuits all different. Complete with 8 coils, 4 Valves, instructions and 8 Blueprints. List Value £7/8/6. Special price £5 9s. 0d. or 7/6 down and 14 monthly payments of 8/- Steel cabinet and panel 14/8 extra or add 1/- to deposit and payments.

**"TROPHY" SHORT-WAVE SETS.** The most efficient self-contained Short-wave sets ever offered. WELL WORTH DOUBLE THE PRICE. Complete in steel cabinet with moving-coil speaker fitted and provision for headphones. Wavelength 12-52 metres, but tuners available for 6-500 metres. Battery Model £5 15s. 0d. or 7/6 down and 18 monthly payments of 7/-, A.C. Model, 6 gns. cash or 7/6 down and 18 monthly payments of 7/8. Headphones with Plug fitted 7/8 extra. Complete specifications on request.

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**P.W. DEAF AID**

Described in June 4th issue.

**KIT "A" Cash or C.O.D. Carriage Paid 37/-**

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2 MULLARD valves: DA1, 15/-; DA3, 15/- £1 10 0  
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4 WAVEBANDS: 14-31, 28-62, 200-550, 900-2,000 metres.  
● Slow-motion drive 8-1 and 100-1. ● Low-capacity switch. ● Airplane dial (stations and wave-lengths) ● 12 months' guarantee.

Overall size: 9" high; 11 1/2" wide; 9" deep

**BRIEF SPECIFICATION:** Provides reception from all parts of the world. Variable selectivity. Stove enamelled steel chassis. Screened coils. Low H.T. consumption. 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. £5/19/6 or 5/- down and 11 monthly payments of 7/6.

**9-VALVE A.C. ALL-WAVE SUPERHET Chassis.** Amazingly efficient, new circuit arrangement, 10-2,000 metres, new Epicyclic Tuning, Plate glass station-name Dial. Automatic Volume Control. Provision for Pick-up. World-wide reception guaranteed. 7 watts output. Complete with all valves, less speaker. Fully guaranteed. £11/19/6 cash or 17/- down and 15 monthly payments of 17/-.

**A.C. BANDPASS S.G. FOUR CHASSIS.** Excellent opportunity. 3 watts output. Provision for Pick-up. Engraved dial. 200-2,000 metres. Complete with 4 valves. Fully tested. 59/6 cash or 5/- down and 12 monthly payments of 6/-. With specially matched mains speaker. £3/19/6 cash or 5/- down and 11 monthly payments of 8/3.

**S.T. 900 BATTERY ALL-WAVE KIT WITH FREE BLUE PRINT AND INSTRUCTIONS.**

Build now this amazing all-wave receiver tuning from Television to 2,000 metres. Kit "A" comprising ALL parts less coils and valves, but with free station-name dial and full constructional details. 55/6 cash or C.O.D., or 5/- down and 11 monthly payments of 5/3.

**SPECIAL OFFER**

**EXTRACTOR KIT.** Special offer of this S.T.900 special selectivity device. List Value 13/6. OUR PRICE 10/6.

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**ALL-WAVE AERIAL.** Absolutely essential for present-day good listening. Complete outfit for instant erection with all aerial and lead-in wire, transformer, insulators, and instructions. List value 37/6. Special Price 17/6 cash or 2/6 down and 7 monthly payments of 2/8.

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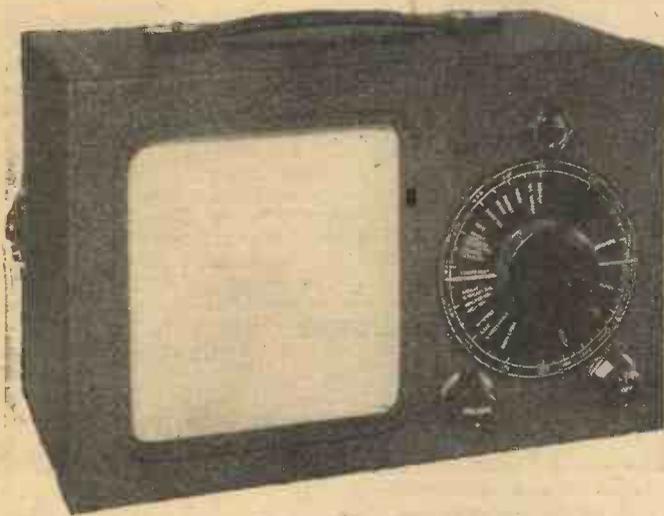
**5/- DOWN**

# THE "ATOM" PORTABLE

A New Miniature Portable Embodying the Superhet Circuit and Incorporating Standard Batteries

THE "Atom" Portable, supplied by Gordon Elf, Ltd., is one of the new season's designs embodying a number of interesting details. The overall size

of the cabinet is only 11½ in. by 7½ in. by 6½ in. and this houses a complete 4-valve superhet chassis, moving-coil loudspeaker, frame aerial and two standard batteries.



The neat appearance of the "Atom" Portable may be gathered from this illustration.

of the cabinet is only 11½ in. by 7½ in. by 6½ in. and this houses a complete 4-valve superhet chassis, moving-coil loudspeaker, frame aerial and two standard batteries.

These are a 99-volt standard Drydex unit and a 2-volt 20 A.H. L.T. cell. The frame aerial is accommodated in the rear door of the cabinet which is shaped for the

purpose. The superhet circuit is built round the latest Mazda Octal-base valves and a two-gang condenser is employed for tuning the aerial and oscillator stages. A

## Controls

A special slow-motion drive is incorporated in the novel dial on the front of the cabinet and a small aerial trimming condenser is fitted above this to enable maximum results to be obtained on both wavebands. The two remaining controls at the bottom of the tuning dial are for volume and combined on-off and wave-change switching.

At the rear of the cabinet two sockets are fitted and connected to the frame aerial, so that an external aerial and earth may be connected when desired. The dial is calibrated with station names and a very good selection of programmes is available on the frame aerial alone. When an external aerial is connected the results are, of course, greatly improved, although selectivity suffers slightly. The quality of reproduction is very good for the type of receiver, and the 6 in. moving coil speaker provides not only substantial volume but also a very well balanced tonal quality. The total H.T. consumption is less than 8 mA, and the accumulator which is provided will give good service before recharging is necessary.

The selectivity, due to the incorporation of a frame aerial and the superhet circuit, is adequate to provide all the programme separation that is normally desired, and there is no undue high-note cutting. The total waverange covered by the set is from 200 to 2,000 metres, and the receiver is available complete with batteries for £8 8s.

## IMPORTANT BROADCASTS OF THE WEEK

### NATIONAL (261.1 m. & 1,500 m.)

Wednesday, June 15th.—Hail Variety:

No. 6.—Cockney Comedian.

Thursday, June 16th.—The Skipper's Birthday; a harbour night's entertainment, written by F. Morton Howard.

Friday, June 17th.—Die Meistersinger, Acts 1 and 2, from Covent Garden.

Saturday, June 18th.—Music Hall.

### REGIONAL (342.1 m.)

Wednesday, June 15th.—La Bohème, Acts 1 and 2, from Covent Garden.

Thursday, June 16th.—A commentary on the Ascot Gold Cup.

Friday, June 17th.—International Society of Contemporary Music: first orchestral concert, from Queen's Hall, London.

Saturday, June 18th.—Life Begins at Sixty: a revue by Denier Warren.

### MIDLAND (296.2 m.)

Wednesday, June 15th.—A Violin Recital.

Thursday, June 16th.—The Trout Fisherman at Work: an outside broadcast from a Shropshire stream.

Friday, June 17th.—Variety from The Hippodrome Theatre, Aston.

Saturday, June 18th.—Gilbert and Sullivan Music: orchestral programme.

### NORTHERN (449.1 m.)

Wednesday, June 15th.—Lightweight T. T. Race; commentaries from Isle of Man.

Thursday, June 16th.—Book Censorship in Bumbleton; written by Frank Tilsley.

Friday, June 17th.—Senior T.T. Race; commentaries from Isle of Man.

Saturday, June 18th.—Diocesan Festival Choirs, from Wakefield Cathedral.

### WEST OF ENGLAND (285.7 m.)

Wednesday, June 15th.—Concert Party, from the Cosy Nook Theatre, Newquay.

Thursday, June 16th.—Dance Cabaret from the Headland Hotel, Newquay.

Friday, June 17th.—Composers of the West—Giles Farnaby: vocal and instrumental programme.

Saturday, June 18th.—Victorian Vignette—further extracts from the diary of Miss Lavinia Dowsett.

### WELSH (373.1 m.)

Wednesday, June 15th.—Welsh Professional Golf Championship: an eye-witness account.

Thursday, June 16th.—Gwiber Emlyn (The Viper of Emlyn): feature programme.

Friday, June 17th.—Choral programme from The Powis Hall, Bangor.

Saturday, June 18th.—Melodies of Wales: Soprano solos.

### SCOTTISH (391.1 m.)

Wednesday, June 15th.—Round the Tower: news from Bellahouston.

Thursday, June 16th.—Circus Memories: feature programme.

Friday, June 17th.—Concert Party, from the Beach Pavilion, Aberdeen.

Saturday, June 18th.—Selkirk Common Riding: feature programme (recorded).

### NORTHERN IRELAND (307.1 m.)

Wednesday, June 15th.—La Bohème, Acts 1 and 2, from Covent Garden, London.

Thursday, June 16th.—Chamber Music.

Friday, June 17th.—Irish Dance Music.

Saturday, June 18th.—Dean Swift, a programme by Denis Johnston.

## A TELEVISION PLAY

### "Lady Precious Stream"

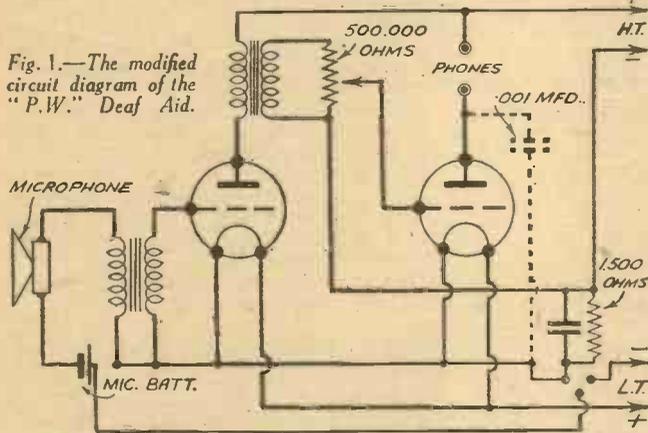
THIS delightful play in the traditional Chinese manner which had more than eight hundred performances in London, will be presented in the Alexandra Palace studios in the afternoon on June 15th. This story of a Prime Minister's daughter who marries Hsieh Ping-Kuei, the gardener, is banished by her family, and sees her gardener return as a conquering potentate, will be produced more or less as it was first seen two thousand years ago. The settings are left to the imagination, actors knocking at invisible garden gates, stepping through unseen doorways and galloping gaily on non-existent horses. An "honourable reader" makes things clear for Western audiences. "Lady Precious Stream" will be repeated in the evening programme on June 17th.

# THE "P.W." DEAF-AID

How to Increase the Sensitivity of this Useful Device and an Economy Hint - - - By W. J. DELANEY

THE deaf-aid which was described in our issue dated June 4th last has aroused keen interest, and two small points have arisen from the various letters which we have received regarding this device. Firstly, the problem of the life of the biasing cell has arisen, principally because this in the original design is continually in circuit with the microphone. The current which flows is quite small, and it was assumed in the original design that the aid would be used fairly continually during the day. Consequently, it was not

the microphone circuit as well as the L.T. circuit, and a slight change in the connections to the switch is required. Fig. 1 shows the modification, from which it will be seen that three points on the on-off switch are used, and these are now joined to the L.T. negative leads instead of to the positive leads. Fig. 2 shows the theoretical circuit with the modification incorporated, and it should be found quite a simple matter to make this change. It is not thought necessary to give the modified theoretical diagram as the change should be obvious if the accompanying illustrations are studied in conjunction with those in our issue dated June 4th last.



considered worth while to economise on the small cell, seeing that it costs only a small sum. It is possible, however, to lengthen the life of this cell, if the aid is only needed for occasional use, simply by arranging that the on-off switch breaks

for long-distance work, it will be found worth while to increase the voltage of the microphone battery. The case is large enough to accommodate a normal 4.5 volt flash-lamp battery of the flat type, and this may, therefore, be used

## Improving Sensitivity

The sensitivity of the microphone input is dependent upon the energising source, and the 1.5 volt cell specified will give sufficient sensitivity for all normal requirements. Where, however, the aid is needed for anyone who is very hard of hearing, or where it is to be used

in place of the small cylindrical cell already mentioned. The lead from the microphone transformer will have to be lengthened so that it will enable the battery to be placed on top of the H.T. battery (above the two valves), the remaining lead from the battery being shortened so that it reaches just to the microphone surrounding ring. Connection to the battery may be made by soldering the leads to the brass strips on the battery, or by bending the ends of the strips in the form of a small ring and using ordinary wander plugs for the purpose. It may be mentioned, in conclusion, that the earpiece should not be permitted to face

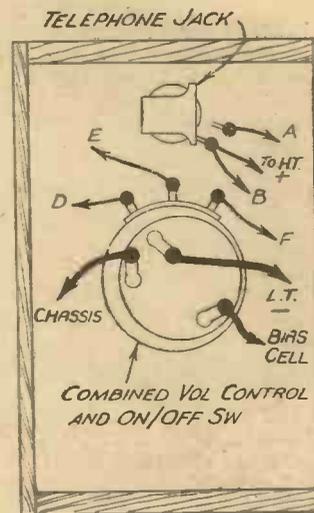


Fig. 2.—This diagram shows the modification to the switch.

the microphone, as this will result in a microphonic howl, and in general it may be stated that the microphone should always be kept pointing away from the earpiece—hence the reason for placing the control and 'phone connection at the back of the cabinet.

### NORTH MANCHESTER RADIO SOCIETY

At a meeting held at 14, Fairfax Road, Prestwich, on Sunday, May 29th, the above society was successfully re-formed. Mr. R. Lawton, of Whitefield, was reappointed as secretary, and the other officers appointed were Mr. A. Park, of Prestwich, as chairman, and Mr. K. Bailey, of Manchester, as technical adviser. It was agreed that meetings be held fortnightly, on Sundays. The membership fee has been fixed at 6s. per year, payable in two half-yearly payments of 2s. 6d. The problem of membership certificates, etc., was discussed and arranged, and arrangements were also made for morse instruction to be given at all future meetings for those interested. In a few weeks' time the society will have its own receiving equipment, etc., and in addition to this there will be commercial types of short or all-wave receivers so that members may get an opportunity of hearing the various models for themselves. One of the plans for the future is that the society obtain a transmitting licence, so that members may carry out more interesting and elaborate experiments. The society is still open to receive more members. Secretary, R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, Near Manchester.

### CARDIFF AND DISTRICT SHORT-WAVE CLUB

THE above club has been active during recent weeks, and at a meeting held on May 26th, R. T. Mathews (GWSAM) gave a very interesting lecture on "B.C.L. Interference Cures." Future meetings of the society are being held fortnightly during the summer months and dates and lectures for these meetings are as follow: June 23rd, Radio Society of Great Britain meeting at which transmitters will be discussed; July 7th, "Propagation," by H. H. Phillips (2BQB); July 21st, Radio Society of Great Britain. Transmitting discussions; August 4th, to be arranged. Any person interested in the activities of the society is requested to write to the Hon. Secretary, H. H. Phillips, 132, Clare Road, Cardiff, enclosing a stamped addressed envelope.

### BRADFORD SHORT-WAVE CLUB

RAPID progress is being made with the new transmitter in readiness for the coming field day, and the construction committee is busy assembling the necessary gear to make this event a huge success.



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.

GSJD and G3KB are supervising the assembling of the "rig," as GSJD has been appointed operator of the club's transmitter, and it is hoped that test calls will be sent out from this station within the next week or two. Anyone interested in the club's activities or who would like to participate in the coming field day, should write to the secretary, S. Fischer (2BMO), "Edenbank," Highfield Ave., Idle, Bradford.

### LONDON TRANSMITTING SOCIETY

A WELL-ATTENDED field day was held on Whit Monday starting at Headquarters at 10 a.m. Tents were erected at Elstree, in grounds kindly lent to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by 2DRC, for field days, and also a DF aerial by 2DFU. A film of the event was taken by 2CBG, of Kodak, Ltd. Fixtures for June include: Field days, June 19th and 26th; National Field Day, July 3rd. The council of the London Transmitting Society have decided that our club notices in future will appear each week in PRACTICAL AND AMATEUR WIRELESS only: will our members please note.

Morse lessons are given every Thursday at 8 p.m. by 2DWS. Membership, which is free, is open to all holders of "AA" or full transmitting licence, who should apply on their QSL card, enclosing 1d. stamp to the hon. sec., G. Yale, 40, Raeburn Rd., Edgware.

### CHADWELL HEATH AND DISTRICT AMATEUR RADIO SOCIETY

ON May 24th, the above club held a very successful junk sale, over which G8PL presided as auctioneer. A sum of 30s. was raised, and a substantial contribution made to the club funds. On May 31st an interesting lecture was given by G8TV, who spoke on television, and illustrated by means of diagrams all the latest developments in this field of radio.

Meetings are held every Tuesday evening, commencing 8 p.m., at 7, The Broadway, Chadwell Heath (trolley-bus terminus). Morse code instruction is available at every meeting for those who wish to improve their code.

The club is going steadily ahead, and 21 members now hold "G" or "AA" licences, the latest being 2DWJ, 2DXL and 2DVA.

New members are invited to any meeting, and will receive a hearty welcome.

Hon. Sec., Rowland C. E. Beardow (G3ET), 3, Geneva Gardens, Chadwell Heath, Essex.

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# NEWS FROM THE TRADE

## Coulphone Transformers

THE accompanying illustration shows the robust nature of the mains transformers supplied by Coulphone Radio Mfg. Co., Ltd., of Ormskirk, Lancs. These are of the super shrouded type, and the mains input regulation is effected by means of the



One of the Coulphone Transformers referred to here.

small screw terminal seen on the insulated strip at the top. The regulation is exceedingly good and the transformers run without undue heating. Various models are available, and all are colour-coded in accordance with the standard code employed for this type of component. Special models will be supplied to order, but amongst standard models may be mentioned the following: 350-0-350 at 60 mA. with rectifier heater winding at 4 volts 2.5A. and a 4 to 6A. winding for ordinary 4-volt heaters, which costs 12s. 6d. The model illustrated costs 25s. and delivers 425-0-425 volts at 150 mA., and has 4 volt 2.5A., 4 volt 4A. and a 4 volt 6/8 amp. windings. In addition to mains transformers Messrs. Coulphone can supply output transformers of the heavy-duty type, including a super shrouded model with secondary output, windings of 8 and 15 ohms. impedance suitable for Rola G12 or similar speakers, which costs 22s. 6d. All transformers carry a full 12 months guarantee.

## New Tungram Battery Valves

AMONG the new battery valves now available in the Tungram range are the H.F. pentodes, in both the straight and the variable-mu types. Both of these valves have the grid taken to the top cap, and both are of the high-slope type. The SP2D (the straight model) has a .1 amp. filament, and is rated at 150 volts maximum for anode and screen. The slope

is 1.7 mA/V and the maximum current is 10 mA. The VP2D, which is the variable-mu model, has similar ratings, but the slope is 2 mA/V. These valves are very useful in modern all-wave receivers, and the top-cap grid connections will greatly reduce losses and facilitate wiring—the standard 7-pin base, is, of course, provided. The price is 11s. each.

## Hivac C.R. Tube

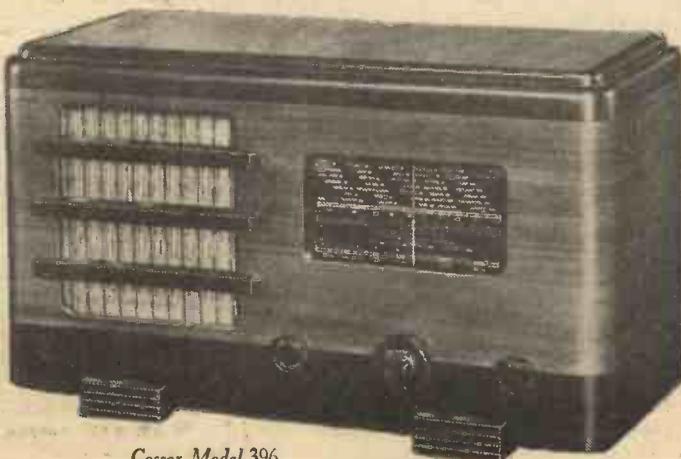
A USEFUL low-priced cathode-ray tube has been produced by the High Vacuum Valve Company and is known as type CR3. This has a 3in. screen and the heater is rated at 2.5 volts 2 amps. The voltage for anode 1 is 400 and for anode 2 it is 1,200 maximum. The negative grid voltage for current cut-off is -50 volts approximately, and the overall length of the tube (including the pins) is 11ins. The image colour is a brilliant green, and the price of the tube is £2 2s.

## New Cossor Model

THE illustration shows a new Cossor All-wave A.C. mains receiver, known as Model 396. This is a 6-valve chassis incorporating a high-gain H.F. amplifier operating on all wave-bands, ensuring a very long range and also freedom from background noise. An 8in. moving coil speaker is fitted and the output stage is a triode. The remaining valves are variable-mu pentode high-gain H.F. amplifier, triode hexode frequency changer, I.F. amplifier, and double diode triode 2nd detector, L.F. amplifier and A.V.C. The dial carries 45 station names and tone control is provided. The wave-ranges covered are 16-52.5, 195-560 and 810-2,085 metres. A switch plug is provided for extension speaker and pick-up connections are included. The price is 9½ guineas.

## New Cosmocord Playing Desk

A NEW model of the playing desk is shortly to be added to the Cosmocord range. This will take the form of a luxury model and will be available in console as well as table models. The cabinet is finished in fine walnut, and the general design takes the form of a shallow cabinet in which a drop front is fitted. When this is lowered the turntable and pick-up is brought forward so that a record may be placed into position. The pick-up in these models is of the crystal type, and is fitted with a swivel head



Cossor Model 396.

to facilitate needle changing. Among the other refinements are an automatic start and-stop device, volume control, and speed control. The price of the table model is £5 10s. for A.C. operation, and £6 10s. for Universal (A.C./D.C.) mains use. Details of the console models are not yet released. A lower-priced desk in which the magnetic type of pick-up is to be fitted will also shortly be introduced at £4.

## W.B. Transformers

MANY of the new W.B. transformers are now available for service engineers and others, and are intended as replacement units. Among these may be mentioned the Universal output component, designed for a steady D.C. of 30 mA. and providing six ratios. This is centre-tapped and it is possible on some of the lower ranges to pass a current up to 120 mA. The price is 5s. L.F. transformers designed for the parallel-feed method of connection are also available at 6s. 6d., whilst a microphone transformer with ratios of 40 and 60 to 1 costs 10s. 6d. On the mains side there is a model designed for normal mains inputs (40 to 60 cycles) and delivering secondaries of 250-0-250 at 60 mA, 4 volts at 2.5 amps, and 4 volts at 4 amps. The latter winding is provided with a centre-tap. This component costs 15s. For use with certain types of receiver Messrs. W.B. are also supplying a complete mains pack in which a mains transformer, smoothing condensers and valve-holder, etc., are ready mounted. This is to sell at 47s. 6d.

## Franklin Cleaning Brushes

FRANKLIN ELECTRIC LTD., of 2-10, Wilson Street, E.C.2, can now supply separately three brushes for use with their cleaning fluid known as Fecol. The price of the set of three brushes is 9d., and these will be found of value to the service engineer for cleaning switch contacts and other delicate mechanisms.

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# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

### Parlophone

**T**HE popularity of the tunes from the film "Snow White and the Seven Dwarfs" is again emphasised by the fact that Richard Tauber has chosen one of the tunes "One Song" for his latest record *Parlophone RO 20387*. The coupling is "You're Mine."

In the 12in. classic series the Berlin State Opera Orchestra and Chorus, conducted by Prof. Robert Heger, have recorded "The Flying Dutchman" (Act III, Sailors' Chorus) coupled with the Pilgrims' Chorus from "Tannhauser" on *Parlophone E 11361*.

Light orchestral recordings are supplied by Orchestra Mascotte with "Cavalier Waltz" and "Once on the Rhine"—*Parlophone R 2521*, and Eugen Wolff and his Orchestra with "Warsaw Night Express" and "Troika Drive" on *Parlophone R 2520*.

Songs from the films are featured by Leslie A. Hutchinson on *Parlophone F 1119* with "I Can Dream, Can't I?" from the film "Right This Way", and "Have You Ever Been in Heaven?" from "Manhattan Music Box."

The first record of Reginald Foort's new radio combination, "The Organ, the Dance Band and Me" playing "Cry, Baby, Cry" and "Sweet as a Song" appears this month on *Parlophone F 1124*.

### Pianoforte Solos

**R**HYTHMIC piano solos are becoming increasingly popular, and three medley records make their appearance this month. Patricia Rossborough plays a "Manhattan Music Box" selection coupled with "Dizzy Fingers" on *Parlophone F 1128*, Billy Thorburn records a "Waltz-and-Fox-trot Medley" on both sides of *Parlophone F 1118*, and a "Slow Fox-trot Medley" and "Quick-step Medley" is supplied by Gerry Moore on *Parlophone F 1117*.

Tessa O'Shea, the popular radio comedienne, gets plenty of laughs with "He said 'Kiss Me'" and "You're at Blackpool by the Sea" on *Parlophone F 1130*, and the Jakdauz of "Band Waggon" fame have recorded "Ultra Modern Swing" and "The Snake Charmer" on *Parlophone F 1129*.

In the Parlophone new swing style series we have Eddie Carroll and his Swingphonic Orchestra playing "Creole Love Call" and "Dinner and Dance"—*Parlophone R 2522*, and the second new rhythm-style series is further supplemented with "Savoy Shout" by Luis Russell and his Orchestra, and on the reverse is "Jubilee Stomp" by Duke Ellington and his Orchestra—*Parlophone R 2523*.

### H.M.V.

**T**HE new sound-films supply most of the material for vocal records of light character in this month's issues. Nelson Eddy sings four songs from the "Girl of the Golden West," in which he plays opposite Jeanette MacDonald.

This film employs the same Wild West story by David Belasco as did Puccini's opera of the same name, but none of Puccini's music is used in the film. The tunes are, however, first rate, and there is a stirring chorus by a quartet of male voices. The songs are "Who Are We to Say" and "Soldiers of Fortune"—*H.M.V. DA 1633*, and "Senorita" and "Sun Up to Sun Down"—*H.M.V. DA 1632*. Betty Driver, who is already, at seventeen, popular as a radio, stage and gramophone star, sings "The Sweetest Song in the World" from the film "We're Going to be Rich," and "I Fall in Love With You Every Day," from "Swing, Teacher, Swing," on *H.M.V. BD 556*. Maxine Sullivan, who, incidentally, is America's No. 1 "Swing" singer according to statistics, also sings two songs from the film "Swing, Teacher, Swing." They are "Please be Kind" and "Moments Like This," on *H.M.V. B 8749*.

Really funny records are rarities, but Arthur Askey (Big-hearted Arthur of the B.B.C. "Band Waggon") has found a double in "The Bee Song" and "Chirrup" on *H.M.V. BD 552*. "The Bee Song" either made him famous, or he made it famous, he cannot remember which, when he used to sing it at Shanklin.

The Meistersextet is a name new to these lists. Actually, half of its members are old friends. When the original Comedy Harmonists disbanded, three of the members went to Paris and, with three additional voices carried on under the same name. The other three remained in Berlin and formed a new combination, the Meistersextet, of which the first record is now issued in this country. They sing two Italian songs, di Capua's "O Sole Mio" and Tosti's "Marechiaro" on *H.M.V. B 8748*.

### Dancing Time

**T**HE new dance titles this month include "I could Use a Dream" and "Sweet as a Song"—*H.M.V. BD 5359*, "Goodnight Angel" and "My Heaven on Earth"—*H.M.V. BD 5366*, also "Serenade to the Stars" and "I Love to Whistle"—*H.M.V. BD 5367*, all played by Roy Fox and his Orchestra. Jack Harris and his Orchestra have made two records this month, the titles being "Somebody's Thinking of You Tonight" and "Picture Me in Paradise"—*H.M.V. BD 5364* and "Cry, Baby, Cry" coupled with "In Santa Margherita" on *H.M.V. BD 5365*. For the correct dance tempo enthusiast Henry Jacques has recorded "I Can't Remember Her Name" and "Tis Better to Have Loved and Lost" on *H.M.V. BD 5362*.

A newcomer to H.M.V. is Al Bowly who now has an orchestra and has recorded for his first record "Half Moon on the Hudson" coupled with "I Can Dream, Can't I?"—*H.M.V. BD 5363*.

The swing music section contains Benny Goodman's recording of an arrangement by Claude Thornhill of "Loch Lomond," coupled with "One o'clock Jump" on *H.M.V. B 8745*.

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## A PIONEER LOOKS BACK

SIR AMBROSE FLEMING, inventor of the thermionic valve, broadcasting his personal reminiscences recently, said:

"I made acquaintance with Mr. Marconi in April, 1898, at Bournemouth, when he was working his wireless telegraphy between the Isle of Wight and Bournemouth: I have not yet forgotten my surprise when I received signals and a message to me sent by Maxwell electric waves twelve miles over sea, printed down in dot and dash on a paper tape. . . . But it was clear that it would require vastly more powerful waves to travel three thousand miles than had already been covered.

"A site was selected at Poldhu; a lonely spot on the coast of Cornwall.

"In December, 1901, Marconi and two assistants went to St. John's, Newfoundland, taking with them balloons and kites to elevate a temporary receiving aerial. The Poldhu station was instructed to send out at certain times three quick short electric discharges forming groups of electric waves denoting the letter 'S.' After some trials, Marconi was able to hear in a telephone connected to a coherer the three ticks denoting the letter 'S,' showing that these wireless waves sent from Poldhu had travelled round the earth for three thousand miles.

"It became necessary to discover a more sensitive and trustworthy wave detector than the coherer which was so far being used. In 1904 I was so fortunate as to find it. Its action depended upon the fact that white hot metals and also hot carbon emit negative electricity in the form of very small particles called electrons.

"This thermionic valve soon became widely used. An American worker—de Forest—added a zig-zag wire called a grid to my valve and this enabled it to magnify as well as detect electric oscillations. Then later it was found that this grid or three-electrode valve could create (as well as detect) electric vibrations.

"As far as speech and music are concerned the valve has caused the earth to shrink to the dimensions of a single room."

## Stray Emission in Cathode-ray Tubes

THE picture signal as represented by the modulated carrier-wave of the Alexandra Palace station gives a range from full black (30 per cent. modulation) to full white (100 per cent. modulation). Assuming that the chemical composition of the powder employed for the screen of the cathode-ray tube is such that the resultant colour when it fluoresces under the electron bombardment during picture tracing is a black and white effect, the result observed should be a light replica in miniature (without the natural colours, of course) of the scene being televised. Complaints are often made, however, that instead of blacks in the picture there are only greys, and in consequence the picture lacks the range of contrast which is so essential for the best results. This is a defect of the tube itself, and arises from a failure of the tube to black out completely when the brightness control of the receiver is turned to its minimum position. This can be tested quite easily by making observations with the set in a darkened room. Instead of the screen being devoid of any light intensity the field of scan will be clearly visible to the eye. The brighter the screen under these conditions the less will be the contrast range in the receiver.

You are sure to want

# NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

By F. J. CAMM

(Editor of "Practical and Amateur Wireless")

Everything about

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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).

## Station TGWA—Guatemala

SIR,—I hope the following piece of news will be of some interest to other readers. Every morning during the past week, at approximately 5 a.m., I have heard a transmission from TGWA, Guatemala, on the 31-metre band. At frequent intervals, an announcement was made in English telling listeners that they were listening to the "Voice of Guatemala."

The programme consisted chiefly of dance music of a local nature, which, although sounding unusual to European ears, was very interesting to listen to. I cannot find this station among the lists of short-wave stations in various periodicals, so perhaps some other reader may have heard it and can enlighten me as to the exact wavelength, and times of transmissions. There is, I believe, a transmission daily on the 19-metre band from TGWA, but what of the 31-metre transmission?—A. C. STAPLETON (Derby).

## New Devices!

SIR,—As a regular reader of PRACTICAL AND AMATEUR WIRELESS I sometimes wonder whether too much attention is paid to the amateur and beginner, and not enough to the advanced worker!

To illustrate my point I enclose two cuttings, one of which refers to a portable transceiver, and the other to some apparently new and interesting device. Looking through the daily papers, the illustrations showing public address work often reveal "mikes" which are strange to the technical reader. Quite possibly, of course, these mikes only work on ordinary everyday principles but on the other hand they may not—then again there is the lip mike. The object of this letter is to suggest that a regular feature be introduced in the paper to enlighten readers as to "what is going on" in outside circles, and keep them up to date—after all, the paper represents "practical wireless." Technical details are desired, not merely pictorial references.—W. R. CLEMENTS (Kew Gardens).

[When new ideas are brought out they are mentioned and described in these pages. All too often, however, a non-technical report appears in the daily papers, and gives an air of mystery or novelty to some idea which is already well known in technical circles. We had already dealt with the subjects in the two cuttings you sent us.—ED.]

## Correspondent Wanted

SIR,—Being a S.W. listener for nearly a year now, I would like to correspond with another experimenter. Will any reader interested in S.W. listening, particularly amateur transmitting, please write to me, and I will exchange views with him. Also may I take this opportunity to thank the Editor for this fine instructive and interesting weekly.—J. TYZACK (Jnr.) (197, South Eldon Street, South Shields, Durham).

## Equipment on Pitcairn Island

SIR,—Many readers may be interested in the following particulars of the radio equipment which was installed on Pitcairn Island through the fine example set by the leading American manufacturers, and donated by them "free of charge."

A 36in. steel cabinet using 19in. panels and chassis: three decks, with audio on the bottom; oscillator; and final at the top. A Shure model 70S crystal mike, feeding a three-stage, and transformer coupled to a pair of 6L6's, as modulators, with 450v. H.T. from a bleeder network, and by arranging the battery p.d. plus a small cathode resistor giving 25v. bias. An 807 crystal oscillator, using cathode regen., and operating on 20, 40, and 600 metres, using Bliley VP4 crystals—14,346, 7,245, and 478 kc/s—and utilising ganged band-switching.

The final is an Amperex ZB120, which requires little bias and driving power, and internal variable link-coupling to terminals on top of cabinet. Two half-wave doublets cut to proper lengths for each band, with 75ft. lengths of Bassett concentric cable for the 20 and 40-metre channels, as provision has been made for individual doublet antennæ.

Five Triplett meters on the cabinet,

CUT THIS OUT EACH WEEK.

## Do you know

—THAT miniature cathode-ray tubes are available for use in test equipment.

—That the above types of tube have screens from 1 up to 5 inches in diameter.

—THAT in some cases of difficulty in removing hum in an A.C. mains set, the smoothing choke may be tuned.

—THAT the simplest way of carrying out the above idea is to connect a fixed condenser across the choke.

—THAT I.F. transformers are now available in which permeability tuning is employed in place of condenser tuning.

—THAT the advantages of the above type of component include the freedom from drift or tuning shift.

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

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indicating: 807 anode current; fil. voltage; antenna current on 600 metres; ZB fil. and plate currents. Filament rheostats are fitted to give a fine adjustment. With 250 mAs at 750 from the Dynamotor, there is 60 watts carrier output. Filament current is 4.1 amps., and the Dynamotor 28 amps. By cutting out modulator on C.W. thus freeing 100 mAs, gives 80 watts with tighter coupling of the link circuit. The wind-charger supplies 8 amps. with a 20 m.p.h. wind, and an automatic cut-out operates when below 6 m.p.h.: a 12ft. steel tower is supplied to support the 8ft. blade. Two 6-volt 300 ampere hour storage batteries are provided which is sufficient for 8 hours continuous running of both receiver and transmitter.

The Sargent Model 11 MF receiver covers 30 mc/s to 100ke/s, having 4 valves with 1 H.F. stage and bandspread; p.m. m.e. speaker, and jacks for 'phones in first or second L.F. stages, and the H.T. from a separate generator of 40 mills. at 200v. and taking 5 amps.

Trusting the above account will help us to be thankful of our ability to obtain our supplies from the mains, which are always on tap.—"SCOTTY" (Edinburgh).

## Two New Zealand QRAs

SIR,—The following may be of interest to other readers of PRACTICAL AND AMATEUR WIRELESS. I have just received cards from two New Zealand S.W.L.s, and they wish to have their QRA noised around for exchange of cards. Their QRAs are as follows: Fireman George Empson, Central Fire Station, Christchurch, New Zealand; and C. O. Pepperell (R9LL) Rauotu, Taranaki, New Zealand.

Both cards look good and are worth trying for. I have been listening to W3XAL on the loudspeaker at R7, peak up to R9. Receiver: B.S.T. Trophy 3 battery model, but statics are rather bad of late.—WM. L. GRUMMETT (2CMP) (Greetland, Yorks.).

## LEAVES FROM A SHORT-WAVE LOG

(Continued from page 336)

11th (31.75—9.449 mc/s). Rennes (P.T.T.) has only been logged so far on its 41th (72.12 m.—4.16 mc/s) and 5th (57.7 m.—5.2 mc/s). Radio Toulouse, however, is found on various points of the condenser dial, such as the 4th (82.15 m.—3.652 mc/s), 5th (65.72 m.—4.565 mc/s), 6th (54.76 m.—5.478 mc/s) and 7th (47.1 m.—6.391 mc/s). A further careful search will reveal many more. It is useful to log them carefully when they have been definitely identified, as on many occasions they will prove a helpful guide in finding more distant transmissions on neighbouring frequencies.

## Regular Broadcasts from Ethiopia

IT is reported that a regular schedule of transmissions has now been drawn up for broadcast through the new temporary 1 kW. transmitter erected in the vicinity of Addis Ababa. So far, two programmes only will be given daily, namely, at G.M.T. 12.30 and 19.00. The wavelength used is 31.25 m. (9.6 mc/s), but it is likely that for the day transmission the 80-metre channel may be adopted later. All announcements are made in the Italian language.

## The Vatican Tries Out a New Channel

AN experimental broadcast was recently logged as emanating from HVJ, Vatican City, on a hitherto unused channel, namely, 25.55 m. (11.74 mc/s).

# Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS		No. of	D.C. £5 Superhet (Three-valve)	1.12.34	PW42
CRYSTAL SETS		Date of Issue. Blueprint	Universal £5 Superhet (Three-valve)	—	PW41
Blueprint, 6d.			F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
1937 Crystal Receiver	9.1.37	PW71	F. J. Camm's Universal £4 Superhet 4	—	PW60
One-valve : Blueprints, 1s. each.			"Qualitone" Universal Four	16.1.37	PW73
All-wave Unipen (Pentode)	—	PW31A	<b>SHORT-WAVE SETS.</b>		
Beginner's One-valver	19.2.38	PW85	One-valve : Blueprint, 1s.	—	—
Two-valve : Blueprints, 1s. each.			Simple S.W. One-valver	0.4.38	PW88
Four-range Super Mag Two (D, Pen)	—	PW36B	Two-valve : Blueprint, 1s.	—	—
The Signet Two (D & LF)	29.8.30	PW70	Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.			Three-valve : Blueprints, 1s. each.	—	—
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2	Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
Selectone Battery Three (D, 2 LF (Trans))	—	PW10	The Perfect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A	The Band-Spread S.W. Three (HF Pen, D (Pen) Pen)	29.8.30	PW63
Leader Three (SG, D, Pow)	22.5.37	PW35	<b>PORTABLES.</b>		
Summit Three (HF Pen, D, Pen)	—	PW37	Three-valve : Blueprints, 1s. each.	—	—
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW33	F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW63
Hall-Mark Three (SG, D, Pow)	12.0.37	PW41	Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48	Four-valve : Blueprints, 1s. each.	—	—
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49	Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
Genet Midget (D, 2 LF Trans)	June '35	PW1	"Imp" Portable 4 (D, LF, LF, Pen)	19.3.38	PW86
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51	<b>MISCELLANEOUS.</b>		
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	PW53	S.W. Converter-Adapter (1 valve)	—	PW48A
Battery All-Wave Three (D, 2 LF (RC))	—	PW55	<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
The Monitor (HF Pen, D, Pen)	—	PW61	<b>CRYSTAL SETS</b>		
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62	Blueprints, 6d. each.	—	—
The Centaur Three (SG, D, P)	14.8.37	PW64	Four-station Crystal Set	12.12.36	AW427
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66	1934 Crystal Set	—	AW444
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69	150-mile Crystal Set	—	AW450
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72	<b>STRAIGHT SETS. Battery Operated.</b>		
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82	One-valve : Blueprints, 1s. each.	—	—
F. J. Camm's Oracle All-Wave Three (HF, Def. Pen)	28.8.37	PW78	B.B.C. Special One-valver	—	AW387
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84	Twenty-station Loudspeaker	—	—
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.33	PW87	One-valver (Class B)	—	AW449
The "Hurricane" All-Wave Three (SG, D (Pen), Pen)	30.4.38	PW89	Two-valve : Blueprints, 1s. each.	—	—
Four-valve : Blueprints, 1s. each.			Melody Ranger Two (D, Trans)	—	AW388
Sonotone Four (SG, D, LF, P)	1.5.37	PW4	Full-volume Two (SG det., Pen)	—	AW392
Fury Four (2SG, D, Pen)	8.5.37	PW11	B.B.C. National Two with Lucerne Coll (D, Trans)	—	AW377A
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17	Big-power Melody Two with Lucerne Coll (SG, Trans)	—	AW388A
Nucleon Class B Four (SG, D, (SG), LF, Cl. B)	0.1.34	PW34B	Lucerne Minor (D, Pen)	—	AW426
Fury Four Super (SG, SG, D, Pen)	—	PW34C	A Modern Two-valver	—	WM409
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull)	—	PW40	Three-valve : Blueprints, 1s. each.	—	—
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67	Class B Three (D, Trans, Class B)	—	AW386
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79	New Britain's Favourite Three (D, Trans, Class B)	15.7.38	AW394
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83	Home-built Coil Three (SG, D, Trans)	—	AW404
<b>Mains Operated.</b>					
Two-valve : Blueprints, 1s. each.			Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
A.C. Twin (D (Pen), Pen)	—	PW18	£5 5s. S.G. 3 (SG, D, Trans)	2.12.33	AW412
A.C.-D.C. Two (SG, Pow)	—	PW31	1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
Selectone A.C. Radiogram Two (D, Pow)	—	PW19	1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Three-valve : Blueprints, 1s. each.			Lucerne Ranger (SG, D, Trans)	—	AW422
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23	Cosor Melody Maker with Lucerne Coils	—	AW423
D.C. Ace (SG, D, Pen)	—	PW25	Mullard Master Three with Lucerne Coils	—	AW424
A.C. Three (SG, D, Pen)	—	PW20	£5 5s. Three; De Luxe Version (SG, D, Trans)	19.5.34	AW435
A.C. Leader (HF Pen, D, Pow)	—	PW35B	Lucerne Straight Three (D, RC, Trans)	—	AW437
D.C. Premier (HF Pen, D, Pen)	81.3.34	PW35B	All-Britain Three (HF Pen, D, Pen)	—	AW443
Ubique (HF Pen, D, (Pen), Pen)	28.7.34	PW36A	"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Armada Mains Three (HF Pen, D, Pen)	—	PW38	Transportable Three (SG, D, Pen)	—	WM271
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50	£8 6s. Radiogram (D, RC, Trans)	—	WM318
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54	Simple-tune Three (SG, D, Pen)	June '33	WM327
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56	Economy-Pentode Three (SG, D, Pen)	—	WM337
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70	"W.M." 1934 Standard Three (SG, D, Pen)	Oct. '33	WM337
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80	£3 3s. Three (SG, D, Trans)	Mar. '34	WM351
Four-valve : Blueprints, 1s. each.			Iron-core Band-pass Three (SG, D, QP21)	—	WM362
A.C. Fury Four (SG, SG, D, Pen)	—	PW29	1935 £0 6s. Battery Three (SG, D, Pen)	—	WM371
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW24D	PTP Three (Pen, D, Pen)	June '35	WM389
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	FW45	Certainty Three (SG, D, Pen)	—	WM393
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47	Minutab Three (SG, D, Trans)	Oct. '35	WM396
A.C. All-Wave Corona Four	6.11.37	PW81	All-Wave Winning Three (SG, D, Pen)	Dec. '35	WM400
<b>SUPERHETS.</b>					
Battery Sets : Blueprints, 1s. each.			Four-valve : Blueprints, 1s. 6d. each.	—	—
£5 Superhet (Three-valve)	5.6.37	PW40	5s. Four (SG, D, RC, Trans)	—	AW370
F. J. Camm's 2-valve Superhet	13.7.35	PW52	"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
F. J. Camm's £4 Superhet	—	PW59	2HF Four (2 SG, D, Pen)	—	AW421
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75	Crusader's A.V.C. 4 (2HF, D, QP21) (Pentode and Class B Outputs for above : Blueprints 6d. each)	18.8.34	AW454
Mains Sets : Blueprints, 1s. each.			Self-contained Four (SG, D, LF, Class B)	25.8.35	AW445A
A.C. £5 Superhet (Three-valve)	—	PW43	Lucerne Straight Four (SG, D, LF, trans)	Aug. '33	WM331
			£5 5s. Battery Four (HF, D, 2LF)	—	WM350
			The H.K. Four (SG, SG, D, Pen)	Feb. '35	WM381
			The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	Mar. '35	WM384
			Five-valve : Blueprints, 1s. 6d. each.	—	—
			Super-quality Five (2HF, D, RC, Trans)	Apr. '33	WM401
			Class B Quadradyné (2 SG, D, LF, Class B)	May '33	WM320
				Dec. '33	WM344

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New Class B Five (2 SG, D, LF Class B)	Nov. '33	WM340
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Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen), A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	—	—
Four-valve : Blueprints, 1s. 6d. each.	Jan. '36	WM401
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM380
<b>SUPERHETS.</b>		
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1935 Super Five Battery (Superhet)	—	WM379
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Heptode Snper Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM386
1935 A.C. Stenode	Apr. '35	WM385
<b>PORTABLES.</b>		
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Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	—	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
<b>SHORT-WAVE SETS—Battery Operated</b>		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D Trans, Super-regen)	30.6.34	AW433
Experimenter's Short-waver (SG, D, Pen)	Jan. 19, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383
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<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	—	WM390
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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
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram.	Mar. '36	WM403
New Style Short-Wave Adapter (1/-)	—	—
Trickle Charger (6d.)	June '35	WM388
Short-wave Adapter (1/-)	Jan. 5, '35	AW492
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	—	—
Wilson Tone Master (1/-)	May '36	WM405
The W.M. A.C. Short-Wave Converter (1/-)	June '36	WM406



# QUERIES and ENQUIRIES

## Quality Set

"I have been out of touch with radio for some time but now wish to make a quality receiver—regardless of cost. I want separate receiver and amplifier units with an output of about 10 watts. Real quality is the primary aim. Can you tell me what circuits you have published of this type? If necessary, I can take off the L.F. side of any set you have published, as I shall add an all-wave receiver section at a later date."—I. P. G. (Stradishall).

WE have not published a set giving the output mentioned, but have described several quality amplifiers. The Listeners' 5-watt amplifier (blueprint WM. 392) is a good small unit, whilst the 12-watt amplifier, described in our issue dated October 30th last, is a very good quality unit but is not available in blueprint form. A paraphase high-quality amplifier was also described in our issue dated January 18th, 1936, and this gives an output from 5 to 7 watts.

## Speaker Connections

"I recently bought second-hand a moving-coil speaker which has four coloured contacts—white, blue, red and black. The volume is very poor compared with my other speaker, which is not a moving-coil. I have tried interchanging the leads to the speaker, but fail to get the results expected from it. Could I alter the speaker so that there are only two contacts? My set is a home-built straight three and delivers a fair amount of volume for its type."—P. M. (Ferndale).

THIS is another case where second-hand apparatus can cause a considerable amount of trouble. The speaker may be removed from a commercial receiver and be totally unsuited for your set. Firstly, the coloured leads are not identified by any particular colour code or scheme and thus the makers alone know what the colours indicate. The speaker may be an energised model, in which case two of the contacts must be connected to a high-voltage source to provide an energising current. Without this the volume would be very poor. On the other hand, the four contacts may be tappings on an input transformer to enable it to be matched to Power, Super Power, Pentode or Push-pull valves, and disappointing results would be obtained if the speaker were not matched to your output stage. It is therefore necessary to find out what the colours indicate and if your supplier cannot tell you this you will have to communicate with the makers of the speaker.

## Cyclo Converter

"In the correspondence columns of your paper for May 21st there is a reference to a Cyclo Converter. As I am desirous of seeing the details, will you kindly let me know in what number or numbers of the journal they appeared so that I can give an order to my newsagent?"—J. R. M. (Edinburgh).

THE converter in question was a two-valve unit employing a triode and a pentode valve as a frequency-changing stage for use with an existing receiver employing H.F. amplification. A plug-in coil was used (six-pin type) and the construction was described in the issue dated April 30th last. Operating notes were given in the following issue.

## Earth Connection

"I am making the ultra-short-wave set for television described in the March 26th issue, but I am not sure as to where connections should be made to earth. I should be very grateful if you would indicate where this should be joined."—R. W. D. (N.W.11).

IN the circuit which was employed in this particular receiver the earth is not of great importance. If an earth lead is employed, however, it should be connected to the common battery negative terminals (L.T.—or H.T.—). On no account should it be joined to the tuning coil or tuning condenser in this particular circuit.

### RULES

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

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

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

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

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

## Headphone Connections

"I wish to connect a pair of headphones to my mains superhet for late night listening, and wonder what is the best plan to adopt. I do not wish to interfere with the output stage as I believe the pentode can be damaged by an open circuit in the load connection, and at the same time I am keen to be able to switch the speaker on when a signal has been located just for test purposes. What is the best plan for me to adopt?"—H. F. (Clacton-on-Sea).

IF your output valve is transformer-coupled you could connect the 'phones through a small condenser between earth and the anode of the L.F. valve. This will not, however, prevent signals from being heard through the speaker, and therefore the best plan is to connect a low-resistance of the variable type across the speech coil of the speaker. With this you could reduce volume to cut-off point and turn it up when required.

## Varley Permeability Tuner

"I have a Varley Tuner which has coloured indications by the terminals and I wonder if you could tell me the connec-

tions for these points. There are three coils which I understand are all of the H.F. transformer type."—F. E. A. (Kettering).

THE primary winding of each coil is identified by a red and brown terminal, red being high potential and brown low. The secondary is joined between green and blue terminals, the yellow terminal being taken to the change-over switch on the secondary winding. In the aerial circuit, therefore, yellow and brown should be joined together so that the coupling is maximum on both wavebands, and in all coils the black terminal is earthed. If no A.V.C. is fed to the coils or a straight circuit is employed you will also have to bond black and blue terminals on each coil, but if A.V.C. is employed it should be taken to the blue terminal.

## Pick-up Tone Control

"I wish to fit a tone control across my pick-up circuit but am uncertain regarding the best scheme to adopt. Can you recommend any alternative ideas which I could try out, or on the other hand, say which is the best arrangement? The pick-up is a standard magnetic type of good quality."—L. N. (S.E.11).

PROBABLY the best scheme is a combination of resistance, capacity and inductance. The most effective values for standard pick-ups and records are 50,000 ohms, .5 mfd. and 50 mH. In place of the latter component you could use a 150-turn tuning coil in conjunction with a .01 mfd. fixed condenser, but if you wish to experiment various plug-in coils could be used in conjunction with different values of fixed condenser.



## Replies in Brief

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

**F. M. T. (Newcastle-on-Tyne).** We cannot supply a blueprint but a standard L.F. stage may be added to your existing apparatus.

**J. O. (Blackpool).** Much depends upon your local conditions and the wavelengths you require. A vertical wire about 10ft. or 15ft. in length often proves most effective.

**J. B. (Burnley) and Others.** It is impossible to give transformer constructional data in the form of a reply, and as so many factors have to be considered the best plan is to obtain a copy of our latest book, "Coils, Chokes, and Transformers." In this will be found tables and all the necessary data to enable any type of transformer to be constructed.

**R. D. (Hford).** Your query was replied to in our issue dated June 11th last. We only send a postal reply when a stamped and addressed envelope is enclosed with the query.

**G. H. (Mossley).** We regret that we are unable to supply a blueprint to make use of the parts you mention.

**W. T. A. (Orrell).** We have not used the coils mentioned in any of our sets and accordingly are unable to recommend a blueprint. The set in question is not one of our designs. The book referred to gives all necessary data concerning all types of coils.

**P. W. (Dublin).** It would probably be worth while modernising the set so that modern plug-in coils could be used. You could improve the set when re-making it, but we are afraid you will be unable to get replacements of the particular coil now in use.

**S. M. (Glasgow).** We regret that it is not possible to identify the condenser and cannot, therefore, state whether it is suitable for use with the coils mentioned.

**F. R. J. (Burton-on-Trent).** It would be possible to carry out the idea mentioned, but it might prove expensive. This would depend upon the cost of electricity in your district.

**W. W. (Pickhill).** We are unable to identify the coils in question. The makers are no longer carrying on with radio construction.

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

**Miscellaneous Advertisements**

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

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THE SHORT-WAVE SPECIALISTS

**MICROVARIABLES.**—All brass construction, latest ceramic insulation. The finest condensers made: 15 mmfd., 1/4: 40 mmfd., 1/7; 100 mmfd., 1/10. Transmitting Type.—0.70 in spacing, 15 mmfd. (neutralising), 2/9; 40 mmfd. Tuning, 3/6. These are quality.  
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**SPEAKERS.**—We carry large stocks. Magnavox, 10in. energised, 1,000 or 2,500 ohms, 18/8. Jensen, 8in., 2,500 ohms, with transformer, 7/8; energised 8in., 3,200 ohms with transformer, 8/11.  
**UTILITY 7/6 Famous Micro Dials,** 3/9; Radiophone, 0.00016 Short-wave Condensers, 3/6. Shortwave HF Chokes, 5-100 metres, 9d. Centalab Pots, all sizes, 1/8; switched, 2/-; 2,000 ohm Pots, 1/-; Tubular Glass Fuses, 2d. Milliameters, 25 m.a. upwards, 5/8; amper, 6/9.  
**SPECIAL OFFERS.**—Class B Kit, worth 20/-, comprising Driver, Transformer, Valve and Holder, 5/-. Dozen wire-ended assorted resistors, 1/6. Order 5/-, post free.  
**W.B. 8in. Permanent Magnet Speakers** at one-third Cost. Extension Type (no Transformer), 7/6; Standard Type (with Transformer), 12/6.

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**BANKRUPT BARGAINS.**—List free. All goods new. Large stock receivers and all components. Keenest prices. Brunswick, Philco, Decca, Ferguson, Trifonic, Phillips, Belmont, etc. State requirements for quotation.—Butlin, 6, Stanford Avenue, Brighton.

**25 ONLY FOR SALE.**—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation.—Universal Radio Co., 221, City Road, London, E.C.1.

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**Potentiometers,** 1/- each, 10,000, 20,000, 250,000, 500,000, 1 meg., 2meg., with switch, 1/3 each, 10,000, 20,000, 250,000, 500,000.

**MAINS TRANSFORMERS.** Primary 200-250v. Secondaries, 350-0-350v., 90 ma., 4v., 2a, 4v., 5a., 4/6. Primary 230v.-250v. only. Secondary 250-0-250v., 60 m.a., 4v., 2a., 13v., 1a., 3/6.

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**HOW MANY CONTROLS?**— See page 366

# Practical and Amateur Wireless

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

Edited by F.J. CAMM

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Vol. 12. No. 201.  
June 25th, 1938.

AND PRACTICAL TELEVISION

## PRACTICAL SOLDERING



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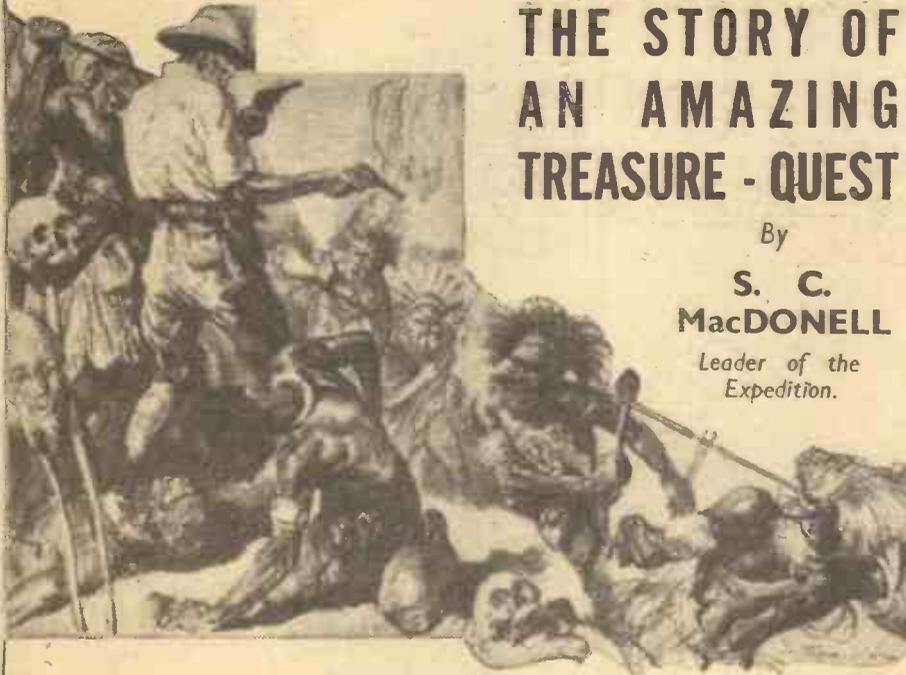
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6D.  
6 JULY

# SOME NEW AERIAL IDEAS—See page 357




## Practical and Amateur Wireless

Edited by **F. J. C. AMM**

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

VOL. XII. No. 301. June 25th, 1938.

## ROUND *the* WORLD of WIRELESS

### Soldering

THE operation of soldering is ignored by many constructors. The result is that many receivers fail to give a good performance merely because the connection between various points is so badly carried out that high-resistance joints affect the circuit design. We have before mentioned that cleanliness is one of the first principles and that good solder and flux should be used. In spite of this many amateurs still try to make use of the various types of "cold solder" which are sold at stores for the repair of domestic cooking utensils. These are totally unsuited for making electrical connection, and apart from the fact that they will not amalgamate metals they often introduce a coating of grease or other insulating material which is detrimental. These materials are quite in order for filling a hole in a kettle, for instance, as the water in the kettle absorbs the heat and prevents the filler from running. When soldering is properly carried out the solder amalgamates with the metal and the result is that the joint becomes practically as strong as a single piece of the metal and the electrical continuity is perfect. A little care spent on this subject, or, better still, an hour's practice with the soldering-iron and some spare wire, will enable the various points to be fully understood and then soldering will be found as quick and simple as terminal connections.

### Darts Championship

THE increasing popularity of darts lends interest to the forthcoming broadcast in the National programme (June 30th) of a darts championship. This will take place at the Agricultural Hall, Islington, and Commentator C. W. Garner, Secretary of the National Darts Council, will carry out the duties. There were no fewer than 87,000 entries, and it is probable that the finals will provide the year's best exhibition of the dart thrower's skill.

### Rail Radio

THE use of radio in connection with the railways has already received attention in most countries. In England it has been mainly in the direction of entertainment, whilst on the Continent it has been experimented with in connection with signalling, with a view to dispensing with existing methods of indication. It enables a driver, fireman or guard to be in constant

communication with the signal-boxes and would greatly increase safety. We now understand that by order of the Ministry of Public Works all trains on the Turkish State Railways are to be equipped with radio. Will England follow this lead and set another example to the world?

Test Matches. Special arrangements are being made to facilitate these broadcasts and they will not be taken by the English stations.

### Another Commercial Station

IT is now stated that negotiations have been completed for the use of an independent Continental station by an English company for sponsored broadcasts. The exact site and wavelengths have not yet been decided upon but it is stated that preliminary tests are shortly to be undertaken with a view to finding a suitable wavelength and power to ensure that the broadcasts will be well received in this country.

### Scottish Transmitter

PRELIMINARY tests have been carried out and aerial tests will shortly be undertaken from the new B.B.C. transmitter at Nigg, Aberdeen. The wavelength to be used is 235.5 metres and the power is given as 5 kW.

### Salisbury Band

THE Salisbury City Silver Band, conducted by J. C. Dyson, will broadcast for the first time from a studio on July 2nd in the West of England programme. Sir Dan Godfrey became President of this band, which was formed in 1934, and twice the band has won the Amesbury Midsummer Cup. It was also successful in winning the Pitt River's Trophy at the Winter Contest of the Wessex Association, and has thus become Champion of the Wessex Association for 1938.

### For Anglers

FISHERMEN who enjoyed the composite talk entitled "A Compleat Angler," broadcast a few weeks ago, will doubtless look forward to a talk in Welsh on June 28th entitled "Psygota yn Nyffryn Ogwen" (Fishing in the Ogwen Valley). This is one of the most beautiful stretches of wild and rugged country in the Principality and offers some wonderful piscatorial opportunities.

### The Fun of the (Newcastle) Fair

IMPRESSIONISTIC sound pictures of the great Town Moor Fair at Newcastle will be heard in the Northern programme on June 23rd. This is one of the biggest fairs of its kind in the world.

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### "The Snow Queen"

A SPECIAL dramatic adaptation for younger listeners of Hans Andersen's famous fairy story will be given on June 29th in the Regional programme and will be followed by the Children's Hour Edition of Radio Gazette.

### The Royal Welsh Show

IN the Welsh programme on June 29th a broadcast will be taken from the Sophia Gardens, Cardiff, where preparations for the Royal Welsh Show are now practically complete.

### Test Match Broadcasts

THE Australian Broadcasting Commission is arranging, at a cost of £30,000, to broadcast to Australian listeners a ball-by-ball commentary on all of the

# ROUND the WORLD of WIRELESS (Continued)

## Broadcasting House Extension

WE understand that the demolition of the buildings adjoining Broadcasting House in Portland Place will begin in October. The enlarged Broadcasting House is likely to take about two years to complete.

## P.A. for Boat Travellers

EXPERIMENTS have recently been carried out at Folkestone Harbour with P.A. speakers, for giving directions to passengers arriving at and departing from the port.

## Southport Night's Entertainment

THE Northern microphone is to make a tour of some of Southport's entertainments on July 1st, to bring to listeners a programme of excerpts called "Southport Night's Entertainment." Variety will be broadcast from the Garrick Theatre; music by Arthur Jacobson and his band from the ballroom in the Floral Hall Annexe, and a relay from the Ernest Binns Concert Party show in the Floral Hall itself.

## Variety from Scotland

ESME MARSHALL, one of the principal artists from the Glasgow Alhambra Revels, will make her first studio broadcast in Scotland on the evening of June 22nd, when she will take part in a variety programme. Many listeners will remember her as the popular "boy" in last season's pantomime, "Puss in Boots," at the same theatre. She will be supported by several other turns. The B.B.C. Scottish Variety Orchestra will be conducted by Kemlo Stephen and the show will be compered by C. Archer Mitchell, the well-known West of Scotland entertainer.

## Empire Guests

GLASGOW, it has been said, has become the heart of the British Empire for six months, and anyone who has had anything to do with the Empire Exhibition at Bellahouston Park will know that many of the most interesting visitors have come from the British Dominions and Colonies. Special space has been left in the Scottish programme on June 22nd for the accommodation of these guests from the Empire, and it is hoped that a number of interesting visitors from overseas will be brought to the microphone on that date. This is the first of a new series which will continue during the period of the Exhibition.

## A Rugby Works Band

ON June 28th the British Thomson-Houston Military Band will be conducted by Jeff Baxter in a programme of popular music; and Archie Doorbar, of Stoke-on-Trent, will sing a group of baritone solos in the interlude. The B.T.H. Band, which is broadcasting for the first time (on the Midland wavelength), has a very high reputation among works bands, and has many public engagements in the Rugby area. Its Bandmaster, Mr. Baxter,

## INTERESTING and TOPICAL NEWS and NOTES

had 25 years' army service and was for six years Bandmaster of the 2nd Battalion South Staffordshire Regiment.



Short-wave radio was recently tested in the Swiss mountains for use by Ski-ing Rescue Brigades and the Swiss Army. Portable receiving and transmitting "stations" were "worn" by the ski-ers during the tests and radio direction-finding apparatus was brought into use to locate the "casualties." An aeroplane, which received instructions while in the air by radio, went to the rescue.

## Chess Tournament

IT has been found necessary to postpone the opening move in the Chess Tournament between members of the B.B.C. and listeners from July 1st to July 8th. The B.B.C.'s opening move will accordingly be announced after the 7.30 p.m. Regional News bulletin on the latter date. Subsequent announcements each Monday, Wednesday and Friday will be made of the listeners' latest move and the B.B.C. staff's response to it.

## Glastonbury Town Band

THE Glastonbury Town Silver Band, conducted by Lionel A. Leavey, with Margaret Winterflood (soprano) as the soloist, will broadcast from West Regional on June 25th. The Band was founded over a century ago, and made its radio debut two years ago. This will be its tenth broadcast.

## A Nottingham Dance Band

RUBE SUNSHINE AND HIS BAND are also to broadcast for the first time on June 27th. This combination consists of 13 players with a vocalist, and has had a number of engagements in Nottingham and district. It has been providing dance music regularly at the Victoria Station Hotel, and the broadcast is another interesting Midland item.

## "Romeo and Juliet" Music

EDWARD GERMAN'S incidental music to "Romeo and Juliet" will be played by the B.B.C. Northern Orchestra, led by Alfred Barker and conducted by H. Foster Clark, in a concert to be broadcast on June 27th.

## "Bubbles" from Boscombe

"BUBBLES," a Concert Party presented by Will Seymour, from the Pier, Boscombe, on June 28th, will include: Patrick Colbert (bass-baritone), Douglas Young and Nan Kenway (entertainers), Leo Conriche (pianist), Jan Ramsden (violinist), Kathleen West (dancing eccentricities), Ella Drummond (soubrette), Jack Crosbie (cartoonist), Jeffrey Piddock (entertainer), and Will Seymour (comedian).

## Variety from Northampton

MIDLAND is to supply a theatre variety broadcast for the National programme on June 30th from the New Theatre, Northampton. Artists who may be included in the broadcast part of the programme are Herschel Henlere, Morton Fraser, the Harmonica exponent, and Bertha Willmott.

## Dance Cabaret from Bournemouth

DANCE Cabaret will come from the Royal Bath Hotel Ballroom, Bournemouth, on June 29th, when the artists will be: Claude Dampier, "The Professional Idiot," assisted by Billie Carlyle; Webster Booth, "The Romantic Tenor"; Davy Burnaby and Michael North; The Carlyle Cousins, "In Close Harmony"; Al Bowly, "Britain's Ambassador of Song"; Billy Thorburn and his Music.

## SOLVE THIS!

### PROBLEM No. 301

Brodersen had an A.C. three-valver with S.G., detector and pentode stages. He decided to modernise it and accordingly obtained two variable-mu H.F. pentodes. He substituted one for the S.G. valve and obtained a decided improvement. He therefore decided to try the other in the detector stage, and the gain was then so great that he decided a volume control should be installed. He used the standard variable control in the cathode lead and linked both cathodes together, joining them to an H.T. potentiometer in the ordinary way. Results were then very disappointing. Why was this? Three books will be awarded for the first three correct solutions opened. Address your envelopes to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 301 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, June 27th, 1938.

### Solution to Problem No. 300

The Q.P.P. stage operates with a fluctuating current reaching a peak value of about 30 mA. Consequently the unit Atkins used was not only too small but an erratic H.T. voltage would be delivered in the absence of suitable stabilising circuits. The following three readers successfully solved Problem No. 300 and books have accordingly been forwarded to them: G. East, 64, Richmond Wood Hill, Bournemouth; H. C. Rüdberg, Follyfield House, Felstead; W. Sheppard, 11, Kingsmead Road, St. George, Bristol. 5.

# SOLDERED CONNECTIONS

A Practical Article, Specially Written for Beginners, Explaining the Correct Procedure for Making Good Soldered Joints  
By Radio Engineer

It is apparent that there are a number of constructors who have not mastered the simple practice of making a good soldered connection.

Terminal connections are efficient, but they do not compare with soldering.

With terminals there is the risk of the pressure applied to the surfaces in contact becoming reduced, either through the terminal head becoming loose or through distortion of the wire. Again, it is possible for the surfaces to become coated with a film of oxide which reduces the efficiency of the connection by increasing the resistance between the surfaces.

It is not sufficiently appreciated that a circuit can be seriously affected by such variations, and many peculiar results are often traced to a "high resistance" contact.

With soldering, such risks are eliminated, providing the soldering is properly carried out so that all surfaces are united by a film of solder which has, so to speak, penetrated the metal.

It would appear from the many receivers which have to be serviced that a good deal of the soldering is not what it should be, and it cannot be stressed too much that a poor soldered joint is far worse than any terminal connection, so it is hoped that the following information will enable the unskilled to overcome their difficulties.

## Bad Examples

The illustrations shown in Figs. 1, 2 and 3 are actual examples of the type of soldering to be avoided at all costs. They represent sections of wiring taken out of a receiver sent in for servicing, and it is very interesting to note that the whole trouble with the

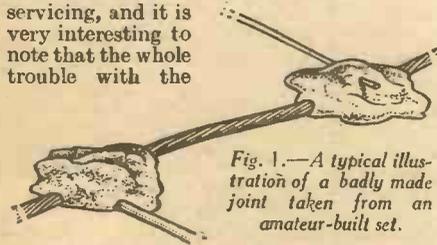


Fig. 1.—A typical illustration of a badly made joint taken from an amateur-built set.

receiver was due to the soldered (!) connections. From these specimens it is obvious that the constructor responsible had the idea in his mind that if the wires were covered with a huge blob of solder, all would be well, and a perfect joint formed. Nothing can be farther from the truth. Solder, like most adhesives, is best when applied sparingly, so don't bury the surfaces to be joined under solder; just coat them with a thin film and float on only sufficient to form a very small globular-shaped mass over or round the surfaces.

To do this properly it is essential to pay attention to the following items.

## The Soldering Bit

This is the name applied to the piece of copper which, when heated, carries and transfers the solder to the actual job. It is usually shaped to a point or wedge, and is obtainable in various sizes and weights. For radio work, quite a small bit will do. One, say, 2ins. by 3/16in. will be amply large enough, and will allow soldering to be done in any awkward positions.

If electricity is available, one cannot do better than use an electrically-heated bit, which has the advantage of retaining its heat so that continuous work can be carried on.

With the ordinary type of soldering iron it is, of course, necessary to heat it on a gas ring, a clear fire or other source of smoke-free heat, until its temperature is

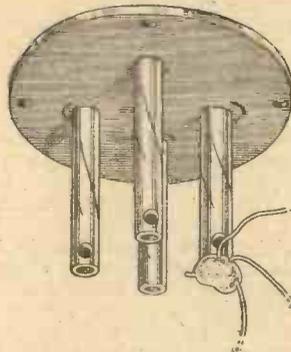


Fig. 2.—Another example of a poor connection made to a valveholder.

raised to a point when it will melt the solder. When doing this, take care not to overheat or burn the copper, a rough indication of the correct temperature being when a faint greenish flame is produced, though after a little experience, one is able to judge by the time the bit has been in the flame.

## Flux

When the copper and the parts to be soldered are heated, their surfaces are liable to become oxidised by contact with the atmosphere; therefore, as such oxidation would prevent the solder from uniting with the metals, it becomes necessary to provide some agent which will prevent this from taking place.

The name given to the agent commonly used is "flux," two well-known commercial examples being Coraline and Fluxite, which take the form of a paste.

Many constructors might remark, "What about 'killed spirit'?" the liquid flux which is often used for certain soldering work. Well, so far as any electrical work is concerned, don't use it, as, in spite of its name, it can be quite an active spirit so far as copper is concerned, its acid content eating into the metal and setting up violent corrosion. When used in radio receiver construction, it is often responsible for weird crackling noises.

When the copper bit has been heated, it must be lightly smeared with flux and melted solder, which is then run over its surfaces until they are coated with an even film. This is called "tinning," and it is essential to see that the bit is always kept in that condition, and quite clean. The operation is best carried out by rubbing the heated iron on a clean piece of tin after applying the flux and solder. Remember, a dirty copper bit or one not heated sufficiently will never make a soldered joint.

These two items are the cause of the majority of failures.

## Preparing the Job

The first thing to do is to see that the surfaces to be soldered are perfectly clean and free from grease. Use a fine file, emery cloth or penknife, according to the work, to make the materials bright so that the actual metal is exposed. Even with tinned copper wire and soldering tags, it is a wise plan to scrape their surfaces before soldering.

After this, a smear of flux can be applied. Don't pile it on, as the excess will only be wasted, and make the job look dirty. Now "tin" the surfaces by applying a very small amount of solder by means of the soldering iron, moving the bit over the job to allow it to become heated.

When this preliminary tinning has been done, place the metals to be joined in position, and again apply the iron—making sure that it is still hot enough to melt the solder.

If all is well, it will be found that the solder will run between the surfaces smoothly and not drag, as it will do if the bit is below the correct temperature. Hold the iron on the job to allow all parts to become hot enough for the smooth flowing to take place; the larger the parts, the greater the amount of heat required. If the solder is just dabbed on, or if the iron is too cold, it will be found that a "dry" joint has been made or, in other words, the solder has not been able to unite with all surfaces and must, therefore, be remade. A "dry" joint is often indicated by a dull grey crystalline appearance, and if there is any doubt,

always go over it again to be on the safe side.

If, also often is the case with beginners, the

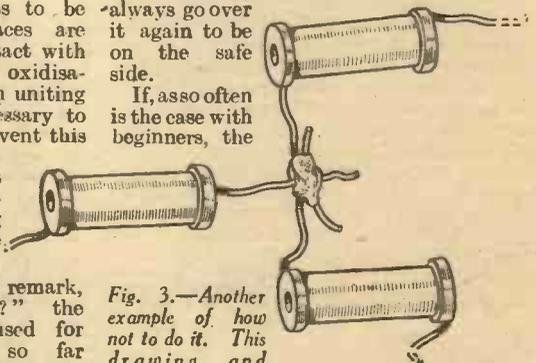
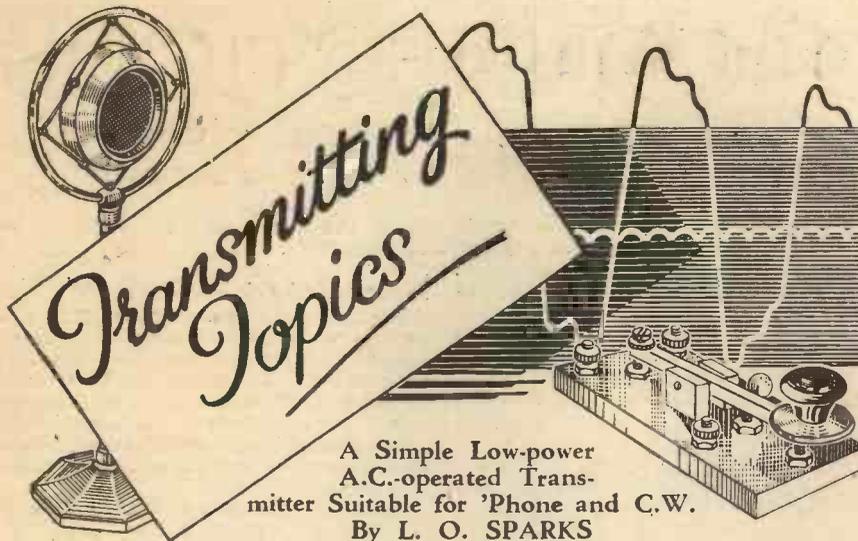


Fig. 3.—Another example of how not to do it. This drawing and the others on this page should be compared with those on page 358.

solder will not "take" to the metals, do not apply more solder, but clean all surfaces again, re-tin them, and start afresh. You will soon get the knack, especially if you experiment with odd pieces of wire, making different types of joints.

With flexible wire, it is very important to clean all strands, twisting them together before the flux and solder is applied. As a guide to the best way of making connections usually met with in radio work, the diagrams shown in Fig. 4 are given, but the efficiency of all of them depends on the solder being applied in the correct manner. Finally, always remember to

(Continued on page 358)



A Simple Low-power  
A.C.-operated Trans-  
mitter Suitable for 'Phone and C.W.  
By L. O. SPARKS

THE 2½-watt Battery Operated Transmitter described in our issue of December 30th, 1936, has proved most popular, but there are many A.A. licence holders who, having electricity supplies available, have requested a mains version of a similar set.

The smaller quantity of gear and number of valves required, the better; therefore, I have selected the 6A6 or the 53 as the basis of the design.

These valves can be considered as mains versions of Class B types used for the battery-operated transmitter.

The theoretical diagram shows that the valve consists of two triode sections having a cathode and heater circuit common to both being housed in one bulb; therefore, from the point of view of layout and wiring the assembly can be treated as a single valver. This means that the number of connections will be reduced, while the saving in space permits a neat and compact assembly to be adopted, and this in turn reduces cost and the problem of housing. Because the arrangement possesses these desirable features, it must not be thought that the outfit is not capable of doing useful work. As a matter of fact, similar sets are quite common and widely used as a "stand-by" and for local working. As many readers will, no doubt, immediately want to know the range or distance which it will cover, let me say that it is almost impossible to give any exact figures, as so much depends on local and atmospheric conditions. However, Continental contacts are not beyond its scope, while A.A. operators will find that its output is more than ample for their needs.

### The Circuit

From the diagram it will be seen that one section is used as a simple crystal-controlled oscillator, the crystal being connected across the grid/cathode circuits in the normal manner. The grid obtains its correct bias from the drop across the grid leak. The anode circuit of the same triode section forms the tank circuit, the coil L being tuned by the variable condenser C. For normal 40-metre working, the coil can be a standard commercial product of good make designed to cover that band, while the condenser should have a value of 0.0001 mfd., or if an Eddystone 0.00016 mfd. is available that will do equally as well. Don't use a cheap condenser of doubtful insulation. It will pay in the end to get a good make, such as an Eddystone, as a poor quality component can introduce serious losses. The aerial can be tapped

straight on to the tank coil by means of a small crocodile clip or, if a Zepp type of aerial is in use, link coupling can be employed. The same applies to an artificial aerial.

The high-tension to the anode is fed through a good low-frequency choke, the characteristics of which must be such that they will prevent any low-frequency currents from passing back into the H.T. supply. The only other component in the anode circuit is the small fixed condenser C2, which has a capacity of .002 mfd. It is essential for this to be of the mica dielectric type capable of operating under the value of H.T. applied.

### The Modulator

The second triode section is used as the modulator valve, and it will be seen that it is a perfectly straightforward arrangement. The grid is connected to a negative tapping on a grid bias battery via the secondary winding of a microphone transformer. The high-tension is applied to the anode from the same line which feeds the oscillator section, but note that the connection is made on the anode side of the L.F. choke. If this point is not observed, modulation will not be applied to the continuous waves generated by the oscillator.

The primary of the microphone transformer is connected in series with a sensitive carbon microphone and a suitable energising battery, the actual value of which will depend on the microphone and the ratio of the transformer.

It is advisable to include an "on-off" switch in the primary circuit to allow the battery to be cut out when the apparatus is not in use.

For morse or "continuous wave" working, it will be necessary to embody a key to break the train of oscillations as desired. The set lends itself to experiments in this direction, but if normal anode voltages are applied the key can be placed in the H.T.

positive lead. It must not be overlooked, however, that the key will be alive with respect to the negative line, and therefore reasonable care must be taken to prevent undue shocks to the operator. If both 'phone and C.W. are going to be used, it is a wise plan to arrange a plug and jack connection for the key, then the jack can also be used for plugging in a milliammeter for checking and tuning purposes.

As in other circuits previously given, a simple key filter circuit is embodied to reduce key interference. This consists of a fixed condenser of .01 mfd. and a small resistance of, say, a hundred ohms.

### Construction

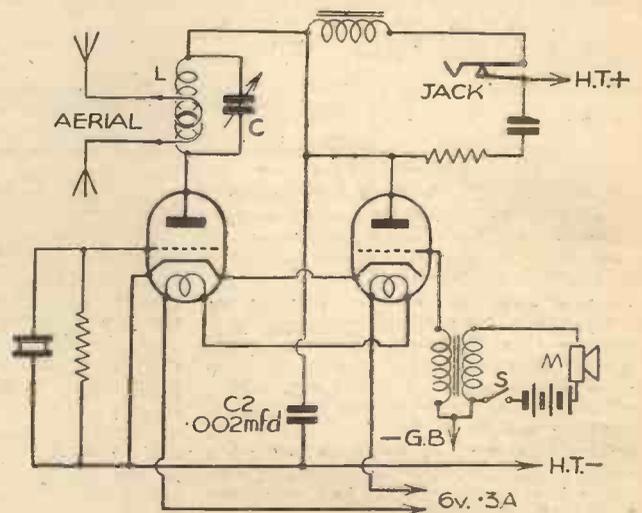
The circuit is such that the layout is not super-critical, provided a reasonable amount of care is taken to see that the connections to the oscillator are kept short and direct. The coil and variable condenser should be located close together, while both of them must be arranged so that the connections to the grid and anode of the valve do not have to wander round other components.

The mike transformer can be mounted on the same baseboard or chassis if the mains equipment is not too close. It will be found that violent hum will be introduced if the mike transformer is allowed to come within the field of the mains transformer, and it is usually necessary, unless a good screening box is provided, to separate the two by at least 3 feet.

The H.T. supply can be obtained from a normal 250-volt 60 mA rectifier, particular attention being paid to the smoothing circuit. If the 6 volts at .3 amp. is not available for the 6A6, a neat and efficient transformer can be obtained for a few shillings from The Premier Supply Stores.

### Operation

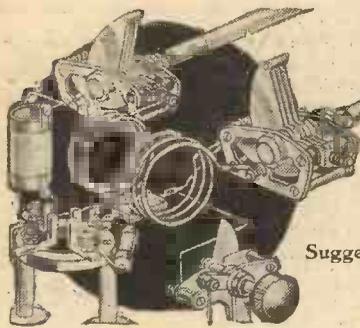
If a milliammeter is available, plug it into the H.T. positive supply. A meter having a maximum scale reading of 50 mA will be suitable.



Theoretical circuit of the transmitter. For the sake of clarity the valves are shown separately, but the elements are actually all contained in one envelope.

After switching on the heater circuit, allow a few seconds for it to heat up, then connect H.T. supply and note the meter reading.

The tank tuning condenser can then be slowly rotated until the minimum setting of the needle is obtained; the exact adjustment will be rather critical as the needle will dip suddenly and then start to rise as the point is passed.



# Short Wave Section

## SOME NEW AERIAL IDEAS

Suggestions for Unusual Uses of Existing Types and Some New Arrangements for Short-wave Work.

By W. J. DELANEY.

THE increasing activity which is taking place on the television wavelengths is introducing a number of new problems, and at the same time these are leading to new conceptions regarding short-wave working. Readers will remember how, when the television programmes were instituted, it was stated that the approximate range was likely to be about twenty-five miles. The Derby was received on a standard commercial television receiver at a point over 200 miles from the B.B.C. transmitter! This was not a freak reception, and distances over 100 miles are now quite regularly covered. The main reason for these long-distance records may be stated to be due primarily to the aerials, and not to the receiving circuits which are in use. The standard dipole alone, when properly designed and used in conjunction with the correct

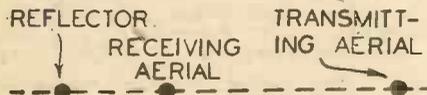


Fig. 1.—The standard disposition of a reflector in relation to transmitting and receiving aerials.

impedance feeder line, will result in a substantial increase in signal strength, but this alone is not sufficient. The judicious use of reflectors will give a tremendous gain when properly applied, and it is probably in this direction that the main field for experiment lies.

### Reflectors

In the ordinary way the reflector is placed behind the aerial so that the signal is, as it were, collected and concentrated on the aerial. It is generally taken for granted that the aerial should be between the reflector and the transmitter, taking these in a straight line. It has been found, however, that this is not always the best plan, and a great deal will depend upon the surrounding country. If a hill intervenes it may be found that the wave is deflected, and tests have shown that the reflector may be placed to one side with an improvement in signal strength. The behaviour of the ultra-shorts still seems a little erratic and not "according to the book," and the reflector may yet prove to be of greater value than is imagined where the contour of the country results in a distortion of the normal radiated wave.

The experimenter should, therefore, try the effect of swinging the reflector round the aerial whilst the signal is watched by another observer so that the results may be carefully observed.

### Tilted Aerials

We recently reported upon a patent which had been taken out abroad for an arrangement whereby an aerial could be tilted, and this point should also be borne in mind when endeavouring to pick up really long-distance signals. Although the B.B.C.

television transmissions, for instance, are radiated from a vertical aerial system, it does not necessarily follow that the receiving aerial should also be vertical.

Theoretically, it should, but, again, theory is not always borne out in practice, and it is quite possible that by tilting the aerial it will be possible to obtain better signals merely because the signal arrives at an angle due to the effects of local hills, valleys, or even buildings. The reflector may also be used to screen an aerial from local interference, and for this purpose it should be placed between the aerial and the source of interference, and again experiment may have to be undertaken in order to locate the most suitable position.

### Unusual Aerials

The amateur transmitter often adopts various aerial arrays in order to endeavour to obtain improved radiation, and there are a number of interesting arrangements which may often be employed at the receiving end where long-distance work is being undertaken. Contrary to belief, the elevated capacity will prove a very valuable pick-up even down to 10 metres, and some interesting experiments were recently carried out with a large square of wood across which were stretched a number of strands of 7/22 copper wire. The centre of

the square was mounted on an eccentric joint so that as a supporting rod was rotated the square took up all positions from horizontal to vertical. The results were very interesting when an American station using a beam aerial was received. A stand-by receiver was kept on to enable normal fading to be observed, but it was found that the revolving aerial gave a complete variation from maximum volume to complete inaudibility—on an 8-valve superhet!

A horizontal network, designed on the lines of the old-time "sausage" aerial flattened out, completely prevented a simple detector-L.F. receiver from giving results owing to the fact that oscillation could not be obtained on the lower wavelengths. The aerial was lowered, and the strands were connected together at both ends with a slight improvement. When several strips of wire were soldered across—again converting the assembly into a large metal carpet or network, the set worked

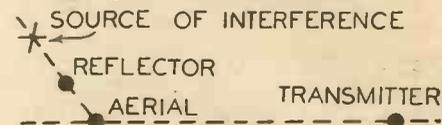


Fig. 2.—How to arrange a reflector to cut out or reduce interference.

splendidly, and results were better than a single short wire.

It will, therefore, be apparent that it does not always pay to follow theory in regard to long-distance reception, and it is worth while carrying out various trials and tests—no matter how ridiculous the idea might at first appear to be. Certain fundamental rules must, of course, be borne in mind, such as insulation, but in other respects, there are still many unknown factors which might be revealed by a chance experiment, and which will result in a general improvement in short-wave technique.

## Leaves from a Short-wave Log

### The Radio Tower of Babel

OF all the European stations, Rome, I2RO3, on 25.4 m. (11.81 mc/s), would appear to be the one which broadcasts in the greatest number of languages in the course of one day. A typical programme is as follows: G.M.T. 11.00—Oriental Music, Italian news; 12.00—English news and Chinese translation for Far East; 13.30—Entertainment for Italians abroad; 16.00—Oriental broadcast for Near and Middle East; 17.15—a similar programme for East Africa; 18.10—Arabic broadcast only; 19.00—French; 19.19—English; 19.37—Italian; 19.58—Serbian; 20.15—French and Italian lesson; 20.38—News in German; 24.00—Portuguese and Spanish for Latin America. At 22.00—through I2RO3, on 31.13 m. (9.635 mc/s)—a talk is given in Esperanto, followed by one in Spanish at 23.30, and in Greek fifteen minutes later. At G.M.T. 01.30, English is broadcast for the benefit of listeners in Northern America.

### From the Far East

JZK, Nazaki (Tokio), Japan, on 19.79 m. (15.16 mc/s), is now transmitting a series of tests daily between G.M.T. 05.00-05.15. XGW, Shanghai, on 28.79 m. (10.42 mc/s), broadcasts a daily news bulletin

in the English language between G.M.T. 14.00-15.00. The studio possesses a man and woman announcer. Interval signal: four or five bells. The news is followed by gramophone records and a Chinese broadcast.

### Macao Calling

STATION CQN, formerly on 29.7 m. (10.1 mc/s), is now CRY9, Macao (Portuguese China), and has adopted the 31.3 m. (9.504 mc/s) channel with an increased power to 500 watts. A programme is now given daily between G.M.T. 12.30-13.30, and announcements are made in Portuguese, English, French, and Chinese. Address: Senhor J. Estrela, Chief of Radio Station CRY9, Government Broadcasting Station, Post Office Buildings, Macao, Portuguese China.

### Portugal's Experimental Broadcasts

THE CSW, Lisbon, group of transmitters, may now be heard daily carrying out test broadcasts on various channels. The schedule, although not fixed, appears to be: G.M.T. 11.00-13.00 on CSW4, 25.34 m. (11.84 mc/s); 17.00-19.00 on CSW3, 30.18 m. (9.94 mc/s); occasionally 17.15-21.00 on CSW2, 27.17 m. (11.04 mc/s), and a return to CSW3 between G.M.T. 22.00-01.00.

# IMPORTANT BROADCASTS OF THE WEEK

**NATIONAL (261.1 m. and 1,500 m.)**  
 Wednesday, June 22nd.—*Don Giovanni, Act I, from Glyndebourne.*  
 Thursday, June 23rd.—*Wimbledon Championships commentaries.*  
 Friday, June 24th.—*Old Time Music-hall.*  
 Saturday, June 25th.—*The Champion Cup: A commentary on the last three chukkas, from Hurlingham.*

**REGIONAL (342.1 m.)**  
 Wednesday, June 22nd.—*The Northumberland Plate: A running commentary on the race, from Gosforth Park, Newcastle-upon-Tyne.*  
 Thursday, June 23rd.—*A Musical Biography—Franz Josef Haydn—6, The Last Creative Period (1796-1803).*  
 Friday, June 24th.—*Orchestral concert.*  
 Saturday, June 25th.—*Concert Party programme.*

**MIDLAND (296.2 m.)**  
 Wednesday, June 22nd.—*Midland Marionettes, all women's concert party.*  
 Thursday, June 23rd.—*A Musical Biography: Franz Josef Haydn, No. 6, The Last Creative Period (1796-1803).*  
 Friday, June 24th.—*Variety programme.*  
 Saturday, June 25th.—*Georges Bizet: Orchestral programme.*

**WEST OF ENGLAND (285.7 m.)**  
 Wednesday, June 22nd.—*Family History—4: Countess of Pembroke and Montgomery, from Wilton House, Salisbury.*

Thursday, June 23rd.—*Abracadabra, a programme of rites, spells and incantations.*  
 Friday, June 24th.—*An Open-air Concert, from the Grounds of the Royal Fort, Bristol.*  
 Saturday, June 25th.—*Band concert.*

**WELSH (373.1 m.)**  
 Wednesday, June 22nd.—*Music by Welsh Composers: Orchestral concert.*  
 Thursday, June 23rd.—*Breuddwyd Hafnos (A Midsummer Night's Dream), Welsh adaptation.*

## SECOND TEST MATCH

Interviews with well-known cricket personalities, including players, will, it is hoped, be a feature when the Second Test Match is televised from Lord's, beginning on Friday, June 24th. Play will be televised daily from 11.30 a.m. to 12.30 p.m.; 2.30 to 3.30 p.m.; and 3.50 to 5 p.m. Two cameras, mounted on the main stand at the Nursery end, will bring the whole field into the picture. A third on the "Tavern" will give more intimate shots. Telephoto lenses should enable viewers to see bowlers and batsmen in close-up.

Special television commentaries will be given by Captain H. B. T. Wakeham.

Friday, June 24th.—*Holidays with Play, a concert party programme from the Coliseum, Rhyl.*  
 Saturday, June 25th.—*The Welsh A.A.A. Championships at Taff Vale Park, Pontypridd—an eye-witness account.*

**NORTHERN (449.1 m.)**  
 Wednesday, June 22nd.—*Liverpool Repertory Theatre Company in "Parnell."*  
 Thursday, June 23rd.—*Come to the Fair, a recorded sound picture from the Town Moor, Newcastle-upon-Tyne.*  
 Friday, June 24th.—*Orchestral concert.*  
 Saturday, June 25th.—*Concert Party programme, from the Floral Pavilion, New Brighton.*

**SCOTTISH (391.1 m.)**  
 Wednesday, June 22nd.—*Band programme.*  
 Thursday, June 23rd.—*United Services Tournament.*  
 Friday, June 24th.—*Gaelic Concert.*  
 Saturday, June 25th.—*Scottish Dance music.*

**NORTHERN IRELAND (307.1 m.)**  
 Wednesday, June 22nd.—*Hymn Recital from St. Patrick's Parish Church, Ballymoney, County Antrim.*  
 Thursday, June 23rd.—*Choral and instrumental programme.*  
 Friday, June 24th.—*Concert Party programme from the Floral Hall, Bellevue.*  
 Saturday, June 25th.—*Hotel Kitchen, feature programme.*

## SHORT-WAVE LOG

(Continued from previous page)

### Germany Still Goes Ahead

ON May 1st last, Germany possessed 9,574,701 licensed radio listeners, or slightly more than double the number declared in 1932.

### Finland on New Channel

THE Lahti-Helsinki short-wave station has been logged during daylight hours on 25.47 m. (11.78 mc/s). The provisional transmitter is rated at 1 kilowatt, but power will be increased to 25 kilowatts in the course of the current year. Other channels allotted to this station are 19.75 m. (15.19 mc/s), and 31.58 m. (9.5 mc/s). Daily transmissions are already being made regularly on the latter frequency.

### And Guatemala

ANOTHER transmission recently logged in the early morning hours was from TGWA, Guatemala City, on 30.98 m. (9.685 mc/s). This channel is mainly used for the relay to the capital of foreign broadcasts, e.g., from other cities in Central and South America. Regular broadcasts are carried out on 16.85 m. (17.8 mc/s); 19.78 m. (15.17 mc/s); 25.51 m. (11.76 mc/s); and 31.75 m. (9.45 mc/s). The call is: Broadcasting Nacional, *La Voz de Guatemala*.

### More Foreign Harmonics

THE 3rd harmonic of Milan (1) is audible on 122.9 m. (2.442 mc/s) and the 2nd of Genoa (1) on 131.6 m. (2.28 mc/s). Brussels (2) gives a strong signal on its 4th harmonic, namely, 80.15 m. (3.728 mc/s), and the 2nd of Hilversum (2) can be picked up on 150.75 m. (1.99 mc/s); also 4th on 75.37 m. (3.98 mc/s). Of the German

stations, Berlin provides a strong 7th harmonic on 50.96 m. (5.887 mc/s), and Breslau a 5th on 63.16 m. (4.75 mc/s). The 100-kilowatt Melnik (Czechoslovakia) transmission can be logged clearly on its 4th harmonic, or 67.4 m. (4.452 mc/s). For dwellers near the South Coast of England the most persistent harmonics are those of Radio-Normandie (Fécamp), in particular the 7th on 30.377 m. (9.877 mc/s), and the 4th on 53.1 m. (5.644 mc/s). The B.B.C. stations are more elusive although the 9th of London Regional may be occasionally heard on 38.01 m. (7.893 mc/s), and the 8th of Welsh Regional on 46.64 m. (6.432 mc/s).

## WESTMINSTER CATHEDRAL P.A. EQUIPMENT

WE are informed that the Tannoy P.A. sound equipment, which was recently completed at Westminster Cathedral, has proved very satisfactory. The equipment was first temporarily installed on January 29th for the return of Cardinal Hinsley and now, after four months' night work on the installation, is fully complete, and in excellent service.

Seven moving-coil microphones with separate switching and fading are included, feeding to an amplifier that incorporates a special form of A.V.C. This eliminates the control that would otherwise be necessary to avoid overloading. The output from the voltage amplifier is fed to three 16-watt power amplifiers, arranged to feed groups of speakers. Thirty-eight speakers are distributed throughout the building.

An interesting point is that speakers near any given microphone are automatically switched out when the microphone is in use, thus avoiding acoustic reaction.

## SOLDERED CONNECTIONS

(Continued from page 355)

keep the bit clean and well tinned; see that it is neither too hot nor too cold; clean to brightness all parts to be soldered; use flux sparingly, and, above all, have a little patience and persevere until you have acquired the knack.

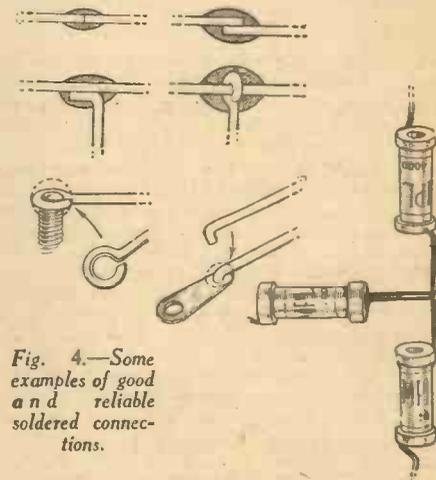


Fig. 4.—Some examples of good and reliable soldered connections.

Keep all the soldering material together in a small box or drawer so that everything is to hand when required, and see that your kit includes a tin of flux, a sheet of medium emery cloth or fine file, one or two lengths of "tinman's" solder and an iron which is fitted with a bit suitable for the work most likely to be encountered. It is possible to obtain solder having a core of powdered resin, and this is quite suitable for normal receiver constructional work and is, in fact, preferred by some workers.

# ON YOUR WAVELENGTH



## Interference and Earthquakes

ONE of our seismologists stated the other day that there is so much electrical interference that it was becoming increasingly difficult to take records of earthquakes. In fact, he thought that in a few years it would be quite impossible.

Sooner or later legislation will be introduced making electrical interference an offence. It ought to have been a long time ago, bearing in mind the annoyance it is causing, and the expense it is putting listeners to in endeavouring to get rid of it. Whatever method is applied in connection with the receiving set to suppress interference, it must to some extent interfere with the performance of the set. It is an onus which ought not to be placed upon set designers or listeners. Now that radio is part of civilisation I hope that manufacturers of electrical apparatus, such as electric motors, vacuum cleaners, sewing machines, hair dryers, and particularly the designers of ignition systems of motor-cars, will regard it as part of their problem so to produce their apparatus that it does not interfere with wireless or television. I am aware that television itself is causing a certain amount of local interference with ordinary sound broadcasting, but I happen to know that that problem is being tackled and I do not think it will endure. Television is particularly susceptible to all forms of electrical interference, and in order to save manufacturers of television apparatus a lot of trouble, they should press for legislation regarding electrical interference. Television cannot become popular if one has optical evidence of the existence of all of the electrical apparatus round about in the form of zig-zag streaks across the television screen. However satisfactory the receiver, the less-informed members of the public will regard visible interference as a defect in the design of the apparatus. We must prepare the land before we build the house.

## History is Made

FOR the first time in the history of the world, two historic functions have been made visible to members of the public miles away from the place where the functions occurred. I refer to the Derby and

## By Thermion

the Trooping of the Colour. I witnessed both on the end of a cathode-ray tube, and I congratulate the B.B.C. and the designers of my set on the excellence of the broadcast and the excellence of the reception. I have before remarked that a great deal of the history we learn at school is open to grave doubt. I do not believe the story of King Alfred and the Cakes, or Bruce and the Spider, or any of the other legends and clap-trap which history books still perpetuate. In future, we shall not be in any doubt as to what Chamberlain said in 1936. It is recorded either on wax or on a steel tape. We shall be able to record television in exactly the same way, and as I have before remarked, it is technically possible even now. I am glad to learn that at the next Radiolympia a television conference for radio dealers may be held, those in the service area only being invited.

## The I.A.R.S.

MR. J. BUTLER, of 92, South Circular Road, Portobello, Dublin, tells me that he has broken away from a certain English wireless society and formed the above. He is very anxious to get into touch with anyone in Ireland interested in furthering the objects of a National Radio Society for Ireland.

## Push-button Tuning

ONE of the leading component manufacturers tells me that it is his opinion that the reason why I only received one postcard in reply to my request for readers who were interested in push-button tuning to get into touch with me was, firstly, that this journal does not circulate amongst those of the public likely to be interested in push-button tuning; secondly, that I only have a small following; or thirdly, that readers are lethargic about writing on such matters, unless it is made very easy

for them to do so and/or they have a vital interest in the subject. My correspondent adds that I "may take it from him" that push-button tuning has definitely arrived, and that "it will be acclaimed by the man in the street." I think my correspondent is guilty of a little sophistry. I do not need this correspondent or anyone else to tell me that push-button tuning has arrived, for it was its arrival which inspired my paragraph. What I complained about was it arriving when other and more urgent things were in need of manufacturers' attention. Do not let us blind ourselves to the fact that push-button tuning is merely a mechanical improvement, and radio manufacturers ought to know by now that far too much attention has been devoted to tuning scales, slow-motion drives, etc., etc., *ad nauseam*. The tuning scale and the tuning drive have been the happy hunting grounds of inventors for far too many years. No one complains about having to tune a set to a particular station. We all know at what particular part of the scale the station to which we desire to listen is located. The fact that this new system will be acclaimed by the man in the street supports my case that readers of this paper are not interested in push-button tuning, for they are not "men in the street" but knowledgeable people not interested in gadgets. The man in the street may be. In spite of the fact that this paper has a very large circulation, consistently maintained since it was first produced, it is possible that it does not circulate amongst men in the street interested in push-button tuning. Regarding his second point that I only have a small following, I can only assure him that I have been writing these columns for very many years, and the size of my post-bag steadily grows. I receive several hundreds of letters in the course of a month, and I am glad to add this manufacturer to my list of readers. I repeat that, whilst push-button tuning may provide a selling point to the man in the street, when they find that it will not, as they may be led to believe, get any more stations from a set (in fact, less), and is merely a mechanical method of turning the tuning condenser, it will cease to be a selling point, and fade out of the

market like so many other gadgets have done. Time will prove the accuracy of my forecast, that you will not see push-button tuning on very many sets in three years' time.

#### Using a Pick-up

I AM often receiving inquiries regarding slight adjustments to receivers described in this paper. One of the most frequent is how to use a pick-up.

To enable any set to be used for the reproduction of gramophone records, a pick-up may be joined from the grid of the detector valve to G.B. in the usual way, a pair of sockets being mounted on the rear chassis runner for the purpose. A change-over switch may be connected in the grid circuit if desired, or the set may be merely detuned when using the pick-up to avoid radio breakthrough. When using the pick-up it may be found that the output is more than adequate, and then by reducing the H.T. voltage on the output stage to 90, and by using 3 volts grid bias, the total anode current may be reduced in the output stage to about 3 mA, thus providing very economical operation.

#### Chess Tournament

THE B.B.C. tells me that it has been found necessary to postpone, from July 1st to July 8th, the opening move in the Chess Tournament between listeners and members of the Corporation staff. The B.B.C. staff's opening move will, accordingly, be announced after the 7.30 p.m. Regional News bulletin on the latter date. The subsequent moves in the game will be announced at the same time each Monday, Wednesday and Friday.

#### New Annual Schools Programme

DETAILS of the Schools broadcasting service for the coming year, are contained in the Annual Programme of Broadcasts to Schools, 1938-1939, recently published.

General satisfaction has been expressed by teachers and others re the various series broadcast last year, and it is felt that little need for change is indicated. There are, however, one or two additions.

Chief among these will be a special French series for Fifth Forms which English schools are taking from Scotland, and two courses of physical training, also being relayed from Scotland every Tuesday morning.

So successful were last year's broadcasts of "Our Village," the special series for rural schools, that this is being revived in a slightly different form under the title, "Our Parish."

Broadcast physical training is a new idea for the schools. Experimental in

## Notes from the Test Bench

#### Faulty Earth Connection

WHEN servicing a Vitesse receiver recently it was found impossible to adjust the I.F.'s for satisfactory response. At times the setting would hold, but it would suddenly shift and the trimmers had again to be adjusted. Repeated examinations failed to disclose any cause of the trouble and new I.F.'s were substituted without avail. The trouble was eventually traced to a faulty earth contact to a bolt on the chassis. A.V.C. decoupling (by-pass) condensers were taken, with other components, to a common soldering tag anchored to a bolt through the chassis, but the lead which was passed through the hole in the tag was dirty and the solder had run round it, and although it was apparently a sound joint the lead and all components joined to it made intermittent contact with the tag and thus the A.V.C. circuit was unstable. When the lead was firmly anchored by properly soldering the trouble was instantly removed.

#### Corroded Earth Tube

ANOTHER somewhat similar case of instability was also traced in a listener's home to a faulty earth. In this case he stated that the instability had gradually arisen until eventually the set went into oscillation and could not be stopped. All the usual tests were made and the valves were thought to be responsible, in view of the gradual increase in the trouble. In this case, however, the set was in perfect order, and it was finally found that the earth tube was of a cheap unknown make and was of coppered iron. It had been in the earth some time and had rusted away at the top where the earth lead was attached, and the result was that the earth was ineffective. A new earth tube of copper cured the trouble.

#### Know Your Components

AN interesting case arose in an experimental circuit recently tried out round some old components. The experimenter had tried to obtain maximum results by using a well-known make of L.F. transformer, but had not realised that this component contained in its case a .0003 mfd. fixed condenser across the primary terminals. In the circuit he was trying this condenser completely destroyed the working arrangement, and results could not be obtained until a transformer without the condenser shunt was employed.

nature, it is being broadcast for one term in the first instance. Its aim will be to help schools with limited facilities for physical training by providing a supplement to the teachers' own work.

Altogether there will be twenty-nine broadcast series for English and Welsh schools during the coming year.

Children of every age are catered for, from the infants of five who listen to Miss Ann Driver's Music and Movement, to Secondary School boys and girls of sixteen and over who listen to the Friday talks to Sixth Forms and often discuss them afterwards with their teachers.

In addition to details of the various series, the Annual Programme contains notes on the use of the school radio, on problems of installation and reception, advice on the choosing of sets, and a special section headed "The Contribution of School Broadcasting."

In April, 1938, it is revealed in the booklet, there were 8,250 schools in England and Wales on the B.B.C.'s Register, which has risen in the last month to 8,477. These comprise, as well as elementary and secondary schools, convents, War Office schools, agricultural colleges, junior instructional centres, and a number of special centres and institutions.

#### Hot and Bothered

I RECEIVED a strange request the other day from a reader who asked me if I could give him details for making a set which made the listener perspire! He said that he was in a house and when the wireless set was switched on the owner of it perspired! The request was quite a serious one, so I could only presume that my correspondent has had his leg pulled. I know several constructors who perspire over sets, and it may be that the programme was making the listener go hot under the collar. Perhaps there was a jazz-band on, or one of those individuals—the very lowest form of animal life—known as crooners was drivelling at the microphone.

#### "Scotland on the Air"

I AM informed that a book entitled "Scotland on the Air," dealing with the development of broadcasting in Scotland and its present position, is due for publication next month. The book, which carries a foreword by Sir J. C. W. Reith, Director General of the Corporation, has been compiled and edited by Mr. George Burnett, Public Relations Officer of the B.B.C. in Scotland.

The majority of the articles have been written by senior members of the B.B.C. staff in London.

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# Practical Television

June 25th, 1938. Vol. 3. No. 106.

## Another American Attempt

THE recent television experiment carried out in America when a complete play was televised seems to have been received with mixed opinions by the New York critics. First of all, the subject chosen, "The Mysterious Mummy Case," was a dramatic play where the entertainment value left something to be desired, but the method of production was good; the direct vision was supplemented by dove-tailed film scenes in order to extend the scope of acting. The demonstration was staged by the R.C.A. in conjunction with the N.B.C., the studio being in the former company's building in the Rockefeller centre. Sound and vision signals were carried from there by coaxial cable to the N.B.C. ultra-short-wave radio transmitter in the tower of the Empire State Building about one mile away. The carrier frequencies used were 46.5 megacycles for vision and 49.75 megacycles for sound, but it is difficult to understand why the higher carrier frequency was not employed for the picture signals in order to secure the advantage of a better band-width for a given percentage of carrier frequency modulation. Picture definition was one of 441 lines interlaced, with 60 frames per second to give 30 complete pictures per second. Iconoscope cameras were used at the transmitting end, while cathode-ray tube receivers giving a picture approximately 10 ins. by 8 ins. were accommodated in one floor of the R.C.A. building. A prominent critic warned the American public not to expect too much from television, while it is freely admitted that America is a long way behind this country in what has been accomplished. It appears that the Government is still loth to give television its official blessing in a manner similar to the B.B.C. service, and until it does, progress is likely to be slow.

## Projection Standards

IN the case of television pictures which are built up on a screen remote from the actual scanning unit, it is still a matter of opinion as to whether front or back projection is to be preferred. Both forms have been demonstrated at one time or another for the smaller type pictures (up to 2ft. wide) and the larger size ones (up to 9ft. wide). The present Marconi and H.M.V. cathode-ray tube projection receivers, where the screen is hinged to a top lid which has to be belifted when in use, have the picture projected on to the back of the screen, and this also applies to the Scophony mechanical optical equipment. Baird's colour screen was rear projected, but the cathode-ray tube apparatus of the same company which is now commercially available to cinemas employs front projection. In either case special screens have to be used in order to counteract as far as possible any loss of light which would quite naturally detract from the picture value. Another very important feature that has to be watched, especially if the pictures are to be shown to a large audience, is the directional properties of the screen. To give a dispersive effect

in order to widen the angle of vision brings about a loss of overall light intensity, and it is only by very careful design that a happy medium can be struck to maintain good pictorial and entertainment value with an absence of eye strain. The casual observer, or even at times the regular viewer, too often fails to appreciate the many diverse problems which encompass television reception as typified by a complete receiver, and the right type of remote screen is only one of many.

## Electron Multipliers

LITTLE has been heard of electron multiplier technique for some time, but it is known that certain firms are devoting a considerable time to research in connection with applications and improvements in this device. Farnsworth, of America, has been one of the leading exponents, and in a new form of multiplier which he has produced the electron stream has been concentrated within more practical limits. To carry this into effect, the target

This is done by applying a form of reaction so that if the output tends to increase beyond a certain safe limit one of the control grids is biased negatively to reduce the magnitude of the primary electrons. The reverse process happens when the output tends to decrease. Another useful scheme which has been suggested for particular applications of the electron multiplier is to incorporate forms of filter circuits so that in any signal one or more frequencies can be selected and amplified if required to the partial or complete exclusion of other frequencies. Although at the moment a serious defect of the electron multiplier is its limited output, efforts are still being made to embody the principles with a thermionic valve and so secure a very large output from a single tube. This would bring about a very great economy when compared with present amplifier practice and effect radical changes in both radio and television receiver design.

## More Details

FURTHER details have now been made available concerning the long-distance television reception record at Ormesby to which reference was made in these columns recently. The site was on the Eston Hills, at a point 700 feet above sea-level to the east of Ormesby Bank, and further experiments are being conducted with a view to collating data which may prove of material assistance when studying all the problems involved in long-distance reception. The first results were obtained in February, but until certain set modifications had taken place by incorporating additional stages of vision gain the pictures were not satis-



A fine view of the camera at the Alexandra Palace, showing the trolley and the heavy cable which the operator in the rear is moving.

electrodes from which the secondary electrons are emitted as a result of electronic impacts are arranged as alternate flat discs and cylinders. To allow for multiplication the sizes of these electrodes progressively increase until the final collector plate is reached, and apart from making the device more compact it is said that stability is also improved. Speaking of stability, it is learned that another firm has proposed an improvement for stabilising the ratio of secondary electrons released to primary electrons providing the target impact.

factory. What is frequently done at long distances to ensure good results is to employ two directional ultra-short-wave aerials—one for sound and one for vision. Under ordinary circumstances the single aerial is a little too long for the B.B.C. vision wavelength and a little too short for the sound, the compromise being adopted to simplify installation. By using dipoles of the correct length for each of the two carriers, however, it is possible to improve very materially the magnitude of the signal pick-up and bring it above the disturbing

## TELEVIEWS

*(Continued from previous page)*

mush level. Again, a lot will depend on the sensitivity of the receiver used. Many commercial models require from one to two millivolts of signal for ordinary working, but, on the other hand, there are some sensitive superheterodynes which function at a tenth of this strength, particularly if the site is free from interference.

## Is it True?

IT is stated that an official of the British Post Office regards visiotelephony—that is, the combination of the telephone with television—as the next logical step in the present development of methods of communication. The telephone has very largely superseded the telegram on the score of convenience and the pleasure of actual conversation at little extra cost, and the addition of sight is regarded as an extra inducement for increasing the scope of the telephone. It is known, of course, that at Dollis Hill experiments have been going on in this connection, but in Germany the first work was undertaken nine years ago. The present trend in that country is to abandon mechanical methods of scanning for this work and employ a projection type cathode-ray tube to furnish the light-spot movement, so that the resulting light and shade reflections can be made to activate the electrode surfaces of suitably positioned multiplier photo-electric cells. Transmitting and receiving cathode-ray tubes can be accommodated in the same unit, and because of the increased sensitivity of the cells there is no trace of eye discomfort resulting from the rapidly moving scanning spot. No doubt in the near future more will be heard of the progress made in this connection and it is hoped that the authorities will lose no time in applying the results in a really practical manner.

## Interference Legislation

AT some time or another there is no doubt that every reader of this journal has experienced the annoying effect of electrical interference when operating either a radio or television receiver. The greatly improved sensitivity of modern sets has brought this matter to a head, and so serious is the whole problem that a joint committee of manufacturers, engineers and Government officials covering a number of representative bodies made a thorough investigation some time ago. The carefully considered results of their deliberations were presented to the Government, together with suggestions for eliminating this "menace" to home listening and viewing. It is therefore welcome news to learn that before the end of this year the Government intend to pass a Bill through Parliament under which every piece of machinery which might conceivably interfere with radio or television reception will be fitted with interference suppressors. Legislation of this type will undoubtedly be welcomed, and the Bill is at present being drafted in conferences between the Home Office, the Ministry of Transport, the Electrical Commissioners and the General Post Office. In the case of television, both sound and vision can be marred by quite a wide variety of types of electrical interference. As a case in point mention can be made of the trouble experienced in the "viewers' parade" soon after the opening of the Ideal Home Exhibition. Curious patterns kept appearing on the cathode-ray tube screens of certain manufacturers' sets. With the aid of a Post Office official and test apparatus the fault was finally located in a neon sign on the floor below. This operated on a frequency of three megacycles which happened to coincide with

the intermediate frequency of a vision receiver chassis. The trouble was eradicated very simply and the subsequent television pictures were clear and distinct.

## Cinema Television Developments

RECENT developments in cinema television have made it quite clear that every effort is being made to regularise this new form of public entertainment. The Scopphony Company are arranging to install equipment for this purpose in cinemas covered by the Odeon circuit and this company's first installation is to be made at the Monseigneur News Theatre, now in course of construction at Baker Street. The screen size is to be six feet by five feet, but it is hoped later on to at least double these dimensions as soon as the experimental work now being carried out is completed. The hope is being quite freely expressed that before long permission will be granted for an experimental service to cinemas, and if this does materialise then progress will be rapid. In the Tatler Theatre the Baird Company followed up their Derby success by showing the televised Trooping of the Colour to a private audience, and it is known that inquiries for details of this equipment have been coming in from the cinema industry at a very rapid rate. Similar apparatus will be displayed on the G.B. Equipment Co.'s stand at the Folkestone Exhibition, so that everyone interested can examine the apparatus thoroughly and learn all the details of its operation. As a new medium for news dissemination the scheme is an admirable one, and the great advantage is its compact, portable nature, coupled with simple operation and maintenance.

## Needing Special Consideration

THE types of cathode-ray tubes now being employed for big-screen television purposes are a direct development from the ordinary ones used in modern receivers. Due to the very high brilliance of the pictures built up on the tube screen prior to projection through a lens on to a remote screen, special consideration has to be given to design and manufacture to enable the tubes to work efficiently over a reasonable period of time. In the first place very much higher anode voltages are employed, often up to 30,000 volts as compared with the 4,000 to 5,000 of the home set. Insulation therefore becomes an acute problem and the connection to the anode is brought out from the glass envelope via a special side terminal. Since the very high voltages incur an increased electronic bombardment the fluorescent powder used for the screen has to be of an improved type, and be capable of giving more light. Unless the screen material is linear in its excitation response from light to dark the resultant picture will exhibit a somewhat patchy appearance. Very careful attention has to be given to the proper binding of the chemical powder to the interior of the ground glass face of the tube, and so remove any possibility of it flaking off when in use. Screen thickness must be absolutely uniform to prevent the brightness level from altering in any way except under the influence of changes in beam intensity corresponding to the incoming vision signal. Again, the tube screen should be as thin as possible to prevent any loss of light when projection is undertaken from the side of the screen which is opposite to that undergoing electronic bombardment. The degree of vacuum inside the projection tube must be high owing to the greater risk of ionisation taking place because of the high voltages in use. That these difficulties are being offset successfully is borne out by the results given by present-day equipment.

## ALAN MARSH

### A Brief Biography

ALAN MARSH, the popular vocalist with Ambrose and his Orchestra, commenced his musical career while still at school. As a very small boy, he was in great demand at school concerts and musical entertainments, in which he was prominently featured. Later, at the more mature age of nine, he joined a choir, in which for five years he was a soloist.

His father, incidentally, is a Cantor in the East End of London, and his brother, too, is the First Cantor of Sydney. It is apparent that this vocal talent runs through the entire family. (Alan's younger sister is singing lead in a road show, and another brother is touring the halls as a single act.) Even as a schoolboy his hobby was drumming, and on leaving school he began to take this



A recent portrait of Ambrose's popular vocalist, Alan Marsh.

up seriously, and later appeared on the stage with his sister in an act, as a drummer-vocalist. About this time he also joined an amateur theatrical society, in which he and his school-friend sang duets, accompanying themselves on the ukulele.

His name and voice began to become familiar to many people, who engaged him to broadcast and record with their respective bands, including: Joe Loss, Harry Leader, Don Sester, Jay Wilbur, Rudy Starita, and then Lew Stone, taking Al Bowly's place as vocalist, with whom he toured all over the country, and was for a long time resident at the Hollywood Restaurant, London. And, lastly, with Arthur Roseberry, before joining Ambrose. Besides broadcasting as a vocalist with these bands, he has also appeared "on the air" as a soloist in the B.B.C.'s variety programme, has toured the halls as a single act, and worked in Cabaret at most of London's hotels and night clubs.

Works frequently for B.I.P. Studios, recording for the background of various films. Has recorded for every recording company in England.

A PAGE OF PRACTICAL HINTS

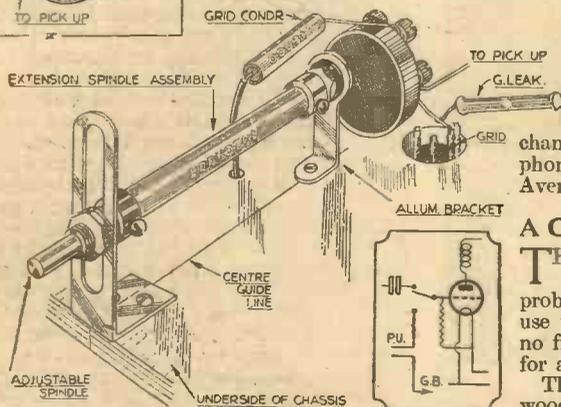
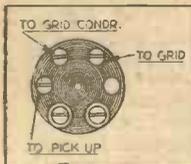
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Radio-gramophone Switching Arrangement

THE accompanying sketch illustrates an arrangement I adopted for the change-over from radio to gramophone in a receiver which was unstable due to long leads going to a pick-up terminal block. Encasing the leads in metallised sleeving was tried, but I found that this resulted in some loss on the radio side. I therefore decided to fit a switching arrangement, and mounted the switch close up against the detector valveholder (to allow of the shortest leads possible) and fitted an insulating extension spindle for operating purposes. The arrangement can be clearly seen in the sketch, which shows it as now in use on the set mentioned, and which has completely overcome the trouble.



This radio-gram switching arrangement overcomes instability caused by long leads.

the baseboard that I required, the front slotted bracket merely allowing of slight angular adjustment. Both the brackets (space permitting) could be of this slotted type, thus allowing of height adjustment. The arrangement described will only be applicable in certain cases, and I would not advise any rearrangement of components in specially-designed receivers. However, those amateurs who may be experiencing the above-mentioned trouble, and have ample room for including the switch as described, may like to try out the arrangement.

The extension spindle assembly is the type made by Messrs. Eddystone for short-wave control purposes, and is very efficient, especially as the spindle end itself is adjustable as to length. The switch I used was a Graham-Farish Snap Turret Switch consisting of a single-pole double-throw switch, and a single-pole single-throw, both operated by the same knob. As will be noted in the sketch, the spindle of this switch is slightly to one side, but I did not find this to be detrimental.

The top inset shows the connections I

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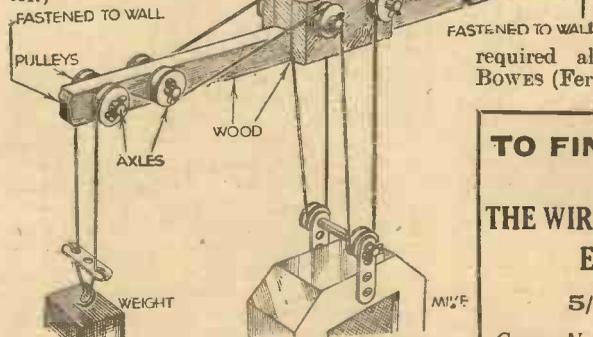
made to the switch, the two shrouded terminals shown being those for the single-pole single-throw switch, which can be wired to the filament circuit for switching the set on or off if desired.

In the bottom inset a circuit is shown of a conventional switching arrangement for a detector valve for change-over from radio to gramophone.—R. L. GRAPER (8, Allison Avenue, Gillingham, Kent).

A Collapsible Aerial

THE structure illustrated shows how I have got over the problem of providing an aerial for use with my portable, which had no frame, and there were no trees for attaching a line.

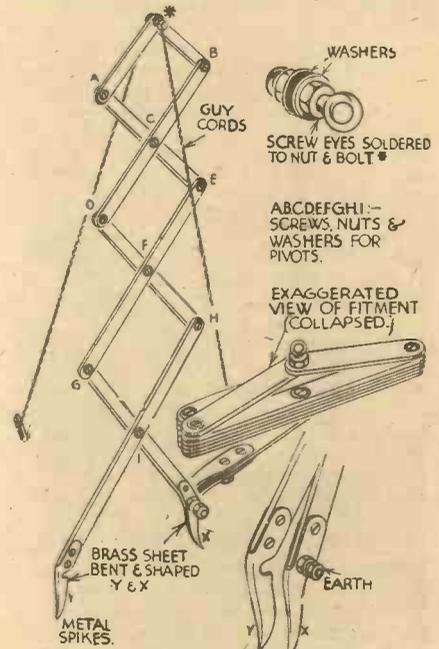
The framework is of strips of wood 1in. wide and 2ft. long, fastened by means of screws and nuts with washers between. Spikes were made of sheet brass (X and Y) which fit together when closed. Some screw-eyes and cord keeps the whole taut, and with the earth terminal attached to one of the spikes. The whole job packs flat, and is very light.—B. WILKES (Leicester.)



An easily constructed adjustable holder for a microphone.

An Adjustable Microphone Holder

AFTER completing a small microphone recently described in PRACTICAL AND AMATEUR WIRELESS, I decided to make a holder for it which would be cheap and



A novel collapsible aerial for use with a portable set.

efficient, and which would be out of harm's way, yet handy to get at. The arrangement works on the principle of the endless buckets used in quarries, and I think the idea may be of use to others, especially amateur transmitters. Constructional details are clearly shown in the accompanying diagram, and the materials required are as follows: 10 pulley wheels; 5 axles; 4 perforated metal strips; piece of wood for supporting arm; fine string; weight (made from pieces of spare wood); and a sliding block (made from small pieces of wood); and a few screws and bolts.

The microphone can be slid along, or pulled down at any convenient spot required along the wooden arm.—R. BOWES (Ferryhill).

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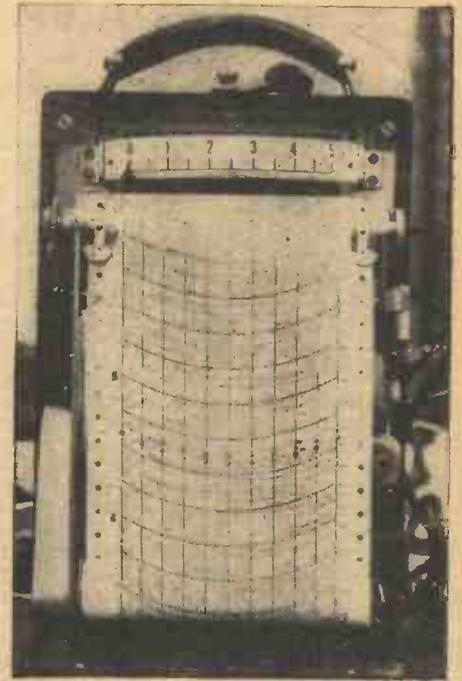
# A LIE-DETECTOR

How to Make Recording Instruments in which "Radio" May Be Applied to Detect Psychological Reactions — By "DETECTOR"

**D**URING the past year or so, we have heard a great deal about the "lie detector," an instrument which presumably registers certain physiological changes occurring in the body following some emotional stress—no matter how insignificant. The particular type of detector known as the "polygraph," devised by Dr. Keeler, of the North-Western University, U.S.A., is the one which has received most notice in the Press on account of the number of cases which have been tested in the criminal courts. The principle upon which it is based depends on a minute increase in blood-pressure resulting from a momentary psychical disturbance following a series of test questions to probe the truth of the

deducted on a class of boys whose resistance was measured before and after a set task. Mental fatigue was found to send up the resistance.

These experiments were given a wide publicity in the Press of this country and abroad, and one enterprising reporter suggested that it might be possible to record the thoughts of a person. Evidently he was thinking of some similar tests to those of the "lie detector." But I must confess that the idea of using such an instrument for recording these things never occurred to me at the time. Of course, the tests are ridiculously simple when one comes to think of it—anyone can carry them out with suitable apparatus. A circuit



(Left) A suspect being questioned by means of a "lie-detecting" machine. (Above) A close-up of the "lie-test" recording device.

## Recalibrating the Scale

For a more straightforward reading, the scale may be recalibrated in ohms so that a direct resistance measurement might be taken. This is purely a matter of choice, however. Naturally, if a milliammeter is used it will be necessary to use higher voltages, and then the sensation of slight turning may be a rather unpleasant accompaniment apart from the fact that an incorrect reading might be given; it is best to keep therefore, to low-measuring instruments, of which there is now a good range from which to select.

Another piece of apparatus which I have found interesting is based on the principle of variability of body-capacitance, when coupled to an oscillating circuit. Most readers have, I expect, seen those penny-in-the slot machines which purport to tell character, etc., through the intermediary of valve amplifiers arranged in a complicated looking arrangement of condensers, transformers, chokes, coupled to an imposing electro-magnetic device for recording the actual written characteristics of the subject. All that is required to work this impressive-looking "robot" is a penny and the raising of a horizontal electrode. Now whether there is any actual circuit here, I do not know, but the idea set me

subject's answers. Some little time ago there appeared a letter in a daily paper querying the absolute truthfulness of such an instrument and the implication of an anomalous reading was raised. Indeed, this is of vital importance, for an innocent subject may easily register a "jump" in blood-pressure when a specific point in a serious question was raised. As was mentioned: "To rely upon a machine where a moral issue is involved is highly dangerous."

for a simple layout is given in Fig. 1. One condition should be observed, however, that any suspicion of "shock" is best avoided by using a sensitive galvanometer. I inserted a Ferranti micro-ammeter—reading to 500 micro-amps full-scale deflection—in series with a 4-volt accumulator; two ordinary cylindrical electrodes (such as those used with shocking coils) being held in the hands.

## Measuring Fatigue

It is with the other type of "lie detector" that I wish to deal, however, because in 1930 I carried out a number of tests with the object of measuring fatigue following mental effort. The part of the apparatus which I used was identical with that form of "lie detector" developed by W. G. Summers, of Fordham University, and consisted of a galvanometer in series with a battery and the subject to be tested. In other words, by measuring the resistance of the person it is possible to determine the minute changes in blood-pressure through their affecting the surface tissues of the body—the pores—so that an increased secretion of sweat occurs, thus bringing down the resistance. My tests were con-

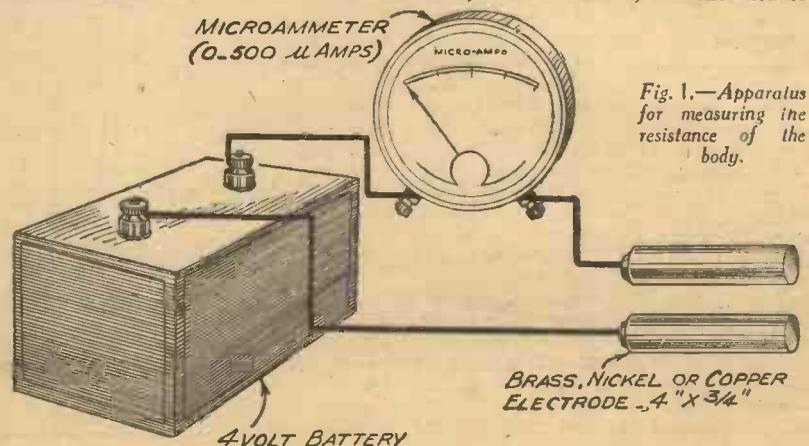


Fig. 1.—Apparatus for measuring the resistance of the body.

thinking that it would be possible to construct an apparatus which really did respond to the body's capacity. The result was the instrument shown in the sketch, which, I think, is sufficiently descriptive to warrant very little explanation.

**An Oscillator**

The oscillator used in the above experiment consisted of an ordinary A.C. mains-operated two-valve set incorporating a metal rectifier. No doubt, any type of amplifier could be used and modified in the

electrode is grasped in the hand, at the same time a change in the pitch of the armature is distinctly discernible. Since there is a continuous fluctuation of current in the meter and relay, the latter periodically operates whatever local circuit is being employed, completing circuits through either pilot lamp, buzzer or ink-recorder as the case may be.

It might be questionable if the layout

might be found for this capacity effect. As a matter of fact, a very technical piece of apparatus made its appearance some years ago, rather extravagant claims being made that it was capable of giving an audible diagnosis of various pathological states, in the form of a high pitched whistle. Surely this is of the nature of a heterodyne beat-note, somewhat after the style of the apparatus which we have just been describing.

**An Interesting Instrument**

It is useful to know that some remarkable phenomena have been recorded in the first place by crude apparatus, and that many results at the time had few merits to accord them a place in modern technique. Nevertheless, some vastly important innovations have been found of use through chance happenings connected experimentally with electrical novelties.

In conclusion I would say that a certain amount of caution is absolutely necessary before any definite conclusions are drawn from experiments which bring in the question of mental interaction, however intriguing and true they may at first appear. Exhaustive tests are always necessary before a piece of psychological phenomenon can be made to fit into a prosaic scientific pattern and to accord with preconceived notions of physical law. I do think, however, that the researches of Professor Adrian, of Cambridge, have shown conclusively that there is a thought "rhythm" capable of demonstration outside the brain, and that this wave is not a true electromagnetic wave owing to its extremely low frequency—ten-per-second. This wave, known as the Berger rhythm can be modified by thought processes and is in some way connected with the sense of sight, being

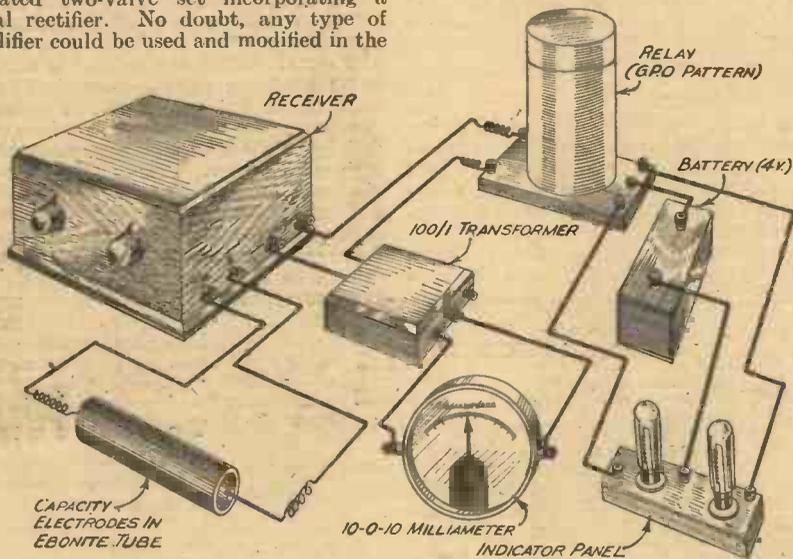


Fig. 2.—Layout of apparatus for showing body-capacity effects.

manner shown. The aerial and earth terminals of the set are connected to two small sheets of copper-foil bent in a cylindrical form so as to slide into the ends of a lin. diameter ebonite tube, leaving a space of about 2ins. inside the tube between them; this tube is 12ins. long. Grasped in the hands, the ebonite tube forms a condensar electrode and forms a capacitive coupling to the input stage of the amplifier. The output terminals (the L.S. of set) are connected in series with a polarised relay (G.P.O. pattern) and the secondary of a 100-1 transformer (the one actually used was a bell-transformer with the usual 3, 5 and 8-volt tappings on the secondary). Notice here that the transformer primary when used as a bell-transformer is the high-resistance side (240 volts), the secondary being the three tappings mentioned above; used in the output stage it must be reversed so that the secondary now becomes the primary. The tapping side of the transformer—the 3-volt tapping—is now connected to a milliammeter reading up to 10 milliamps (the one employed being a moving-coil instrument).

**An Impulse Counter**

The relay contacts are closed through any piece of apparatus such as a lamp, bell-indicator or buzzer and a battery. If required this circuit may incorporate an impulse counter to record the number of impulses impressed on the grid of the first valve, or to operate a graphical ink recorder. This is at the choice of the experimenter. The conditions of operation are quite simple, for the first thing to do is to tune the amplifier, using reaction to produce a high-frequency whistle which can just be heard from the vibration of the relay armature. When this is quite audible, the set is oscillating and a meter reading is immediately given as shown by a momentary swing of the needle. This needle deflection increases when the ebonite

has any practical value; it is difficult to assess any definite claim, but it is sufficiently interesting to warrant further experi-

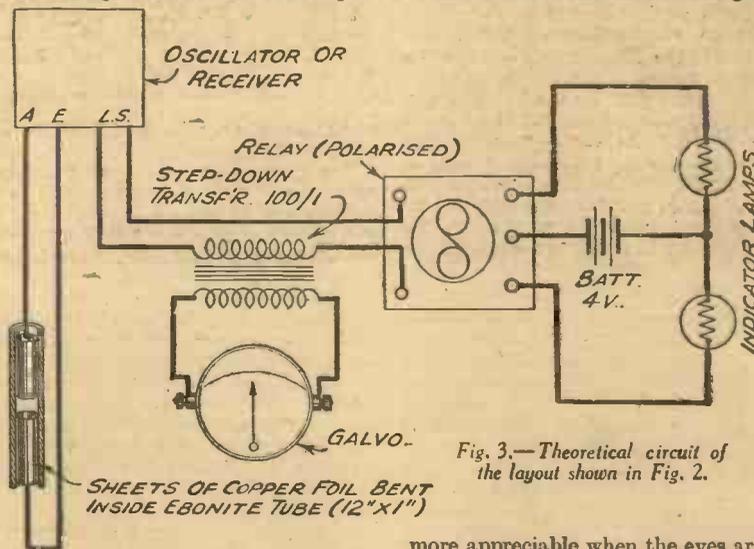


Fig. 3.—Theoretical circuit of the layout shown in Fig. 2.

ment. We all know what complicated circuits may be applied to operate remote control arrangements which incorporate photo-electric cells; similar applications

more appreciable when the eyes are closed, while thought-concentration interrupts it. Such findings are indeed valuable, both as a means of diagnosis and also in the comparison of normal fatigue reactions.

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# HOW MANY CONTROLS?

The "Experimenters" Suggest that Variable Selectivity and Efficient Tone-control Systems should be More Widely Adopted by Constructors

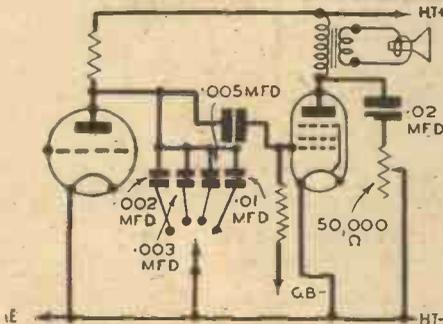
THE number of receiver controls has tended to diminish gradually over the past few years, and many experimenters are of the opinion that this is a bad thing. On the other hand, there can be no doubt that the greater simplicity of operation is appreciated by the class of person who is sometimes rather unkindly described as the "ordinary listener." Whatever the pros and cons might be, it is certain that a few extra controls are often valuable to the interested user of a receiver. It is true that they must be used discriminately if the set is to perform to the best of its capabilities, but the average reader of PRACTICAL AND AMATEUR WIRELESS is quite capable of doing this.

### Correlated Controls

Controls that are very valuable, and which are often omitted in the interests of simplicity, are those for tone and selectivity. To a certain extent the two are correlated, because the adjustment of a variable-selectivity control often gives effects similar to those of the tone-control. For example, if the band-width acceptance is reduced by means of the selectivity control, the higher notes are automatically attenuated or reduced in intensity in relation to the lower notes. And if a tone-control is not fitted, the output circuits being designed to give "mellow" reproduction when the selectivity is moderate—say 9 kc/s—there is a double attenuation of the higher frequencies if the band width is narrowed to, say, 5 kc/s.

This shows the need for the two controls, although they may be ganged if both are suitably graded. As the constructor can rarely gang them suitably, however, separate knobs for the two functions are desirable. Then, if tuning is sharpened by narrowing the band-width acceptance, the L.F. circuits can be made to give comparatively high high-note response.

To obtain really successful variable



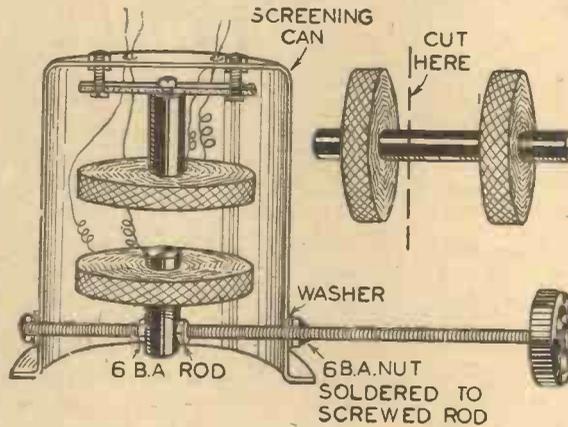
Two alternative methods of simple tone control which are referred to in this article.

selectivity it is practically essential to use a superhet circuit. There will generally be two intermediate-frequency transformers and both may be of the variable-selectivity type, the controls being ganged. On the other hand, the simpler method of using a variable selectivity I.F. transformer following the frequency-changer with a normal "fixed" transformer between the I.F. and second-detector stages is usually perfectly satisfactory as long as the second trans-

former has closely-coupled windings: in other words, provided that it covers a wide band width due to the tuning being rather flat.

### Variable Selectivity

The method of providing variable selectivity is nearly always dependent upon the design of the I.F. transformers. Two principal methods are by mounting one winding so that it can be moved mechanically in respect of the other, and by using a form of coupling winding between the two tuned windings, this having a variable resistance connected to it to produce more



A home-made variable selectivity I.F. transformer.

or less damping, and so to alter the degree of electrical coupling.

The system of tone-control can take one of many forms. In some cases a low-inductance iron-cored choke and fixed condenser are associated with the primary circuit of the first L.F. transformer, a potentiometer being used to increase the effect of either. Thus, when the condenser is in parallel with the transformer primary, there is a top-note cut-off, and when the effect of the choke predominates a bottom cut-off is produced. Theoretically, this method of "two-way" tone-control is ideal, but in practice there are many snags. The most important is that signal strength is curtailed at one end of the scale; another is that reproduction at the mid-way position of the control is not as good as it would be without the extra devices.

### How Pentodes Help

Greater efficiency is to be obtained by using an extra valve for tone-control purposes, its function being to increase (by normal amplification) signal strength at one end of the scale. But the average constructor does not wish to add to the number of valves in this manner. Fortunately, evolution has helped to solve the problem in a fairly satisfactory manner. As most readers are aware, pentode and tetrode output valves are more sensitive to the high than to the low register. Thus, by providing a variable high-note cut-off only, an effective measure of tone-control can be obtained.

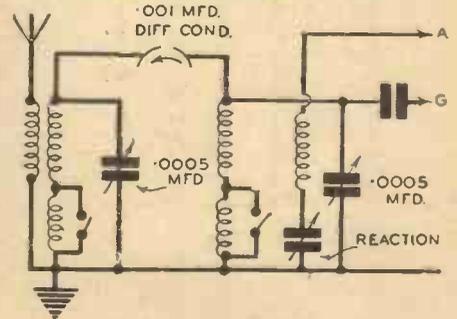
There are very many ways of arranging

the control, the most usual being to connect a fixed condenser and variable resistor in series between the anode of the output valve and earth. When the resistor is adjusted to its maximum value the combination has little effect, but as the circuit resistance is reduced, the condenser comes into effect and by-passes a certain proportion of the high frequencies. This method is not always as satisfactory as might be desired, and some manufacturers prefer to provide a fixed resistor and condenser in the output-valve anode circuit, and to include the tone-control in another part of the set. The fixed corrector circuit is designed merely to prevent excessive high-note response from making reproduction "squeaky."

### Tone-control Methods

One convenient method of adding tone control in addition to the correction circuit mentioned is to include either a variable resistor and fixed condenser or a number of fixed condensers across the anode load of the penultimate L.F. valve. When condensers are used alone there is a rotary switch for putting any one of them in circuit. Thus, if there were four condensers rated at between .01 mfd. and .002 mfd. there would be a four-way switch to which one terminal of each of the four condensers would be joined.

At least one receiver manufacturer combines a tone-control arrangement such as this with a variable selectivity control. An eight-way rotary switch is used, four



A useful form of variable selectivity control for a simple set of the Det.-L.F. type.

positions of this altering the band width, and the other four controlling the tone-correction condensers. This is probably one of the best systems for use in a set intended for a non-technical user.

Another simple tone-control system, which is better in practice than theory would suggest, consists of connecting a 100,000-ohm variable resistor (of the graded type (in parallel with the primary

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(Continued from facing page)

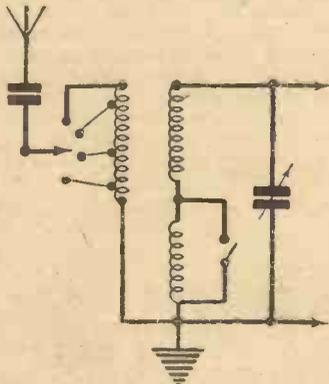
of the L.F. transformer in the detector or second-detector anode circuit. There are many other more-elaborate methods, but those mentioned are generally most convenient for the constructor.

**Side-band Splash**

One of the most valuable uses of either tone or selectivity control when receiving more distant stations is that it permits of the elimination of certain forms of interference such as side-band splash. When this occurs it is heard as a "rustling" or "dithering" noise on top of the programme being received, although the signal from the interfering station is generally unrecognisable. It is most pronounced on speech, when the depth of modulation is frequently increased by the control engineers. The trouble is due to the fringes of the two side-bands producing what might almost be described as beat notes. By cutting down the band width the trouble can be overcome, and if the high-note response of the L.F. portion of the set is slightly increased it will often be found that quality of reproduction does not suffer to any great extent. Even if it does, slightly inferior quality is preferable to annoying interference.

**For "Straight" Sets**

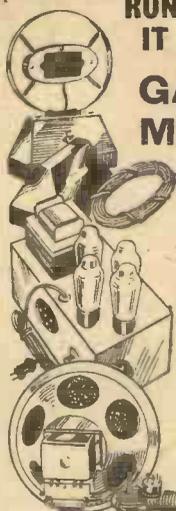
Some form of tone control can be applied to almost any type of receiver but, as has been pointed out, variable selectivity is a really practicable proposition only when using a superhet circuit. Nevertheless, there are methods by which the principle can be applied to oven simple types of "straight" receiver. For example, if an H.F. transformer or double-wound coil is used in either the H.F. or aerial circuits, a fair measure of control is possible by tapping the aerial winding and bringing out these tapings to the contacts of a rotary switch, as shown in an accompanying illustration. Another method which is somewhat better although not always as convenient, is to use a band-pass tuner with



Variable selectivity introduced by a tapped aerial winding.

"top-capacity" coupling. Two similar coils, both tuned, are together connected to the earth line, while the aerial is connected to a second winding of one of them. The corresponding winding of the other may be used for reaction if the circuit is of the Det.-L.F. type. Between the top ends of the two coils is connected a small-capacity variable condenser; a .0001-mfd. differential reaction condenser is satisfactory if connection is made only to the two sets of fixed vanes.

An ultra-simple method, which is not particularly good, is to connect a .0002-mfd. variable condenser between the aerial terminal of the set and the aerial winding.



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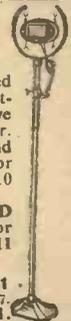
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# EKCO PUSH-BUTTON MODEL P.B. 199

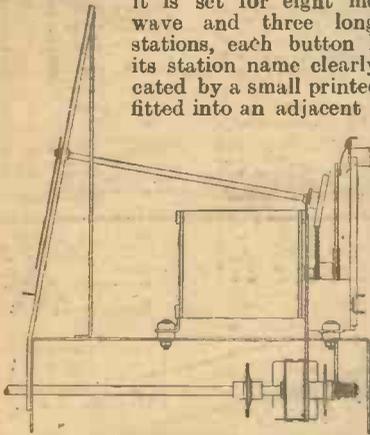
## Details and Test Report of the First of the Ekco New Automatic Tuning Receivers

**T**HE Ekco P.B. 199 is the first press-button receiver of the motor-tuning type we have received for test purposes, and if it can be taken as a criterion of the system which is rapidly becoming so popular, we can only say that the day of the ideal receiver is with us.

In appearance, the receiver is similar to an ordinary model, with the exception of the neat push-button strip which is fitted to the right of the large square three-scale dial. Twelve buttons are provided, eleven of which actuate the station selector mechanism—the remaining button being so arranged that it cuts out the motor control and allows the receiver to be tuned in the normal manner by an efficient slow-motion drive.

When the hand control is used, the "Mystic Eye" tuning indicator is brought into circuit and this very neat little device enables an accurate setting to be obtained with the utmost ease.

Before the receiver leaves the factory, it is set for eight medium-wave and three long-wave stations, each button having its station name clearly indicated by a small printed label fitted into an adjacent frame.



This shows the main details of the motor-driven station locators incorporated in the Ekco receiver.

Fresh names may be inserted if it is required to change the setting of the selectors, and spare indicating labels, covering the majority of the worth-while stations, are provided with the receiver.

Bearing in mind the accuracy required when tuning a modern superhet, it is quite pardonable for one to wonder if it would not be a difficult job to set the selector device for other stations, and therefore this was one of the first things we investigated after applying all the normal tests.

In the back cover of the receiver is fitted a drop flap which, when released, exposes the station selectors mounted on two semi-circular tracks, each selector being numbered to correspond to the push-buttons on the front of the cabinet. When it is desired to change the station for any one selector, the motor mechanism is cut out by pressing the twelfth button, and the receiver tuned to the exact setting by the slow-motion control and the "Mystic Eye." The selector unit is then moved round its track until a small pilot light, fitted on the chassis, goes out, this indicating correct location of the selector. Although great accuracy is obtainable by this method, the makers have embodied a

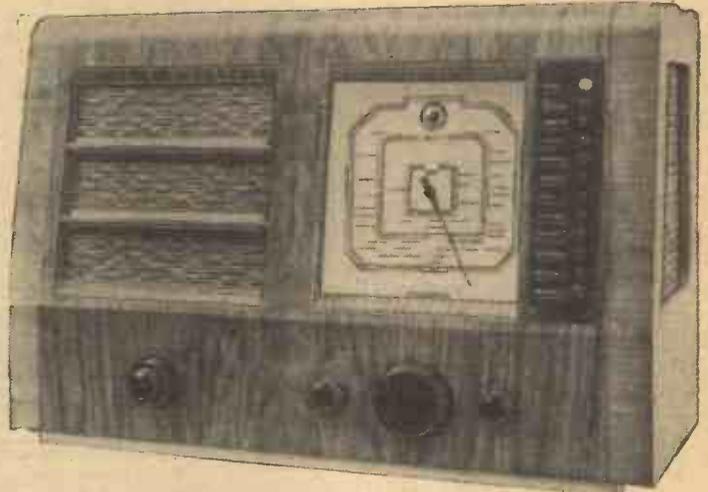
unique A.F.C. or automatic-frequency control circuit, which compensates for the slightest variation in the mechanism so that "spot-on" tuning is always obtained.

### Test Report

When the P.B. 199 was tested with the button control in action, it was found that all the stations indicated came in at a reasonably consistent sound level, the volume being pre-set by the manual control which also provides a smooth and well-graduated adjustment for the ultimate output required. Inter-station noise or any form of interference from the motor is non-existent,

the speaker being completely dead when the dial pointer is travelling from one setting to another.

The button control was given a most exhaustive test, the mechanism being



Ekco Model P.B.199, which embodies motor tuning.

made to select one station after another over a considerable period and, in every instance, the desired station came in as soon as the pointer had reached the correct setting. Various aerials were tried and, in fact, everything was done to create the widely-differing conditions which the modern receiver is called upon to contend with, but the P.B. 199 came out on top every time.

With the dial control, dozens of stations were received at good entertainment volume, the speaker being able to handle an output more than one usually requires for domestic purposes without the slightest trace of distortion.

Apart from the tuning and wave-change control, there is fitted a volume, tone, and selectivity control, the latter allowing the local or more powerful stations to be received with the highest quality of reproduction or, if so desired, a greater degree of selectivity to be obtained when reaching out for the more distant transmissions.

The short-wave stations were particularly good and, when tuning over these bands, the slow-motion control and the "Mystic Eye" proved most efficient and helpful.

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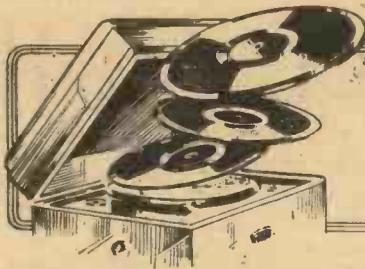
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### SPECIFICATION

Specification: Model P.B. 199.  
Receiver: Press-button Motor Tuning. 10-Stage All-wave superhet for A.C. mains. Table model.  
Valve Combination: Ekco VP41, TX41, T41, VP41, 2D41, DT41, OP41 and R41.  
Controls: Tuning, Volume, Tone, Selectivity and Press-buttons.  
Test report: Very efficient on all wavebands. High quality of reproduction on both radio and gramophone. The Tone control providing a wide and pleasing variation over the whole frequency response.  
The Press-button tuning was found to be most consistent and accurate.  
Makers: E. K. Cole, Ltd., Ekco Works, Southend-on-Sea.  
Price: 18½ Gns.



# Impressions on the Wax

## A REVIEW OF THE LATEST GRAMOPHONE RECORDS

### Decca

THE International Festival of Contemporary Music now running in London (June 17th to 24th) is an important International Festival for it is attended by people from all over the world. Amongst the British musical works performed at this gathering is Alan Rawsthorne's "Theme and Variation for Two Violins," played by Kathleen Washbourne and Jessie Hincliffe. Nine variations arise out of the theme, and they are full of variety in style, mood, rhythm, etc. It has been recorded on Decca K 884-5 and is a "tuneful" work by one of the younger English composers.

It seems impossible to get away from the tunes from "Snow White and the Seven Dwarfs" as yet another recording appears this month, this time by Dudley Beaven on the organ, who makes his Decca debut with selections from this film on Decca F 6682.

I am always appreciative of Strauss waltzes and therefore I have a distinct partiality to Charley Kuzs "Medley of Strauss Waltzes" on Decca F 6693.

Greta Keller turns to the films for her latest recording on Decca F 6683. She sings "You're a Sweetheart" and "My Fine Feathered Friend," both of which are from the film, "You're a Sweetheart." Dance tunes are supplied by Lew Stone and his Band playing "Dinner and Dance" and "An Amazon Goes A-wooing" on Decca F 6679, whilst Jack Jackson and his Orchestra have recorded "Please be Kind" and "Good-night, Angel" on Decca F 6677 and "You Got the Best of the Bargain" and "You're an Education" on Decca F 6678.

### Rex

IF you are keen on dancing, then I can recommend Maxwell Stewart's Ballroom Melody playing "Palais Glide" and "Lambeth Walk" on Rex 9301. There is issued in connection with this record a leaflet telling you how to dance these two exhilarating dances. Maxwell Stewart presents the tunes in strict dance tempo and without vocal refrains.

Gracie Fields has two tip-top records this month with "Lambeth Walk" and "Little Drummer Boy" on Rex 9308, and "Walter, Walter" and "The Trek Song" both tunes being from her latest film, "We're Going to be Rich," Rex 9307. You must hear her version of "Lambeth Walk," which is exhilarating and she has the Corona Babes to assist her. Another record played in strict dance tempo is Reginald Dixon on the organ playing "Dancing Tune" on Rex 9303. The waltz introduces "The Merry Widow," "The Maid of the Mountains," "My Hero" and "Blue Danube," whilst "Rosalie" and "Double Dare You" are played in quick-step time.

### Vocalion

RHYTHMIC records are featured this month with "Toots" Mondello and his Orchestra playing "At Sundown"

and "I'll See You in My Dreams" on Vocalion S 151, and Ace Harris and his Sunset Royal Orchestra playing "Rhythm 'bout Town" and "One Little Word Led to Another" on Vocalion S 152. "Always and Always" from the film "Mannequin," coupled with "Please be Kind," is played by Red Norvo and his Orchestra on Vocalion S 156, and Stuff Smith and his Onyx Club Boys have recorded "Here Comes That Man With the Jive" coupled with "I've Got a Heavy Date" on Vocalion S 154.

### Panachord

"THE Last Mile" and "Beneath a Bed of Daises" is sung by Johnny Marvin, with guitar accompaniment, on Panachord 25973, and the Paradise Island Trio (steel guitar, organ and vibraharp) play two dreamy numbers, "My Isle of Golden Dreams" and "On Miami Shore," on Panachord 25975.

Films feature in the dance tunes played by Ben Pollock and his Orchestra on Panachord 25976 as "Have You Ever Been in Heaven?" and "Mama, I Wanna Make Rhythm" are both from the film "Manhattan Music Box."

### H.M.V.

THE death of Feodor Chaliapin in Paris during April is much regretted by all music lovers. Only two double-sided records remain unissued, and these are now available. One shows him in his most famous rôle, as King Boris in "Boris Godounov," in the Prayer and Death of Boris, the climax of the tragedy—H.M.V. BD 3464. The other features two songs, the well-known Russian folk song, "Black Eyes," and "The Prisoner," in which the captive shares his cell with an eagle, who seems to urge him to fly away—H.M.V. DB 3463.

Paul Robeson has this month chosen a song that Chaliapin made famous, "The Song of the Volga Boatmen," a sort of Russian shanty, sung by the river workers as they hauled their barges. Robeson sings it most effectively, and, except for the "Ei Uk'neym," in English. It is coupled with "An Eriskay Love Lilt," from Kennedy-Fraser's "Songs of the Hebrides"—H.M.V. B 8750.

The B.B.C. Kentucky Minstrels, who need no introduction, give some fine harmony work in Doris Arnold's arrangement of "The Holy City" on H.M.V. BD 546. Reginald Foort is at the organ.

There are records by two of the most popular exponents of the theatre organ. Reginald Foort at the B.B.C. theatre organ plays his "Hit Parade No. 3" on H.M.V. BD 553. This includes "Serenade to the Stars," and "So Long, Sweetheart"; and Al Bollington at the organ of the Paramount Theatre, London, plays a "Medley of Viennese Waltzes" on H.M.V. BD 519.

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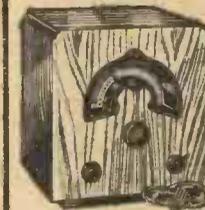
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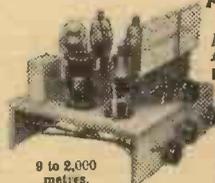
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# Technical Fundamentals—II

Further Particulars of Frequency-changing Valves are Given in this Article

AS will be clear from Fig. 50, signal oscillating potentials, and locally generated oscillating potentials, are acting on two separate grids of the same valve, and it stands to reason that both these grids will have a control on the current at the outer anode. Actually, the effective mutual conductance of the signal amplifying section of the valve varies in sympathy with the oscillating potential on the grid of the oscillator section. The result, of main interest from our present point of view, is that the fluctuating current in the outer anode circuit is dependent upon the product of the signal and oscillator e.m.f.'s. This, in turn, means that there will be a component fluctuation having a frequency

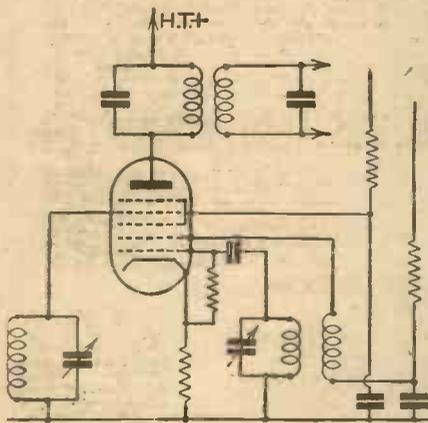


Fig. 50.—Circuit diagram of a pentagrid frequency-changing stage.

equal to the difference between the signal and oscillator frequencies. This "difference" frequency will, of course, be adjusted to the required intermediate frequency value, and the I.F. transformer in the outer anode circuit (Fig. 50) will respond to this particular frequency.

It is to be emphasised again that the signal section of the valve is not adjusted for detection. Incidentally, that is one reason why it is possible to apply A.V.C. to the signal grid.

There is a certain optimum amplitude for the local oscillations which implies that the oscillator (external) circuit should be designed accordingly. It is, of course, correspondingly desirable that the local oscillations should keep reasonably constant in amplitude, and the presence of the grid condenser and grid resistance in the circuit of Fig. 50 is concerned with this requirement.

The octode frequency-changer is a valve containing one electrode additional to the number contained in the pentagrid. This additional electrode is a suppressor grid which is mounted directly in front of the other anode, and is internally connected to the cathode. The presence of the suppressor grid has the effect of making the signal amplifying (or "modulator") section of the valve have the characteristics of an H.F. pentode.

The triode-hexode frequency-changer can be regarded as consisting of two valves with a common cathode. Essentially, the triode-hexode consists of a triode oscillator and a hexode "mixer." The electrode

assembly is represented diagrammatically in Fig. 51. Note that the grid of the triode section is internally linked across to an "injector" grid in the hexode assembly.

The oscillator tuned circuit is connected between the triode grid and the cathode, and the oscillating potentials set up on the triode grid are directly applied to the injector grid of the hexode. Electrons passing from the cathode to the hexode anode must necessarily pass through both the signal grid (carrying the input potentials) and the injector grid (carrying the local oscillation potentials). The current fluctuations in the hexode anode circuit are, therefore, dependent upon both the signal and the local oscillation potentials and, as in the case of the pentagrid, will be proportional to the product of these potentials. As a result, the first I.F. transformer will be supplied with a component having the usual "difference" frequency.

The triode-hexode offers an appreciable advantage over the pentagrid and the octode, where short-wave reception is

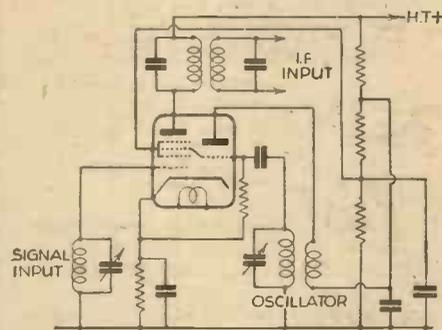


Fig. 51.—A triode-hexode frequency-changer circuit.

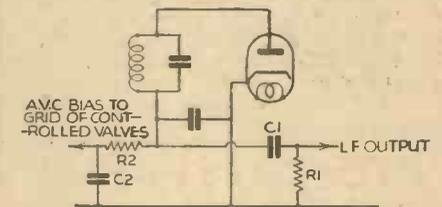


Fig. 52.—A simple A.V.C. circuit.

concerned. This is due to the fact that the virtual separation of the oscillator of the triode-hexode renders interaction negligible between the oscillator anode and the signal grid. Such interaction is appreciable with the pentagrid and the octode, particularly on short-wave signals, and has the effect of lowering the conversion efficiency.

## A.V.C.

Automatic volume control is the term applied to the automatic control of the effective high-frequency amplification of a receiver in such a manner as to bring about a decrease of amplification with an increase of signal carrier amplitude, and an increase of amplification with a decrease of carrier

amplitude. The primary objects of incorporating A.V.C. in a receiver are: (1) to prevent strong signals overloading the output stage (2) to minimise the effects of signal fading.

The control upon the H.F. amplification is exercised by means of grid biasing, and this implies that the controlled valves must be of variable- $\mu$  types. The question that is raised now is, how can a direct voltage, dependent upon the signal carrier amplitude, be obtained for application as bias to the grids of the controlled valves.

The problem brings us to a further consideration of the diode detector. In article seven of this series it was shown that if unmodulated H.F. oscillations are applied to a diode detector circuit the rectified current in the load resistance will be of steady D.C. character. Under modulation conditions the current in the load resistance will, of course, fluctuate at audio-frequency, and in article seven we were chiefly concerned with utilising the corresponding audio-frequency voltage developed across the load resistance.

In connection with our present interest it becomes a very useful idea to regard the current in the load resistance as consisting of two components: a D.C. component dependent upon the carrier amplitude and an A.C. component dependent upon the modulation of the signal. Corresponding to these two current components there will be two voltage components set up across the load resistance. For A.V.C. purposes it is the direct voltage component that matters.

It must be emphasised that, under conditions of negligible detector distortion, this direct voltage is independent of the modulation but is directly dependent upon the carrier amplitude so that the value of the voltage will rise with an increase of the incoming signal strength. The practical problem resolves itself into that of picking up this direct voltage and applying it to the grids of the H.F. valves. The direct and alternating voltage components are both present at the diode load resistance, but separation is easily effected by quite simple filtering arrangements.

It is possible to make a single diode detector perform the double function of signal detector and A.V.C. detector, and Fig. 52, shows a basic circuit. C1 and R1, respectively, are the grid condenser and leak of the succeeding valve. C1 will block D.C., so that the alternating component of voltage only will act on the L.F. valve.

(Continued at foot of col. 1, page 371)

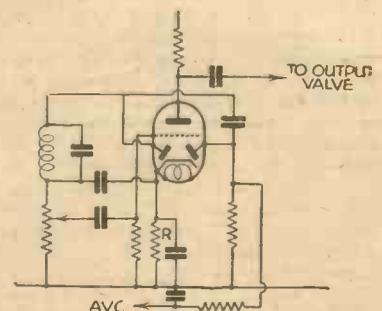


Fig. 53.—A double-diode-triode circuit providing detection, delayed A.V.C. and L.F. amplification.

# RADIO CLUBS & SOCIETIES

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

## PECKHAM DISTRICT SHORT-WAVE CLUB

A CLUB has been formed under the above name for this district. If any readers are interested full particulars may be obtained from the Secretary: L. J. Orange, 11, Grenard Road, Peckham, London, S.E.15.

## LONDON TRANSMITTING SOCIETY

A SUCCESSFUL Junk Sale was held on June 9th, Mr. Altman, 2DCN, being auctioneer. £10 11s. 3d. going to society's banking account. We have to thank Mr. Allen, 2CXU, Mr. Green, 2DTW, Mr. Morgan, 2CBG, Mr. Robbins, 2DRC, Mr. Barnes, 2DHK, Mr. Croucher, 2DFU, for their help at this event.

We are erecting 50ft. antenna masts, June 30th. We have decided on a 28-mc/s directive antenna system, four-in-phase antennas, backed up by four reflectors, concentrating the radiation in the direction of transmitter being received. The society are spending a day by the sea in September, and we shall be pleased to hear of members wishing to go with us. Morse lessons are given Thursdays, 8 p.m., by Mr. Yale, and we welcome new members. Membership is free to holders of Transmitting Licence (AA or full) and application must be made on QSL card and not by letter, and 1/4 stamp should be enclosed to, 2DWS, 40, Raeburn Road, Edgware.

## TECHNICAL FUNDAMENTALS No. 11

(Continued from previous page)

R2 and C2 provide the filtering for the A.V.C. feed line. The alternating component of voltage acts across R2 C2 in series. The impedance of C2 can be made sufficiently low in comparison to the resistance of R that only a negligible fraction of the alternating voltage remains across C2, and the voltage acting on the controlled valves becomes sensibly direct in character.

There is some disadvantage in making the one diode act as both signal and A.V.C. detector. Such an arrangement will give a certain amount of A.V.C. biasing, even on very weak signals, which means that the receiver will not be able to attain its maximum sensitivity under the circumstances when it is most desirable that it should be able to do so.

It is more satisfactory to have a delay on the A.V.C. action such that the controlled valves receive no A.V.C. bias unless the input signal amplitude is above a certain pre-determined level. With delayed A.V.C. the receiver will provide its maximum H.F. amplification on all signals below this particular amplitude.

For delayed A.V.C. a diode separate to the signal detector is used as A.V.C. detector, and the required delay is brought about by negatively biasing the anode of the A.V.C. diode. The A.V.C. diode will now remain out of action unless the peak amplitude of the H.F. oscillations applied to it exceeds the value of the delay bias.

Convenience in construction of circuits involving two diodes has been well catered for by the valve manufacturers, and commonly used multiple valves include the double-diode (detector and A.V.C.), the double-diode-triode (detector, A.V.C. and L.F.), and the double diode output pentode (detector, A.V.C. and output).

Fig. 53, shows a typical circuit arrangement using a double-diode-triode for signal detection, delayed A.V.C., and L.F. amplification. It will be observed that the resistance R in the cathode circuit provides the bias for the triode and also the delay bias for the A.V.C. diode.

## KING'S LYNN SHORT-WAVE CLUB

A SPECIAL meeting was held at the Adult School for a demonstration of short-wave gear and receivers, by Mr. Cholot, of Lissen, Ltd., who showed how, by suggestions and criticisms of existing sets from clubs all over the country, manufacturers were able to improve their sets. Several battery sets were demonstrated, and after the lecture members were invited to try the sets themselves. An unexpected and welcome visitor was Mr. Jeapes (G2XV) a prominent R.S.G.B. member from Cambridge. It was decided to accept the offer of having the four-valve superhet on loan for test.—Secretary, G. Rodgers, 112a, High Street.

## EASTBOURNE AND DISTRICT RADIO SOCIETY

A SHORT-WAVE DEMONSTRATION was given by Mr. E. Cholot, of Lissen Radio, Ltd., to the Eastbourne and District Radio Society on May 30th, in the Science Room at the Cavendish Senior School, East Street, Eastbourne.

He arranged a demonstration of sets and components, and then went on to explain their Hi-Q Short-Wave Components.

Two models were demonstrated, Model 8114, a 5-valve (excluding rectifier) 4 wave superhet and

Model 8302 EB, a 5-valve (excluding rectifier) 3-wave superhet. He also demonstrated a 4-valve Hi-Q battery superhet.

He told that at previous society meetings he has been asked if he has any so-called junk for sale, so he now makes a regular practice of having a sale afterwards, though some of the stuff which was offered for sale was far from being junk. Books were also sold.—T. G. R. Dowsett, Hon. Secretary, 48, Grove Road, Eastbourne, Sussex.

## THE BOOTLE AND DISTRICT AMATEUR TRANSMITTING SOCIETY

AT the last meeting of this society on Tuesday, June 7th, the committee was elected as follows: Secretary, C. E. Cunliffe; Chairman, R. D. MacKenzie; Vice-Chairman, T. H. Snee; Treasurer, J. H. Cunliffe. Members' representative, E. Forster. A list of rules for the society were also decided upon. The meetings are now held each Tuesday evening instead of on Monday. We shall soon be starting our summer programme, and so all intending members are advised to write to the Secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool 20, for application form.



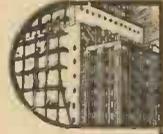
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- Motor Engineering
- Motor Trade
- Municipal and County Engineers
- Naval Architecture
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- Pattern Making
- Play Writing
- Police, Special Course
- Preceptors, College of Press Tool Work
- Pumps and Pumping Machinery
- Radio Communications
- Radio Service Engineering
- Road Making and Maintenance
- Salesmanship, I.S.M.A.
- Sanitation
- Secretarial Exams.
- Sheet Metal Work
- Shorthand (Pitman's)
- Short Story Writing
- Shipbuilding
- Structural Engineering
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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).

## Interference

**SIR**,—I wonder if any readers have experienced and can explain the peculiar form of distortion which I have recently been getting on the short-waves. I have a simple home-made S.W. three, and on about 30 metres (?) I can hear certain broadcast stations which appear to be harmonics of medium-wave stations. The signals "float" for want of a better word, and are accompanied by a "squishing" sound. The signal rises and falls quite rhythmically, and the distortion is such that I cannot yet identify the language. I should like to know if it is a local phenomenon or is due to any faults in my set.—**G. A. WATTS** (Hendon, N.W.9).

## Spanish Tests

**SIR**,—Just recently I have picked up what I take to be Spanish broadcasts on various wavelengths. Two or three times I have heard these on different wavelengths, saying the same thing, and as near as I can make out on my set the wavelengths are 25 and 30 metres. Can anyone assist me by identifying these stations? These broadcasts were heard about midday on three separate occasions.—**T. DOVEY** (Cambridge).

*[Although it is not possible to say definitely without more details, it would appear that these were the experimental broadcasts from the new Lisbon transmitter.—Ed.]*

## Variable Selectivity

**SIR**,—I was interested in your article on S coil types recently published and should like to thank you for the interesting details. It is not often realised how valuable certain small details can be in a paper and I should like to tell you that I was using a very old set (vintage and make unknown) when I read this article. As a result of the details given I modified one or two connections and made two changes in my coils on the lines of certain details given in that article. My set is now one hundred per cent. better. It is more stable; I can adjust reaction much more delicately, and I get at least a dozen more stations than before. It is these small improvements which one can make that add to the enjoyment of radio construction and experiment.—**A. PAUL** (Oswestry).

## Double Earths

**SIR**,—I read with interest the details on double earths and mains interference recently published from J. D. (N.W.5) and experienced similar trouble myself. It was some time ago and details are not now very clear in my mind, but from what I remember the trouble was first introduced by clicks which eventually turned out to originate when switches were operated in a neighbouring house. A local electrician was consulted and said that the switches were faulty. I was not satisfied and carried

out a number of experiments. I found that the trouble was loudest when a water-pipe earth was used, and on inquiring from the neighbour I found that he also was using a water-pipe earth. When one of us changed the earth the trouble decreased, but did not vanish entirely. Eventually I used a counterpoise and the clicks and a slight background of hum were entirely removed. I think this proved that the original assumption of J. D. was correct, namely that the trouble comes via the earth, and it is probable that much of to-day's interference is introduced into modern receivers through this all-important connection.—**K. PEARCE** (Hornsey, N.).

## Service!

**SIR**,—I wonder when the radio industry will be put on the same basis as the car industry. If one wishes to purchase a car—even a second-hand one—from a local garage, it is possible to arrange for a trial run. In some cases a mechanic will accompany the purchaser and explain certain peculiarities which may be present in that car, or the prospective purchaser may take the car out alone—on paying a suitable deposit (or even without it if he is known to the garage proprietor). In the case of a radio set you have to hear it in a shop, and if any comments are made regarding the

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## Do you know

—THAT submarines are guided, and ships make use of depth gauges, by apparatus in which radio echoes are employed.

—THAT an ordinary triode may be used as a diode by ignoring the grid or by strapping together grid and anode.

—THAT under-charging is just as damaging to an accumulator as over-charging.

—THAT satisfactory radio-gram switching cannot be arranged in a simple diode circuit.

—THAT the advantages of iron-core coils are often lost owing to the use of inefficient tuning condensers.

—THAT for maximum performance in a push-pull stage separate grid-bias of each valve should be employed.

*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.*

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performance one is told that the shop is screened, it is a bad day, or some other excuse. Any suggestion that the set be taken home and tried on your own aerial is met with a polite refusal that the set could not be resold if brought back as it would be second-hand. What is one to do? I have yet to hear a set in any showroom that I could take a fancy to, and every comment on performance has been excused. I have even made fictitious complaints in order to judge whether the salesman was making excuses without knowing anything about the set—and I have proved that he was. I hope things will be improved when television comes in!—**L. ASMUNS** (Blackpool).

## Radio Control

**SIR**,—I wished to carry out some tests on the wireless control of boats recently, and you gave me some details, but told me that a licence was necessary. I have been now in touch with the G.P.O. and am informed that no licence is required for ordinary radio control experiments. It is necessary, however, not to adopt spark transmission, and furthermore, I am informed that there are no restrictions whatsoever in this connection, with one proviso. Should any interference be experienced by listeners in the vicinity on ordinary broadcast wavelengths the authorities may introduce some limitations on the activities of the experimenter. This information may be of value to others who are interested in this branch of radio work.—**C. FEARNELY** (Gosport).

## The Vitesse

**SIR**,—I built the Vitesse receiver some time ago, and had done nothing but grumble at it. It was a sore point at home as I failed to get anything out of it, and my friends had told me that that was the fruits of home construction. I then did what I ought to have done at first, and wrote to you, as a result of which you kindly examined the set for me. You discovered two silly mistakes in the wiring which I had repeatedly checked (?) and after rectifying these and lining up the set you invited me to hear it. I must express my thanks for your service work and also for the design which is now setting all my friends by the ears and at least two have started in to build the set for their own use. You are doing amateur construction a real service and I, for one, greatly appreciate it. With renewed thanks.—**G. WINTERS** (Liverpool).

## "Economy S.W. One"

**SIR**,—Just a line to tell you that I have made the "Economy" S.W. 1 valver and it works splendidly. I have two aerials, one about 15ft. long and the other 30ft., as I sometimes find I get better results with the shorter one. I have been a regular reader of PRACTICAL AND AMATEUR WIRELESS for the last four years and it has helped me a lot on many occasions so here's wishing you further success.—**C. G. GRIGGS** (Herne Bay).

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# NEWS FROM THE TRADE

## "Triogen" Coils

WE have been informed by Messrs. Wright & Weaire, that owing to the multiplicity of manufacturing difficulties which have been experienced with the Triogen coils, it has been decided that they will be withdrawn from circulation. No further supplies are, therefore, now available.

## New B.T.-H. Microphone

A SIMPLE carbon-type microphone is now included in the range of B.T.-H. microphones, and this is claimed to possess a very high degree of sensitivity. It is designed for use at banquets and similar functions where an unobtrusive unit is needed. It is of rugged construction and measures 2 7/16in. long, 1 1/16in. high and

## Ediswan Valves

THE Edison Swan Electric Company are shortly releasing three valves designed primarily for use in modern television receivers. These are screened pentodes and a beam-power pentode. The first two are of the screened type with very small dimensions and type SP41 is for use in I.F. or H.F. circuits, whilst the second SP42, is for use as a video output stage. The beam-power amplifier, type AC6/Pen, will fulfil the normal function on the sound side.

## New Avo Valve Panel

THE Automatic Coil Winder and Electrical Equipment Co., Ltd., have introduced a new valveholder panel for use with their valve tester. This is a distinct advance over the previous types as it has only twelve valveholders, but these cater for all English valves with pin bases, including the new Mazda Octal types, side-contact bases and all American bases (also including the octals). Space is provided for the addition of four further holders should it be found necessary at any time to add these. Nine roller switches, each carrying ten contacts, enable any type of valve to be instantly tested and a detailed instruction book explains the use of the test panel. The price of this panel is 3 guineas and it should be remembered that this will take the place of the two present panels. The complete tester costs 12 guineas.

## Battery Push-button Set

THE Decca Company announce that they will shortly release a battery-operated push-button set. It will be a 5-valve superhet to sell at a figure round about £9 9s., and in appearance will resemble the existing mains models.

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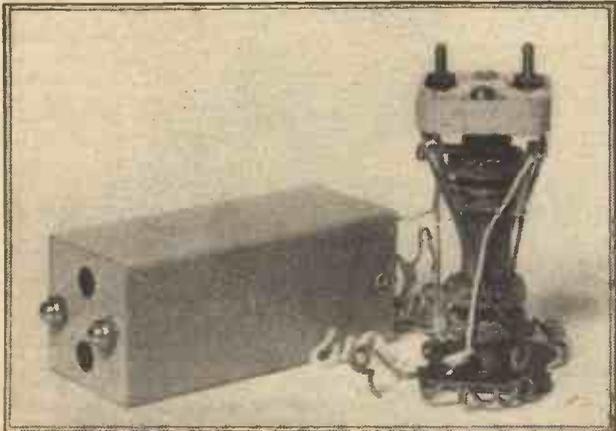
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## FRANKLIN RADIO SERVICE COMPONENTS

A RANGE of special carded service kits and loose components is included in a folder recently issued by Franklin Electric Co., Ltd. The contents of the kits, consisting of resistors and condensers of varying values, have been revised, and the cards and boxes carrying these have been redesigned. Several new lines have been introduced, and the 1-watt insulated resistors at 6d. each are available, either loose or carded. High efficiency volume controls, dry electrolytic condensers, and tubular interference suppressors are also listed. Every serviceman should obtain a copy of this useful folder.

## ELECTRADIX BARGAINS

VENNER TIME SWITCHES. 1 amp, 50 amps, 100 amps, 120 amps, 160 amps, and 200 amps, fitted 40-day clocks on-off, type T.O.B., etc., 75% off; Bargain.  
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 L.T. DYNAMOS. Type "V." Our latest for Lighting or Cell Charging, 140 watts. Enclosed Dynamo, 12-20 v. 12 amps. Bal Bearings. Vee Pulley, 35/-.  
 Set with Marine Type Switchboard with Ammeter, maximum and minimum Auto Cut-out Main Switch and Fuses, Field Regulator, 65/-.  
 ELECTRIC PUMPS, for A.C. or D.C. 12 v. to 230 v. Centrifugal all-bronze pump, throws 120 galls. per hour. For fit. fountain, Caravans, Bungalows and boats, 67/6. Ceasepool pumps, 25/10.  
 AIR COMPRESSORS, for Paint Spraying, Set Cleaning, Inflation, etc. Foot operated, 45/-.  
 Electric, No. 1 size, 15/15-. No. 2 Twin-rot., 27/10-.  
 METERS. Switchboard 2in. to 5in. dia., Amps. and Volts up to 12,000 v.  
 Weston Central zero 1 to 15 amps, pol. mag. dead beat. Flush panel, 24in. dial, nickel or black. Sale price, 5/6. Hoyt C7 mov. coil milliammeters, 25-0.25 m.a., 10/-.  
 Weston 5, 30, 50, 100 and 200 m.a. mov. coil milliammeters, 17/6. 0.3 m.a., 25/-.  
 MICRO-AMMETERS for Checking Amplifiers. W.W. Apr. 7th, 50 micro-amps, full scale, 50 mV, moving coil, 1,000 ohms, flush panel, 24in. dial, 40/-, 2,000 meters of all sizes in stock. Silvertown astatic horizontal Galvos, jewel pivots, 7/-.  
 Ammeters, all ranges to 20 amps, 7/-.  
 Recording Graph, 12-hr. Chart Ammeters, 25/10.  
 Cell Testers, pocket, 15/-; Model 8 Portable Test Bridge, .001 ohm to 1 meg., 27/-.  
 Paul Unipivot, Model U, listed £30, reads 1/4 micro-amp. to 15 amps, 1/10 milli-volt to 1,000 volts. Also ohms and mega, Sale 29/10-.  
 Cambridge Unipivot Dynamometer Wattmeter, Model D, Reads from .01 watt, 27/10-.  
 No. 108, with moving coil meter and graded Rheo, 37/6.  
 Decca Bridges, 10,000-ohm 4-dial Wheatstone, with Galvo, 210.  
 G.P.O. type, 27/10.  
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 PANELS in Ebonite and Faxonite 1" thick all sizes. Aluminium, 16 and 18 gauge, one side enamel, 12in. x 12in., 3/-.  
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Bulgin type C.73 I.F. transformer, seen complete and with the unit removed to show the construction.

7/16in. deep. It is supplied on a stand providing an overall height of 21ins. The price of this microphone is 45/-.

## Bulgin I.F. Transformer

THE accompanying illustration shows the Bulgin type C.73 transformer, both in its case and removed to show internal construction. The case of this particular transformer is square (sharp-edged) and takes up less room than other types of transformer, trimming being carried out through two holes in the top in the usual way. The cans measure 1 1/2in. square by 3 1/2ins. in height, to which must be added approximately 1/4in. for the top lock-nuts. Two lugs are riveted to the bottom of the cans and are provided with insulating washers and locking nuts, and the coils may thus be mounted on any standard metal chassis. If they are required for use with a wooden chassis it will be necessary to recess the underside to enable the lock-nuts to be tightened up. Litz wire is employed for the windings and the leading out wires are welded to ensure reliability of contact. Coloured connecting leads are provided for sub-chassis connection, and the adjusting screws on the trimmers are insulated from the H.T. supply. The coils are, of course, designed for an I.F. of 465 kc/s., and the price is 6s. Where it is necessary to use a higher gain, this transformer is available with a tighter coupling between primary and secondary windings. The price is the same, but the type number is C.74.

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Two-valve : Blueprints, 1s. each.		Midget Short-wave Two (D, Pen)	—	PW38A
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The Signet Two (D & LF) ..	20.8.36	Experimenter's Short-wave Three	—	PW30A
Three-valve : Blueprints, 1s. each.		(S.G, D, Pow)	—	
The Long-range Express Three	—	The Perfect 3 (D, 2LF (RC and	7.8.37	PW63
(SG, D, Pen)	24.4.37	Trans)	—	
Selectone Battery Three (D, 2 LF	—	The Band-Spread S.W. Three	29.8.36	PW68
(Trans))	—	(HF Pen, D (Pen), Pen)	—	
Sixty Shilling Three (D, 2 LF	—	<b>PORTABLES.</b>		
(HC & Trans))	—	Three-valve : Blueprints, 1s. each.		
Leader Three (SG, D, Pow) ..	22.5.37	F. J. Camm's ELF Three-valve	—	PW65
Summit Three (HF Pen, D, Pen)	—	Portable (HF Pen, D, Pen) ..	—	
All Pentode Three (HF Pen, D	—	Parvo Flyweight Midget Portable	19.6.37	PW77
(Pen), Pen)	29.5.37	(SG, D, Pen)	—	
Hall-Mark Three (SG, D, Pow)	12.6.37	Four-valve : Blueprints, 1s. each.		
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	Featherweight Portable Four (SG,	15.5.37	PW12
F. J. Camm's Silver Souvenir (HF	—	D, LF, Cl. B)	—	
Pen, D (Pen), Pen) (All-wave	—	"Imp" Portable 4 (1- LF, LF,	19.3.38	PW80
Three)	13.4.35	Pen)	—	
Genet Midget (D, 2 LF (Trans))	June '35	<b>MISCELLANEOUS.</b>		
Cameo Midget Three (D, 2 LF	—	S.W. Converter-Adapter (1 valve)	—	PW48A
(Trans))	8.6.35	<b>AMATEUR WIRELESS AND WIRELESS MAGAZINE</b>		
1936 Sonotone Three-Four (HF	—	<b>CRYSTAL SETS</b>		
Pen, HF Pen, Westector, Pen)	—	Blueprints, 6d. each.		
Battery All-Wave Three (D, 2 LF	—	1934 Station Crystal Set ..	12.12.36	AW427
(RC))	—	1934 Crystal Set ..	—	AW444
The Monitor (HF Pen, D, Pen) ..	—	150-milo Crystal Set ..	—	AW450
The Tutor Three (HF Pen, D, Pen)	21.3.36	<b>STRAIGHT SETS. Battery Operated.</b>		
The Centaur Three (SG, D, P) ..	14.8.37	One-valve : Blueprints, 1s. each.		
The Gladiator All-Wave Three	—	B.B.C. Special One-valver ..	—	AW387
(HF Pen, D (Pen), Pen)	29.8.36	Twenty-station Loudspeaker	—	
F. J. Camm's Record All-Wave	—	One-valver (Class B)	—	AW449
Three (HF Pen, D, Pen)	31.10.36	Two-valve : Blueprints, 1s. each.		
The "Colt" All-Wave Three (D,	—	Melody Ranger Two (D, Trans) ..	—	AW388
2 LF (RC & Trans))	6.12.36	Full-volume Two (SG, D, Pen) ..	—	AW392
The "Rapid" Straight 3 (D,	—	B.B.C. National Two with Lucerne	—	
2 LF (RC & Trans))	4.12.37	Coil (D, Trans)	—	AW377A
F. J. Camm's Oracle All-Wave	—	Big-power Melody Two with	—	
Three (HF, Det, Pen)	28.8.37	Lucerne Coil (SG, Trans) ..	—	AW338A
1938 "Triband" All-Wave Three	—	Lucerne Minor (D, Pen) ..	—	AW426
(HF Pen, D, Pen)	22.1.38	A Modern Two-valver ..	—	WM400
F. J. Camm's "Sprite" Three	—	Three-valve : Blueprints, 1s. each		
(HF Pen, D, Tet)	26.3.38	Class B Three (D, Trans, Class B)	—	AW386
The "Hurricane" All-Wave Three	—	New Britain's Favourite Three	—	
(SG, D (Pen), Pen)	30.4.38	(D, Trans, Class B)	15.7.33	AW394
Four-valve : Blueprints, 1s. each.		Home-built Coil Three (SG, D,	—	
Sonotone Four (SG, D, LF, P) ..	1.5.37	Trans)	—	AW404
Fury Four (2SG, D, Pen) ..	8.5.37	Fan and Family Three (D, Trans,	—	
Beta Universal Four (SG, D, LF,	—	Class B)	25.11.33	AW410
Cl. B)	—	£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
Nucleon Class B Four (SG, D	—	1934 Ether Searcher; Baseboard	—	
(SG), LF, Cl. B)	6.1.34	Model (SG, D, Pen) ..	—	AW417
Fury Four Super (SG, SG, D, Pen)	—	1934 Ether Searcher; Chassis	—	AW419
Battery Hall-Mark 4 (HF, Pen,	—	Model (SG, D, Pen) ..	—	AW422
D, Push-Pull)	—	Lucerne Ranger (SG, D, Trans) ..	—	AW423
F. J. Camm's "Limit" All-Wave	—	Cosor Melody Maker with Lucerne	—	
Four (HF Pen, 1 LF, P)	26.9.36	Coils	—	AW424
All-Wave "Corona" 4 (HF Pen,	—	Mullard Master Three with	—	
D, LF, Pow)	9.10.37	Lucerne Coils	—	AW424
"Aome" All-Wave 4 (HF Pen, D,	—	£5 5s. Three; Do Luxe Version	19.5.34	AW435
(Pen), LF, Cl. B)	12.2.38	(SG, D, Trans)	—	
<b>Mains Operated.</b>		Lucerne Straight Three (D, RC,	—	
Two-valve : Blueprints, 1s. each.		Trans)	—	AW437
A.C. Twip (D (Pen), Pen) ..	—	All-Britain Three (HF Pen, D, Pen)	—	AW448
A.C.-D.C. Two (SG, Pow) ..	—	"Wireless League" Three (HF	—	
Selectone A.C. Radiogram Two	—	Pen, D, Pen) ..	3.11.34	AW451
(D, Pow)	—	Transportable Three (SG, D, Pen)	—	WM271
Three-valve : Blueprints, 1s. each.		£6 6s. Radiogram (D, RC, Trans)	—	WM318
Double-Diode-Triode Three (HF	—	Simple-tune Three (SG, D, Pen) ..	June '33	WM327
Pen, DDT, Pen) ..	—	Economy-Pentode Three (SG, D,	—	
D.C. Ace (SG, D, Pen) ..	—	Pen)	Oct. '33	WM337
A.C. Three (SG, D, Pen) ..	—	"W.M." 1934 Standard Three	—	
A.C. Leader (HF Pen, D, Pow) ..	—	(SG, D, Pen) ..	—	WM351
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	£3 3s. Three (SG, D, Trans)	—	WM354
Urbique (HF Pen, D, Pen) ..	28.7.34	Iron-core Band-pass Three (SG,	—	
Armada Mains Three (HF Pen, D,	—	D, QP21)	—	WM362
Pen)	—	1935 £6 6s. Battery Three (SG, D,	—	
F. J. Camm's A.C. All-Wave Silver	—	Pen)	—	WM371
Souvenir Three (HF Pen, D, Pen)	11.5.35	PTP Three (Pen, D, Pen) ..	June '35	WM389
"All-Wave" A.C. Three (D, 2	—	Certainty Three (SG, D, Pen) ..	—	WM393
LF (RC))	—	Minutube Three (SG, D, Trans) ..	Oct. '35	WM396
A.C. 1936 Sonotone (HF Pen, HF	—	All-Wave Winning Three (SG, D,	—	
Pen, Westector, Pen)	—	Pen)	—	WM400
Mains Record All-Wave 3 HF	—	<b>Four-valve : Blueprints, 1s. 6d. each.</b>		
Pen, D, Pen)	5.12.36	65s. Four (SG, D, RC, Trans)	—	AW370
All-World Ace (HF Pen, D, Pen) ..	28.8.37	"A.H." Ideal Four (2 SG, D, Pen)	10.9.33	AW402
Four-valve : Blueprints, 1s. each.		Two-Four (2 SG, D, Pen)	—	AW421
A.C. Fury Four (SG, SG, D, Pen)	—	Crusader's A.V.C. (2HF, D, QP21)	13.8.34	AW445
A.C. Fury Four Super (SG, SG, D,	—	(Pentode and Class B Outputs for	—	
Pen)	—	above : Blueprints 6d. each) ..	25.8.35	AW445A
A.C. Hall-Mark (HF Pen, D,	—	Self-contained Four (SG, D, LF,	—	
Push-Pull)	24.7.37	Class B)	Aug. '33	WM331
Universal Hall-Mark (HF Pen, D,	—	Lucerne Straight Four (SG, D,	—	
Push-Pull)	9.2.35	LF, trans)	—	WM350
A.C. All-Wave Corona Four	0.11.37	£5 5s. Battery Four (HF, D, 2LF)	Feb. '35	WM381
<b>SUPERHETS.</b>		The H.K. Four (SG, SG, D, Pen) ..	Mar. '35	WM384
Battery Sets : Blueprints, 1s. each.		The Auto Straight Four (HF Pen,	—	
£5 Superhet (Three-valve) ..	5.6.37	HF Pen, DDT, Pen) ..	Apr. '36	WM404
F. J. Camm's 2-valve Superhet ..	13.7.35	<b>Five-valve : Blueprints, 1s. 6d. each.</b>		
F. J. Camm's £4 Superhet ..	—	Super-quality Five (2HF, D, RC,	—	
F. J. Camm's "Vitesse" All-	—	Trans)	May '33	WM320
Waver (5-valver) ..	27.2.37	Class B Quadradyne (2 SG, D, LF,	—	
<b>Mains Sets : Blueprints, 1s. each.</b>		Class B)	Dec. '33	WM344
A.C. £5 Superhet (Three-valve) ..	—			

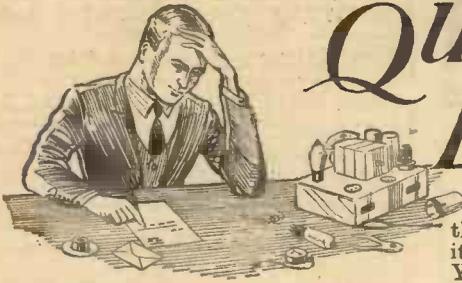
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Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable) to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Now Class B Five (2 SG, D, LF	—	Class B) ..	Nov. '33	WM340
<b>Mains Operated.</b>		Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C. ..	—	Economy A.C. Two (D, Trans) A.C. ..	—	WM286
Unicorn A.C.-D.C. Two (D, Pen) ..	—	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. ..	—	A.C. Triodyne (SG, D, Pen) A.C. ..	19.8.33	AW390
A.C. Pentaquester (HF Pen, D,	—	Pen)	23.6.34	AW439
Manovani A.C. Three (HF Pen,	—	D, Pen)	—	WM374
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Harris' Jubilee Radiogram (HF	—	Pen, D, LF, P)	May '35	WM186
<b>SUPERHETS.</b>		Battery Sets : Blueprints, 1s. 6d. each.		
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The Request All-Waver ..	—	1935 Super Five Battery (Superhet)	—	WM407
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Heptode Super Three A.C. ..	—	"W.M." Radiogram Super A.C. ..	May '34	WM350
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<b>PORTABLES.</b>		Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D,	—	LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF,	—	Class B)	—	AW393
Family Portable (HF, D, RC,	—	Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D,	—	QP21)	—	WM363
Tyers Portable (SG, D, 2 Trans)	—		June '34	WM367
<b>SHORT-WAVE SETS Battery Operated.</b>		One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.) ..	—	S.W. One-valver for America ..	23.1.37	AW429
None Short-Waver ..	—	Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det.,	—	Pen)	—	WM402
Home-made Coil Two (D, Pen)	—	Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D,	—	RC, Trans)	—	AW355
Experimenter's 5-metre Set (D,	—	Trans, Super-rogen)	30.6.34	AW438
Experimenter's Short-waver (SG,	—	D, Pen)	—	AW463
The Carrier Short-waver (SG, D, P)	—	Four-valve : Blueprints, 1s. 6d. each.	—	WM390
A.W. Short-wave World-Beater	—	(HF Pen, D, RC, Trans)	—	AW456
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Standard Four-valver Short-waver	—	(SG, D, LF, P) ..	—	WM383
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"W.M." Band-spread Short-waver	—	(D, Pen) A.C.-D.C. ..	—	WM388
"W.M." Long-wave Converter ..	—	Three-valve : Blueprint, 1s.	—	WM352
Emigrator (SG, D, Pen) A.C. ..	—	Four-valve : Blueprint, 1s. 6d.	—	WM391
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<b>MISCELLANEOUS.</b>		Enthusiast's Power Amplifier (1/0	—	June '35
Listeners' 5-watt A.C. Amplifier	—	(1/0) ..	—	WM392
Radio Unit (2v) for WM392 ..	—	Harris Electrogram (battery ampli-	—	WM399
De-Luxe Concert A.C. Electro-	—	gram) ..	—	Mar. '36
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The W.M. A.C. Short-Wave Con-	—	verter (1/-) ..	—	June '36



# QUERIES and ENQUIRIES

## Car Radio

"I wish to use a small battery portable as a car radio, using the standard batteries. I want to make this non-directional; if I make an aerial in the car (tourer) or under it, would this make the set non-directional? The idea, of course, is to run the set while in motion. Also, can you suggest a good form of suppressor for the car?"—E. J. S. (Ely).

IT is quite possible to use an external aerial with a portable, joining this to the grid end of the frame winding. Most portables have aerial and earth sockets for this purpose. Alternatively, you can wind two or three turns of wire round the outside of the portable cabinet and join the aerial to one end of this, taking the other to the car chassis. This will overcome the directional effects. As your car is a tourer the best place for the aerial will no doubt be under the running boards, and you may try out various lengths of wire for the purpose. You may not need suppressors, but if they are found necessary they may be obtained from Messrs. Dubilier or Belling-Lee.

## Balanced Reproduction

"I am trying out some experiments in reproduction and wonder if you can give me any hints on obtaining better results. I have a large 10-inch moving coil and a small midget M.C. and should like to use both to obtain more even response of all frequencies. Should they be placed in any relative position regarding each other, or may they be placed side by side close together? Perhaps you can suggest some other scheme so that I could use these two units."—H. E. (N.W.11).

THEORETICALLY the large speaker should handle the bass and the small speaker the treble, and if mounted side by side and fed with a common signal they may give very good results. Improvement may be carried out, however, by separating them or even by placing the large unit so that it is directed downwards and the small unit so that it is directed forwards. On the other hand, maximum results would no doubt be obtained if you built a special filter circuit designed to feed all frequencies up to a certain value to the large speaker and frequencies above that value to the small speaker. You should experiment with various transformers and fixed condensers in order to find a circuit suited to your speakers, your set and the general acoustics of the room.

## Variable Condenser Rating

"I have an old variable condenser with nine fixed vanes and ten moving. Can you please tell me what value this is, and how to work it out?"—T. R. (Bournemouth).

IT is not possible to state exactly what capacity the condenser possesses. The capacity is dependent upon the area of overlap of the plates and the spacing, and the latter is most important. Some condensers have the vanes very close together, whilst in others there may be quite a wide space between them. Therefore, if you

cannot identify the make of the condenser and have the value given by the makers, the only solution is to have it tested upon a good capacity bridge. You could, of course, make a rough test for yourself by tuning to a station on your set and substituting the condenser for your own, adjusting this to bring in the required station. This might enable you to estimate its capacity from the relationship between the settings of the two components.

## High-Note Buzzer

"I am trying to improve my morse and have been using an ordinary converted electric-bell movement as a sounder. I find, however, that the low note is rather depressing when used for long periods, and I want a high note to coincide with some of the special code transmissions which I can

### RULES

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

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

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

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

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

pick up on my set. Is there any way I can convert the bell for a high note, or any simple way of making such a sounder?"—T. F. (Yarmouth).

THE armature of the bell is too heavy to vibrate at sufficient speed to produce a high note. The special miniature buzzers sold for the purpose are exceedingly light and give a very high note, and you could probably build a similar device in which your bell magnets could be incorporated. The armature must be very short and light to give the high note. A simple sounder may be made round an

ordinary earphone, using the existing diaphragm with a lead soldered to it to act as the armature. A contact must be arranged to make and break at the centre of the diaphragm in order to obtain the buzzer effect.

## Magic Eye Tuning Indicator

"I have had a Magic Eye cathode-ray indicator presented to me and should like to incorporate this in my set. Unfortunately, however, this is a rather old superhet and does not incorporate the valuable A.V.C. arrangement. Can I make use of the indicator in any way without it being just an ornament?"—V. R. (S.W.1).

THE indicator is normally used to show the exact tuning position, and it is difficult to judge this when A.V.C. is working properly. However, in your case the indicator could be incorporated to give a signal strength indication—somewhat in the manner of a simple "R" meter. In this case it should be fed from the grid of the second detector, adopting more or less standard connections to the target and other electrodes of the indicator.

## Tapped Resistance

"For test purposes I wish to use a tapped wire-wound resistance so that pre-arranged values may be tapped off. I have looked through all the component catalogues I have by me, but am unable to find anyone making such a component. I wonder if you can put me on to someone who can supply this item?"—J. S. (Bath).

MESSRS. BULGIN supply two variable indicator resistors, both rated at 60 watts. You do not state what power rating you require. These two items are available in maximum ranges of 10,000 and 50,000 ohms and a slider on top is graduated in ten steps. You might need something smaller, and in that case we would suggest that you consider the W.B. volume control (the Adiabatic model) which is wire wound and selection is carried out by a rotary arm running over a number of studs. You could strip this down and rewind it to definite values according to your requirements. We cannot trace any other suitable item without more specific details as to your requirements.

## Valve Tester

"I want to make up a valve tester and it appears that the only real solution to the the different valve-base types is to mount a holder for every type on the panel. This will increase the size of the panel and seems wasteful. Is there no other way in which I can obtain the desired interchange by means of adapters, for instance? If so, where can I obtain them?"—W. F. E. (Luton, Beds).

THE use of separate holders is adopted in most commercial testers, but with a little ingenuity you can make use of a single holder and separate adapters. A 9-pin holder could be mounted on the test panel, and special reducing adapters could then be inserted in this holder, so that different valves could be plugged into the adapters. We think you will find sufficient range of adapters in the Bulgin list, but it may even then be necessary to take out separate terminal connections in certain cases and to make outside connection for certain types. This trouble is, of course, overcome when separate holders are mounted on the test panel.

### NOW READY!

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

Edited by

F. J. CAMM

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

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## RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

# RADIOMART

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**MICROVARIABLES.**—All brass construction, latest ceramic insulation. The finest condensers made: 15 mmfd., 14; 40 mmfd., 17; 100 mmfd., 1/10. Transmitting Type.—0.7mm spacing, 15 mmfd. (neutralising), 2/9; 40 mmfd. Tuning, 3/6. These are quality.

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**UTILITY 7 7/8 Famous Micro Dials, 3/9; Radiophone, 0.00016 Short-wave Condensers, 3/6. Short-wave HF Chokes, 5-100 metres, 8d. Centralab Pots, all sizes, 1/6; switched, 2/-; 20,000 ohm Pots, 1/-; Tubular Glass Puses, 3d. Milliameters, 25 m.a. upwards, 5/9; super, 6/6.**

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# RADIOMART

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