# MR. F. J. CAMM'S ALL-WAVE SILVER SOUVENIR

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# Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

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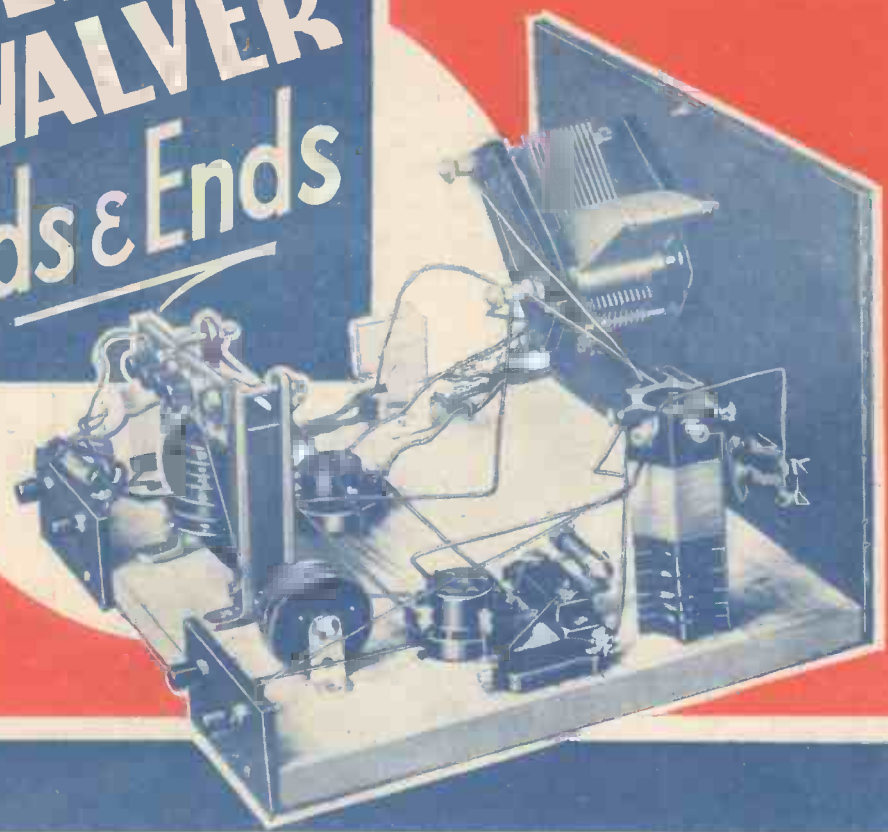
AND AMATEUR TELEVISION


## A GUINEA TWO-VALVER from Odds & Ends



# THE ALL-WAVE SILVER SOUVENIR!

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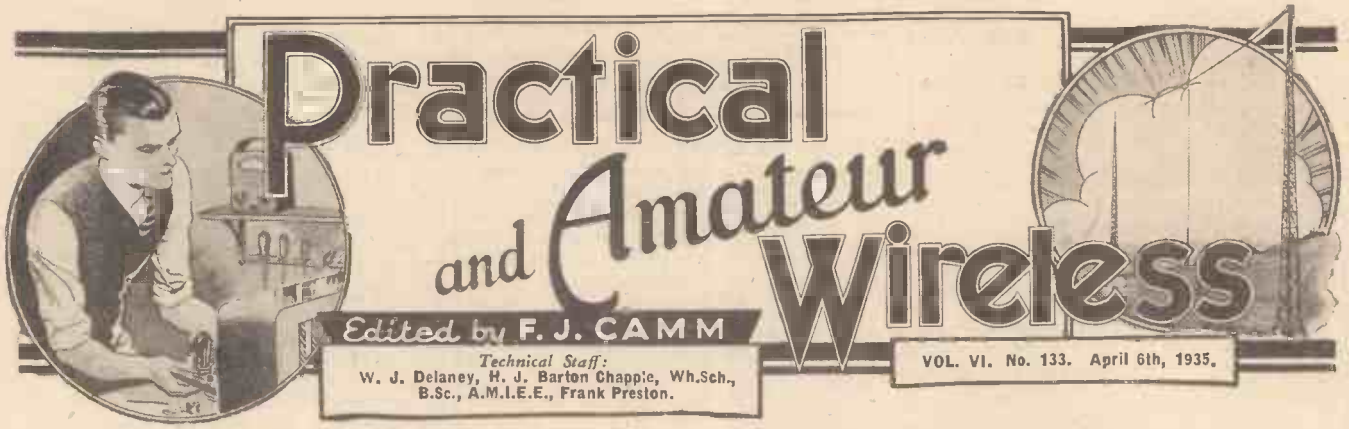


# ROUND *the* WORLD *of* WIRELESS

### The World's Youngest Announcer

DOROTHY MADICK, a twelve-year-old Melbourne girl who for some months, at one of the local broadcasting stations, had taken a prominent part in the children's hour, was recently appointed as announcer for the programmes broadcast to adults.

### Paris Radio and the Theatres

SINCE the Wireless Bill was brought into operation, thus securing an annual revenue to the State, the Broadcasting authorities have decided to grant subsidies from this fund to both Paris opera houses and two theatres specialising in comedies. In exchange, the State stations will be entitled to relay eighty performances in the course of the year.

### The Voice of Electricity

IN the high-frequency laboratories of the General Electric Company at Schenectady, New York, fifty-million kilowatt generators have produced "sparks" 60ft. long. As an opening signal for its short-wave transmissions through W3XAF and W2XAD, the G.E.C. gives its listeners three terrific crashes of man-made lightning; they are records of ten-million volt discharges, and precede the station's call: *This is the Voice of Electricity.*

### The Beloved Announcer

ONE of the most popular announcers in France, Jean Roy, of Radio Toulouse, being seriously ill, has been unable to fulfil his studio duties. As listeners have clamoured to hear his voice, announcements for certain portions of the programme are recorded in his own home and broadcast later during the same day.

### Eiffel Tower on Lower Wavelength

THE long-delayed promise made by the French authorities to withdraw the Eiffel Tower broadcasts from the long-wave band would appear to be on the point of being carried out. Work has been started on the alteration of the transmitter, and it is expected that the station will change its wavelength to 206 metres towards the beginning of April.

### The Annual Clock Change

THE advent of British Summer Time will compel us to put our clocks forward one hour on Sunday, April 14th. Other Continental countries which adopt Summer Time do not change over on the same day. As an example, France, Belgium, and Portugal will make the alteration on March 31st, Holland will go over to the new time on May 15th. Between the former and the latter date the time in Great Britain, consequently, is forty minutes ahead of that in the Netherlands.

### The World's Largest Loud-speaker

THE latest American sensation is the giant loud-speaker built by the Western Electric and Manufacturing Company which can magnify the human voice to an extent that it may be heard many miles away. The instrument, which is mounted on a swivelling column in the form of a searchlight, was tried out recently on the guard cutter *Tampa*, at a yacht race and gave full satisfaction.

### Norway's Second Long-wave Station

THE small 100-watt broadcaster at Tromsö, which hitherto has been relaying the Oslo programmes on 249.2 metres, will now be found on 1,186 metres (250 kc/s) the original channel allotted to the capital transmitter.

### The World's Radio Stations

DURING 1934 the number of radio transmitters in the world was increased by 2,300, bringing the grand total up to 35,638. Of these stations 27,927 are operated by shipping and aircraft, and of the balance 1,448 land transmitters are devoted to broadcasting services.

### New Portuguese Relay

SO far, Portuguese listeners have been satisfied with the two medium-wave stations working at Lisbon and Parede. As, however, the reception of the programmes has been difficult in the northern part of the country, the authorities are permitting an amateur transmitter at Oporto to relay the Lisbon wireless entertainments. The power of Radio Sonora, Oporto, which is undertaking this service, is 100 watts and the wavelength 222.6 metres (1,348 kc/s), a channel allotted to Portugal in the Lucerne Plan.

### Listen to WOR, New York

A NEW 50-kilowatt transmitter at Carteret (New Jersey) some seventeen miles from New York, was recently brought into operation on 422.3 metres (710 kc/s). It is a privately-owned station which has been included in the Mutual Broadcasting System, an independent association working with WGN, Chicago, WLW, Cincinnati, and some smaller transmitters. Calling itself the Quality Group, signals from these stations may frequently be heard in Europe between G.M.T. 01.00-03.00.

### Broadcasts Only on Sundays

MENTION is seldom made of a third broadcasting station in Holland, namely, the little Bloemendaal transmitter which claims to be one of the oldest established in Europe. It is to be found on 245.9 metres (1,220 kc/s) but is only heard on Sundays at G.M.T. 09.40 and 16.40, when it relays a sacred service from a local church.

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*IMPORTANT NOTICE*

## NEWNES WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA

**This great Gift Book is now Ready for all readers who have collected Gift Tokens numbered 1 to 13.**

WITH the Gift Token given on the back cover this week, many thousands of readers who have been collecting these Tokens from No. 1 will have thirteen. They are, therefore, qualified to receive

**NEWNES WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA**

which has been reserved for them.

If you have thirteen consecutive tokens—Gift Tokens numbered 1, 2, 3 up to 13—attach them to the Subscription Voucher sent to you, and fill it up *carefully* in accordance with the instructions.

**POST TO-DAY**

The Voucher, etc., should be posted to the address given on it *at once*, and as there is an enormous number of books to be sent out applications will be treated in strict rotation. You want your copy quickly, of course, so send for it at the earliest possible moment and it will be despatched in the first batches.

*Note.—If you have lost any of your Gift Tokens you may send threepence in stamps in lieu of each—or add the necessary amount to your postal order.*

Readers who started collecting Gift Tokens from No. 2 or No. 3 must wait until they have thirteen consecutive Tokens—Nos. 2–14, or 3–15, etc.—before claiming the volumes waiting in their names.

# ROUND the WORLD of WIRELESS (Continued)

### Training Radio Artists and Announcers

SIMILAR to the private school opened in London some months ago, Berlin, Vienna, Prague, and Paris have instituted microphone courses for the special training of speakers and artists engaged for broadcasts. In the same way announcers are prepared for their jobs.

THE LATEST H.M.V. AUTORADIOGRAM

*Preparing an H.M.V. 15-valve autoradiogram which, as Royal Warrant Holders, "His Master's Voice" are showing in the replica of the King's house at the Ideal Home Exhibition.*

### Liberty Statue as Wireless Aerial

A REPORT from America states that a proposal has been seriously put forward to install a high-power station on Bedloe's Island, in New York harbour. It is the site of the Statue of Liberty which it is suggested might be put to good use as an antenna!

### Development of Broadcasting in India

ALTHOUGH British India has already possessed stations at Calcutta and Bombay for some time, the first unit of the great radio chain which is to cover the entire country was opened recently at Peshawar, on the North-west frontier. The scheme calls for a network which in five years' time will provide a service to 700,000 villages and a population of 320 million inhabitants. The second station, which is to be a high-powered one, is being built at New Delhi. For the broadcast of the programmes in the different districts, it is proposed to carry out transmissions which will be picked up by radio receivers in the various communities, and these, in their turn, being equipped with loud-speakers, will permit the inhabitants to listen to the broadcasts in open streets or squares.

## INTERESTING and TOPICAL PARAGRAPHS

### Atmospheric Crashes as Fire Warning

IN a small village not far distant from the Austrian capital, a postman, wishing to hear the late Vienna programme, switched on his receiver and retired to bed in the same room. Falling asleep, he awoke several hours after the station had closed down; a snowstorm was raging outside and atmospherics heard through the loud-speaker had disturbed him. Getting up to switch off the set he found the neighbouring room on fire, but had been fortunately aroused in time to put it out.

### "Roland"

HENRY AINLEY will play lead in the broadcast revival of "Roland," a play which was heard on two occasions during 1929. The repeat performance is to be given on the National wavelength on April 3rd. "Roland" is a drama derived from Turold's Song by E. A. Harding, now B.B.C. Programme Director at Manchester. It is essentially a radio play and has nothing in common with the average theatre production, the effect being achieved purely by words.

### "Episode Past"

AN artist who has performed a great deal before the microphone has written her first play for broadcasting. She is Valentine Dunn, and the play, which is entitled "Episode Past," will be broadcast on the National wavelength on April 4th and the Regional on April 5th.

### Organ Recital from Rotherham

A NEW cinema organ played by an organist new to the microphone will be heard by Northern listeners for the first time on April 8th. The organ is that of the Regal Cinema, Rotherham, and the organist is Kenneth Dando. This is, incidentally, the first time there has ever been a broadcast from Rotherham.

### Concert from Belfast

ROGER QUILTER pays a visit to Belfast on April 5th, to conduct a special studio concert of his own music for Northern Ireland listeners. The programme will include the "Children's Overture," and three pieces from his incidental music to "Where the Rainbow Ends." May Turtle (soprano) is to be the soloist.

Read the preliminary announcement regarding Mr. F. J. Camm's Silver Souvenir Receiver on Page 73

### "Maritana"

PORTIONS of the opera "Maritana," played by the Carl Rosa Opera Company, will be relayed in the Scottish programme from the King's Theatre, Glasgow, on April 6th. The scenes are a square in Seville, the prison, and in the Palace of Montefiori.

### Good Friday Concert

ON Good Friday (April 19th), at 7.30 p.m., a performance of the Bach St. John Passion will be given at Queen's Hall by the B.B.C. Symphony Orchestra and the Philharmonic Choir, under the direction of Sir Henry Wood. The soloists on this occasion will be Elsie Suddaby, Astra Desmond, Margaret Godley, Eric Greene, Arthur Cranmer, William Parsons, Roy Henderson, and Jan van der Gucht.

### "The Bread-Winner"

THE production of "The Bread-Winner," which will be broadcast in the Regional programme on April 15th and in the National programme on April 16th, is notable for two things: it is the first full-length play of Somerset Maugham to be brought to the microphone, and it marks not only Ronald Squire's first appearance in a broadcast play but also his first appearance of any kind since his severe motor accident last year.

### "The Dairymaids"

THE farcical musical play, "The Dairymaids," will be heard by Regional listeners on April 10th, and by National listeners on April 11th. The plot revolves somewhat erratically around a model dairy farm and an academy of deportment run on very athletic lines by a martinet called Penelope Pyechase, and the score, by Paul Rubens and Frank E. Tours, contains many tuneful songs, including "Tinker, Tailor," "Poaching," "Love among the Daisies," "The Sea-serpent," and "The Sandow Girl."

## SOLVE THIS!

### PROBLEM No. 133

Atkins had a three-valve set which gave splendid results over a period of a year or so. One day, after cleaning it up and generally dusting all parts, refitting battery leads, etc., he switched on and obtained no signals. Disconnecting the batteries he tested all wiring but found nothing wrong. The leads were next tested and found intact and in order. The H.T. battery was then tested and found up to voltage, but on testing the accumulator he obtained no reading. What had happened?

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., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 133 in the top left-hand corner, and must be posted to reach here not later than the first post Monday, April 8th.

### Solution to Problem No. 132

Owing to the fact that the aerial lead was completely screened, and the coils in the receiver were also screened, there was no possibility of picking up the radiations from the wavemeter. Pycroft should have bared a small portion of the aerial lead, and placed a lead from the wavemeter near the bared portion, or twisted it round the bared wire in order to hear the heterodyne note.

The following three readers successfully solved Problem No. 131, and books are accordingly being forwarded to them:

G. R. Tice, 85, Arden Street, Gillingham, Kent; R. Cumming, 12, Trinity Road, Barkingside, Ilford; R. Morris, 8, High Street, Ledbury, Hereford.

# THE GUINEA TWO-VALVER

Full Details of a Simple Receiver in which can be Incorporated Many Odd Components in Addition to those of which Constructional Details are Given.

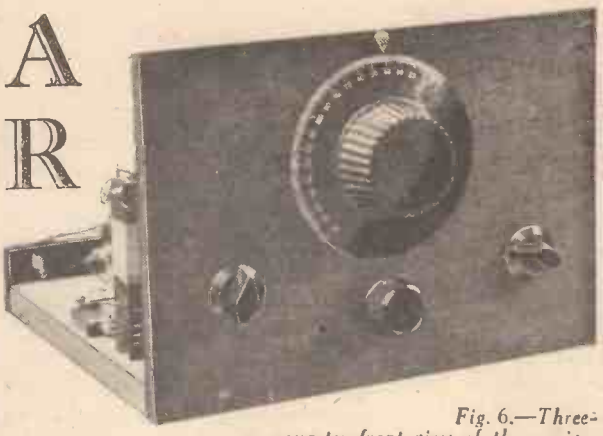


*Fig. 6.—Three-quarter front view of the receiver showing the neat panel lay-out.*

WITH a view to appeasing the mechanical "appetite" of many enthusiastic wireless constructors and experimenters to whom the mere assembly of a set of ready-made components is of little interest, I have devised the two-valve set illustrated on this page. It is the very opposite of the numerous "kit sets" which can be assembled in a single evening, since the most important (and incidentally, the most expensive) components are themselves home-made from more or less raw materials, and thus a number of interesting and instructive hours can be spent on their construction.

Although the parts are home-made, no sacrifice has been made in the way of efficiency or "up-to-dateness" of design, and the set is as good as any similar one which could be obtained at any price. The complete receiver can be made for much less than thirty shillings, notwithstanding the fact that best-quality materials are employed throughout. It has a degree of selectivity which is ample for all average requirements, and will bring in several stations at good loud-speaker strength. Running expenses are low, since the consumption of both H.T. and L.T. current is very small.

## The Home-made Components

When first working out the design I had in mind the construction of every component part, but eventually the conclusion was reached that it would be better to make only the principal ones, namely, the tuner, H.F. choke, and L.F. transformer. The reason for this decision was two-fold. In the first place the smaller components can be bought more cheaply than they can be made, and, in the second, there is some difficulty in obtaining suitable raw materials for them.

Before going on to describe the receiver in detail I think it will be better to deal with the construction of the three home-made components, and under separate headings.

## The Tuner

This is always the most important item of any set, since it is upon the tuner that both selectivity and sensitivity depend. It is well known that if any attempt is made to push selectivity beyond certain limits, losses in other directions are inevitable, so I have drawn a satisfactory compromise, with a result that the tuner is sufficiently selective easily to eliminate any Regional Station at a distance of ten miles or so, and yet is sensitive enough to allow good reception of transmissions from much farther afield. It is constructed in rather

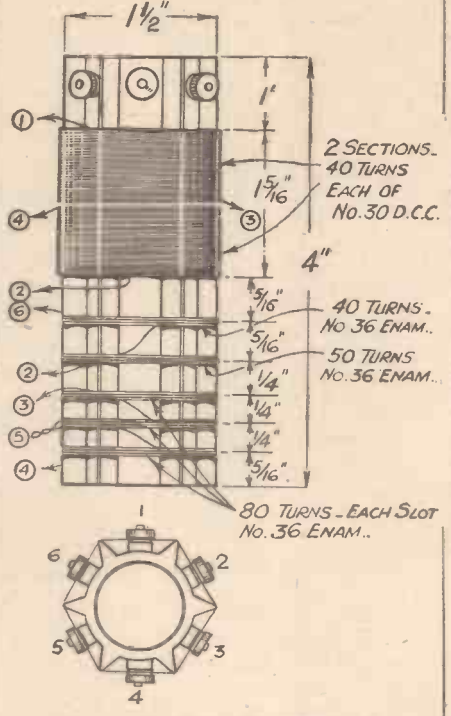



*Fig. 1.—Details of the tuning coil.*

an unusual manner so that the aerial is connected to a centre tapping when receiving on either long or medium waves; as a result, selectivity is equally high on both wavebands.

Dimensions and constructional data are given in Fig. 1, while the materials required are as follows:—

1 4in. length of 1½in. diameter low-loss coil former.
6 6 B.A. terminals.
¼oz. 30 gauge d.c.c. wire.
½oz. 36 gauge enamelled wire.

The first thing is to prepare the ebonite former by drilling six ⅛in. holes round one end and fitting the terminals into them. Next, the five slots should be made in the projecting ribs; the slots are 1/16in. wide and can easily be cut with a small saw, or may be turned out in a lathe if desired.

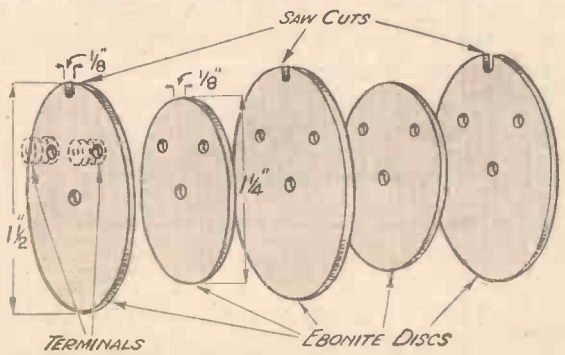



*Fig. 2.—Constructional details of the high-frequency choke.*

## The Winding

Now the winding can be commenced by putting 240 turns of 36 gauge enamelled wire in the lower three slots (80 in each). A looped centre-tapping should be taken after winding 120 turns. This will comprise the long-wave tuning coil.

## Reaction

The reaction turns can now be wound in the fourth and fifth slots, being careful to wind in the *opposite direction* to that followed for the long-wave winding. Again 36 gauge enamelled wire is used, 50 turns being placed in the lower slot and 40 in the upper one.

## The Medium-wave Winding

The medium-wave winding consists of two single-layer coils of 40 turns each and arranged end to end. The 30 gauge wire is used in this case, and the turns must go in the *same direction* as those of the long-wave winding.

The method of anchoring the ends of the windings is the same in each case, and consists of making two small holes through the ebonite coil former through which the wire is threaded from the outside, through to the inside, back to the outside and, finally, to the inside again, where it can conveniently be taken to the appropriate terminal.

## Terminal Connections

When all three windings are complete the leads can be cut to such a length that they will just reach the appropriate terminals (See Fig. 1), the ends bared and soldered to the terminal shanks; it can be seen that two wires are attached to each of terminals 2, 3 and 4. If soldering is objected to, perfectly good contact can be made by looping the ends of the leads and gripping them between two washers fitted under the terminal nuts.

## The High-frequency Choke

The main constructional details for this component are given in the sketch of Fig. 2. An ebonite bobbin is the first requirement and can be made in one of two ways, depending upon the workshop facilities available. It may be turned out of a solid block of ebonite or built up from five discs—three 1½in., and two 1¼in. diameter—each ⅛in. thick. The discs can be cut out from the sheet material by means of a fret saw, or may be shaped from small square pieces by sawing and filing. When the bobbin has been made, two 6 B.A. terminals, with soldering tags, should be fitted in the approximate positions shown. Next, a small metal angle bracket is attached by means of a 1in. 4 B.A. bolt and nut. The bracket can be taken from

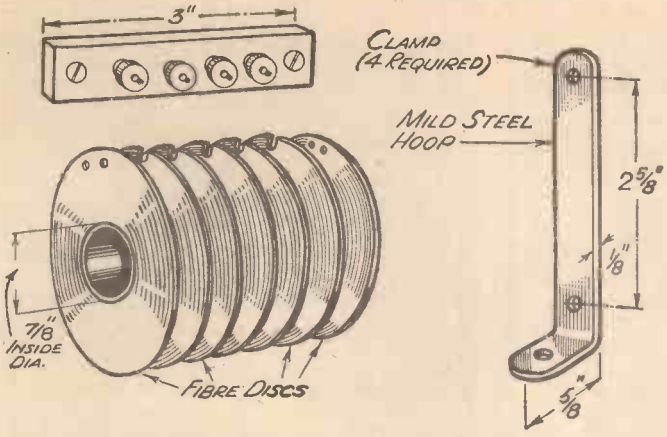



*Fig. 3.—Details of the winding spool.*

Materials required are :—

3½ doz. pairs of No. 5 stalloy stampings.
9ozs. 42 s.w.g. enamelled wire.
4 terminals (Belling Lee type "Q").
1 strip ¼in. ebonite, 3⅛in. by ⅝in.
1 18in. length ¼in. by ¼in. mild steel.
4 1¼in. by 5/32in. bolts and nuts.
1 1½in. length fibre tube, ¾in. internal diameter.
1 sheet 1/16in. fibre.
1 short length Systoflex sleeving.

a set of Meccano parts or made from a piece of brass strip. A saw-cut must now be made across the edge of the bobbin so that the ends of the winding can be brought out to the terminals. The winding consists of 1,200 turns of 42 gauge enamelled wire, of which 600 are accommodated in each slot. Start by soldering the end of the wire to one soldering tag, pass it through the saw-cut and fill the first slot; continue to wind in the same direction until the second slot is full. The other end of the wire can them be returned through the saw-cuts and soldered to the second terminal.

In passing it will be of interest to note that the choke has an inductance of approximately 130 microhenrys, and will therefore permit of perfect reaction control over all wavelengths up to 2,000 metres.

## The Low-frequency Transformer

The construction of the transformer is the most tedious of all the work involved in making the set, but no difficulty need be experienced if "patience" is made the watchword.

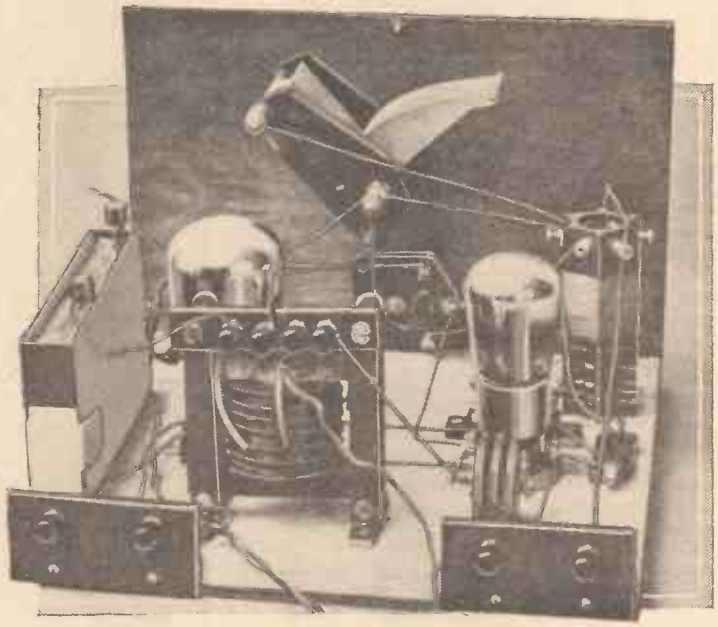


*Fig. 7.—Rear view of the receiver showing the lay-out of the components.*

## The Winding Spool

The winding spool must be made first of all and details are given in Fig. 3. A piece of fibre tubing forms the basis, but if this cannot be obtained, well-shellacked cardboard may be used in its place. Seven discs of thin fibre are used to divide the spool into six sections; they must be made to fit very tightly on the tube, and can be securely fixed in position by applying a liberal coat of thin glue or shellac varnish.

## The Method of Winding

The spool is next to be wound with a total of 30,000 turns of wire, so it will be desirable to rig up some device for rotating it whilst the wire is fed on. I personally did the job by tightly fitting a wooden rod into the tube and gripping this in the lathe. The latter was set to a speed of about seventy revolutions a minute and the bobbin containing the wire was slipped on an iron rod held in the tool rest. Instead of making any attempt to count the number of turns the exact lathe speed was determined and the number of turns worked out on a "time of running" basis.

When a lathe is not available a breast drill gripped in the vice makes a fair substitute, but the whole job can be done entirely by hand if desired. The spool should be fitted on to a stick which can conveniently be held in the hand and should be a tight fit in the spool. The bobbin of wire is held on a small wooden stand so that it can rotate easily as the wire is drawn off. The stand may be made from a piece of ply-wood fitted with two notched uprights.

No matter what method of winding is employed, great care must be taken that the wire is not subject to sudden jerks, because it is very thin and will easily break. If a break *does* occur it must be properly repaired, by soldering, before proceeding any farther. It is also advisable to cover the joint with a spot of sealing wax or a thin strip of paper to prevent any rough edges from scraping the insulation from adjacent turns and so causing a short circuit.

Before commencing to wind, a 12in. length of flex should be soldered to the end of the fine wire and taken twice round the spool. This wire will later be used for making connections to the terminals and should be marked "I.P." (inside primary) by sticking on a piece of stamp-edging. The winding can then be proceeded with, putting 10,000 turns in the first two sections.

*(Information regarding the completion of the transformer, as well as details of the construction of the receiver, will be dealt with next week. A scale wiring plan will also be reproduced to assist those readers who are not able to follow the theoretical diagram shown below.*

*(To be continued)*

### COMPONENTS REQUIRED FOR THE GUINEA TWO-VALVER

One Three-ply Panel, 10in. by 7in.
One Baseboard, 10in. by 9in. by ⅝in.
One .0005 mfd. S.L.F. Tuning Condenser.
One .0003 mfd. Differential Condenser.
One Dial Indicator.
One Double-Pole Switch.
One Single-Pole Switch.
Two Valveholders
One .0001 mfd. Fixed Condenser.
One 1 megohm Grid Leak.
One Grid Leak Holder.
One Dual-Range Tuner (home-made).
One H.F. Choke (home-made).
One 2 : 1 L.F. Transformer (home-made).
Two strips Ebonite, 3in. by 1½in.
Four Terminals.
One pair G.B. Battery Clips.
Five Wander Plugs; marked "H.T.—," "H.T.+," "H.T.+1," "G.B.+," and "G.B.—."
Two Spade Terminals; marked "L.T.+" and "L.T.—."
One coil "Glazite," 2yds. twin flex, and screws.

#### SUITABLE ACCESSORIES

One Detector Valve (Mullard P.M.2D.X.).
One Pentode Valve (Mullard P.M.22A).
One 99-volt H.T. Battery.
One 2-volt, 45 a.h. Accumulator.
One 9-volt G.B. Battery.
One Loud-speaker in cabinet.

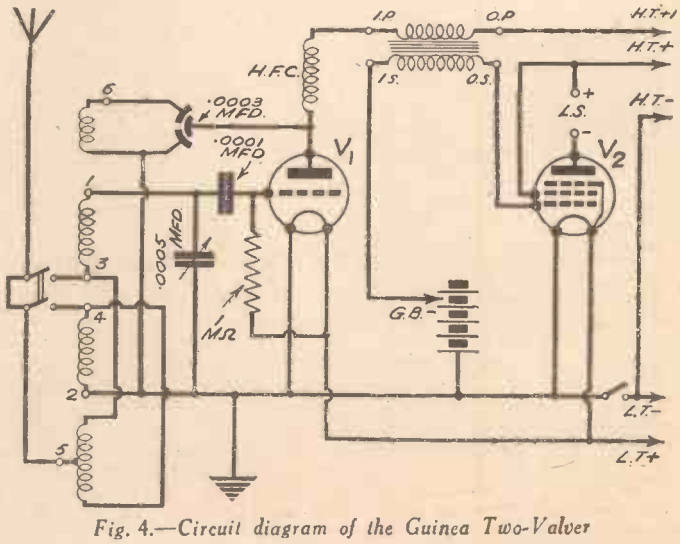
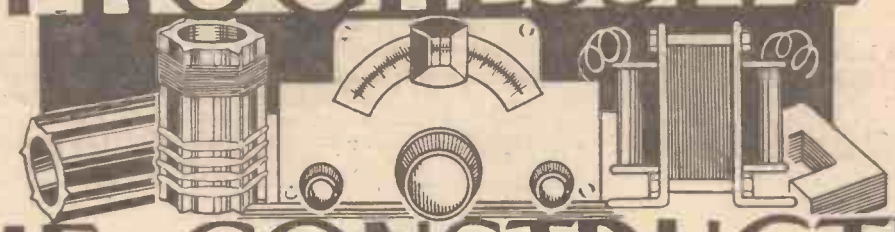



*Fig. 4.—Circuit diagram of the Guinea Two-Valver*

Previous articles in this series were published in the issues for Jan. 26th, Feb. 2nd., Feb. 9th, Feb. 16th, Mar. 2nd, Mar. 9th, Mar. 16th, and March 23rd.

# PROGRESSIVE HOME CONSTRUCTION



The subjects already dealt with include Home-made Components, Making an L.F. Transformer, a Single-valver, an H.T. BatteryEliminator, H.T. Rectifier, an H.F. Amplifier, and Operating Battery Sets from A.C.

**This Week the Experimenters Describe, in their Interesting and Readable Style, the Construction of a Class B Amplifier**

*by The Experimenters*

AS promised a few weeks ago, we are now going to describe how you may make a simple and effective class B amplifier for use with the units dealt with previously, or with any other battery receiver having a single low-frequency stage. As in the past, we shall not only explain how the parts may be assembled, but how the principal components can easily be made at home. The circuit of the class B amplifier, with which all readers are no doubt familiar, is given in Fig. 1, where it will be seen that the only components involved are an input transformer, a .02-mfd. fixed condenser and a valve-holder. This circuit assumes that the speaker to be used is provided with an input transformer suitable for class B working; where this is not the case,

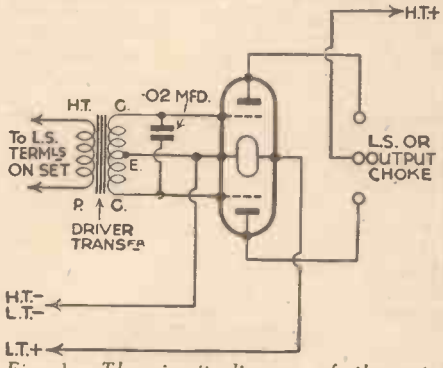



*Fig. 1.—The circuit diagram of the unit described.*

however, it will be a simple matter to construct a centre-tapped output choke which will serve to feed practically any type of speaker, and details will be given.

## The Driver Transformer

It is obvious that the most important component of all is the input or driver transformer, and this is quite different in essentials from an ordinary L.F. transformer, of which constructional details have previously been given. In the first place, the transformer has a centre-tapped secondary, but a far more important point than this is that the secondary must have a low D.C. resistance. The reason for this is that a constantly-fluctuating current flows to the grids of the two halves of the class B valve, so that if the secondary resistances were appreciable it would tend to prevent the current changes, thereby introducing serious losses and also distortion. In order to ensure a sufficiently-high primary inductance a fair number of turns has to be used on the primary winding, and since the ratio of primary to secondary must be about unity it is evident that the secondary winding must also contain a large number of turns. Added to this it is evident that the wire used for the secondary should be of rather heavier gauge than is generally employed in making transformers. All these facts go to make it apparent that the final transformer must be a large component, and that shown in Fig. 2 is, actually, a good deal larger than those on the market. We do not say that it could not be made smaller, but by making it of good size it is easier to manipulate the windings, whilst it is not so necessary to arrange them so carefully.

## Making the Transformer

The materials required for the transformer illustrated are as follow, and they can be obtained from such a firm as Peto-Scott: Three dozen No. 5 Stalloy stampings; four ounces 40-gauge enamelled wire (primary); nine ounces 34-gauge enamelled wire (secondary); fibre sheet or good shellacked card (for winding spool); ebonite strip (for terminal mount); terminals, mild steel hoop (for clamps); four 1½in. bolts, and odd pieces of flex and insulating tape.

It is unnecessary to describe the construction in detail, since the drawing gives sufficient information to enable readers to make the transformer by referring to the information given in previous articles of this series in connection with the construction of mains and L.F. transformers. We would say, however, that the centre tapping on the secondary winding should be located with fair accuracy to ensure a "balance" between the two sections of the valve. One method of ensuring accuracy is to divide the spool holding the secondary winding into two halves, dividing the appropriate wire in the same manner; each half can then be wound separately, and the centre tapping made later by joining together the end of the first winding and the beginning of the second, care being taken that both windings are put on in the same direction of rotation.

## Tone Compensation

The purpose of the .02-mfd. fixed condenser is to prevent over-emphasis of the higher frequencies and to avoid "class B whistle," which is caused by the valve being more sensitive to the upper register. The condenser is not essential if the usual tone-control device consisting of a .03-mfd. fixed condenser and 20,000-ohm variable resistance in series is connected between the anodes of the valve, but it is nearly always to be preferred. If desired, however, the tone control can be used in addition to the condenser, in which case the fixed condensers in both circuits may have a value of .01 mfd. Details for the construction of a .01-mfd. condenser were given in the previous article, and a .02-mfd.

(*Continued on next page*)

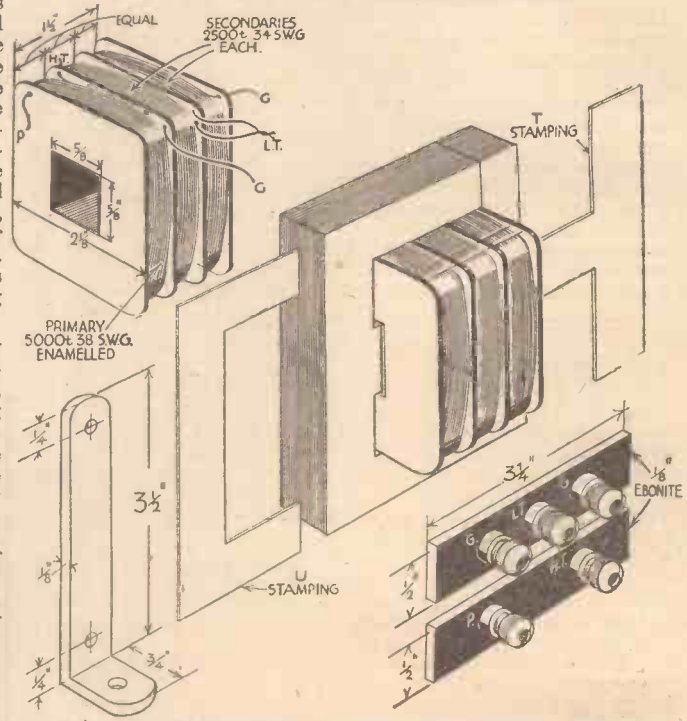



*Fig. 2.—All the main details for constructing the driver transformer are given in the above sketches.*

(Continued from previous page)

condenser can be made by doubling the number of plates. At the same time, we think that most constructors will prefer to buy the condenser(s) ready made, since the price is so low and experience in making such condensers has been had before.

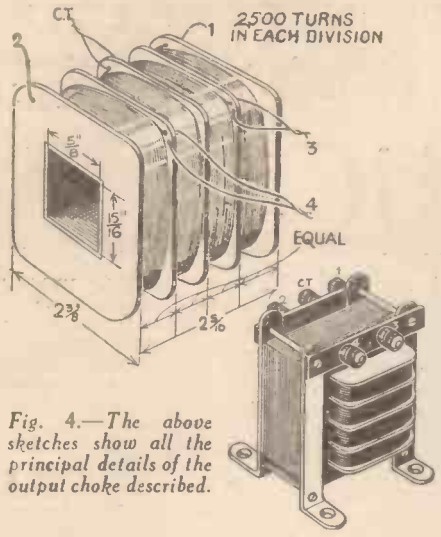



*Fig. 4.—The above sketches show all the principal details of the output choke described.*

The few parts required can be mounted on either a chassis or baseboard measuring about 8in. by 6in.; the form of construction adopted will, of course, depend upon that followed before, although in this case there is no advantage to be gained by using a chassis in preference to a baseboard. No matter which form of construction is followed the connections will be as shown in Fig. 3, and it will be seen that these are very simple and few in number. A switch is not shown in the filament leads, since it is assumed that the L.T. wires will be connected to the corresponding terminals on the existing receiver, in which case the original switch can be used on the amplifier as well.

## An Output Choke

When the loud-speaker in use is not provided with a universal transformer an output choke can be made as shown in Fig. 4, the materials required being as follows: Three doz. pairs No. 4 Stalloy stampings; 1½lb. 32-gauge enamelled wire; fibre (for spool); terminals, mild steel hoop (for clamps), terminal strips, and four 1½in. bolts, etc.

Of the five terminals on the choke the two end ones and that joined to the centre tapping should be joined to the two anodes of the valve and to H.T.+ respectively, whilst the two speaker leads should be taken to the two end terminals on the choke (1 and 2). This assumes that the speaker is intended for use with a battery pentode valve, but if it is designed to follow a small power valve it may be connected to the other two terminals provided (3 and 4).

A suitable valve for use in the amplifier is the Cossor 220B, and this should be preceded by an L.F. or small power valve in the L.F. stage of the existing receiver. When greater output is required a 240B valve may be used for class B, this being preceded by a small power valve.

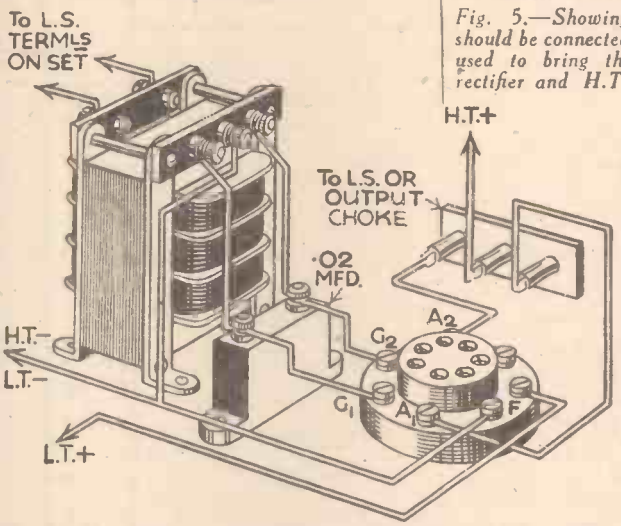



*Fig. 3.—A practical wiring plan of the amplifier. The arrangement is the same as that shown in the theoretical in Fig. 1.*

## H.T.-voltage Regulation

It might be well to add that for satisfactory results with class B output the H.T. supply should be capable of delivering up to 35 milliamps without appreciable voltage change. This means that when a dry battery is employed it should be of the super-capacity type. When using an eliminator of the usual type, it is necessary to add a neon stabiliser to this, the connections being shown in Fig. 5. The effect of the stabiliser is to "absorb" a certain amount of voltage when the output from the eliminator tends to rise, due to the reduced current taken by the valve, and the

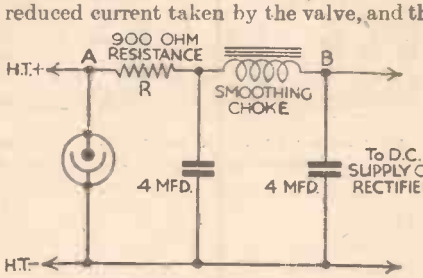


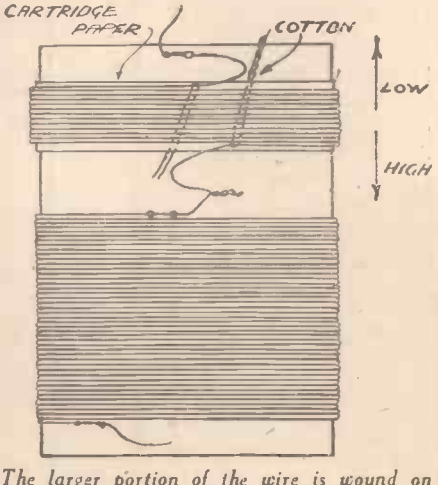

*Fig. 5.—Showing how a neon stabiliser should be connected. Note the extra resistance used to bring the total value between the rectifier and H.T.+ lead up to 1,800 ohms.*

effect is that the voltage remains reasonably constant. For the stabiliser to be fully effective the resistance between the points marked A and B in Fig. 5 must approximate to 1,800 ohms. Consequently, the resistance R must be added if the resistance of the smoothing choke is lower than the figure mentioned. The approximate resistance of the smoothing choke which we described is 900 ohms, so that R should have a value of 900 ohms. A resistance can be made by winding 40yds. of 38-gauge enamelled Eureka wire on a strip of fibre.

# Matching-up Tuning Coils

IT is usual when matching up inductances for tuning coils to wind on a turn or two more than experience indicates is necessary, and to remove a few turns whilst the coils are on test. The method described here makes the matching of tuning inductances much more simple than removing a turn, and also has the advantage that adjustments can be made at any time in the future, even to increasing the inductance of the coil, which would mean in the usual construction the addition of turns.

The larger portion of the inductance, as shown in the accompanying illustration, is wound on the former in the normal manner, and may be about seventy-five per cent. of the total turns required. The remainder of the turns are wound on a piece of cartridge paper wound round the former but not stuck to it in any manner, the ends of the wire being held by a piece of cotton bound in with the wire and drawn tight after winding, and the ends cut off. The coil can then be treated with a thin coat of dope, but this should not be applied in a manner likely to make the cartridge paper adhere to the former. The inner ends of the two windings are soldered together, and the coil fixed up in the test circuit. By sliding the smaller coil towards the larger the inductance will be increased or, by sliding it away, reduced. In this way it is possible to accurately balance the inductances of two or more coils before fitting into a receiver, with the advantage that final adjustments can be made in the receiver. When the correct inductance has been found, the edge of the cartridge paper can be secured with a dab of sealing wax or adhesive.—W. H. F.




*The larger portion of the wire is wound on the former in the usual manner as shown.*

## Matching I.F. Circuits

Quite apart from their use for determining the wavelengths of transmissions received, the buzzer and heterodyne types of meter are also valuable when ganging the intermediate-frequency amplifier of a superheterodyne. Thus, if the meter is placed somewhere near to the anode lead to the first I.F. transformer and tuned to the intermediate frequency (approximately 2,700 metres for 110 kc/s, or 2,000 metres for 150 kc/s) the trimmers on the I.F. transformers can be adjusted until the note becomes loudest. Actually, it is not generally essential that the intermediate frequency should be perfectly accurate, but it is necessary to have the various transformers tuned to the *same* frequency. In those cases where the anode lead mentioned above is completely screened, the method of calibration described might not prove satisfactory, due to the fact that the complete screening of the I.F. amplifier prevents the "pick-up" of wavemeter signals. In such an instance, it should be possible to replace the screened lead by an unscreened one for the purpose of preliminary adjustment.


# RECEIVING TELEVISION PICTURES ON A C.-R. TUBE

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

CONSIDERABLE time is being spent in detailing quite fully the various operating details and working of the auxiliary equipment used in conjunction with cathode-ray tubes, for it is felt that in this way the reader, when he comes to use this device later on for the reception of high-definition television pictures, will not regard his equipment as something complicated and dangerous, but rather look upon it as an intelligent means to a definite end, namely, better home entertainment. Furthermore, the home constructor will be in a far superior position to the person who buys a complete set (he always is, of course, but it is as well to bear in mind that the same conditions will operate with television transmissions as for standard radio conditions), for he can see exactly the function of each part, and can manipulate his controls with the full knowledge of the results which accrue from each of these variables.

## Electrode Systems

In dealing with the building up of a picture on the fluorescent screen by intensity modulation, mention was made of the steps which have to be taken to avoid any question of de-focusing so as to keep the picture sharp and clear. This means that the complete electrode system must maintain the spot in its true electrical focus irrespective of the modulation voltages applied to the shield or cylinder. In consequence of this the electrode systems of modern "hard" cathode-ray tubes used for television purposes are something more than a mere cathode, shield, and accelerating anode (gun).

Just as in a very accurate lens-focusing system one, two, or more lenses are positioned at proper distances apart to give a sharp image, so in the cathode-ray tubes one, two, and sometimes three successive anodes or accelerators (no doubt we shall have standardised names for these various parts in the not too distant future, at least we hope so in order to avoid confusion) mounted at suitable points along the cylindrical section of the tube, and fed with positive potentials (increasing in magnitude as these electrodes approach nearer to the fluorescent screen) correlated one to the other.

## Second Accelerator

Complete details of these arrangements have not yet been made public in many cases, but as a case in point mention can be made of the Ediswan cathode-ray tube, type B.H. This has two accelerator plates as shown in Fig. 1, and according to the makers' rating these are supplied with positive potentials of 250-800 volts for the first electrode and 800-2,000 volts for the second electrode, that is the one farthest from the cathode. The shield, under these conditions, has applied to it a negative bias of 50-150 volts and becomes entirely the electrode concerned with varying the spot brightness as a result of the incoming signal voltages.

These two accelerating electrodes, in conjunction with the potential relation to the negative cylinder, accomplish electrostatically the focusing of the electron beam. In practice a fixed relationship exists between the positive voltages applied to these two electrodes, that is to say, an increase in second accelerator voltage requires a *proportional* increase in first accelerator voltage. The anode voltages and negative bias for the cylinder are nearly always furnished from a potentiometer arrangement of tappings connected across the main D.C. supply to the tube. This is called the power pack exciter unit, and many different schemes are used for this purpose.

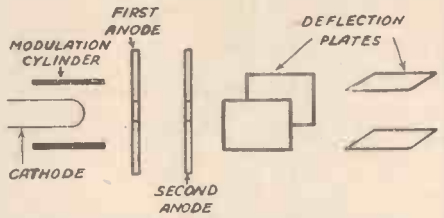



*Fig. 1.—Adding a second accelerator anode to cathode-ray tubes for television reception.*

That shown in Fig. 2, however, will suffice for descriptive purposes, and is arranged to work in conjunction with the dual accelerator electrodes previously mentioned.

## Supplies to the Electrodes

There are many features which should be noted in connection with this power pack and exciter unit. First of all, the positive side of the H.T. supply is earthed, and, due to the high potentials required for television C.-R. tubes, proper precautionary measures must be adopted to ensure that the insulation is adequate in every component position. The rectifying valve can be an MU.2 or one of a similar rating, and as will be seen it acts as a half-wave rectifier. Across this 2,000-volt H.T. feed is the series combination of fixed and variable resistances to furnish the correct electrode voltages.

In this case the second accelerating anode is connected to the extreme positive H.T. voltage through a resistance, while the corresponding first anode is linked to a potentiometer. By adjusting the movable arm of this component it is possible to determine the correct potential with reference to the first anode to give a correct spot focus. The feed to the cathode or filament is derived from a 2-volt accumulator, a coarse and fine resistance being included together with an ammeter to obtain a correct filament current. This cathode is joined to its appropriate point on the main H.T. feed. In this way resistance $R_2$ is negative with respect to the cathode, and it is from this potentiometer that the negative cylinder or shield potential is derived, being joined to the arm of $R_2$ through an input potentiometer $R_7$. Under working conditions the incoming television signal from the output circuit of the radio receiver is applied to $R_7$ through the medium of the

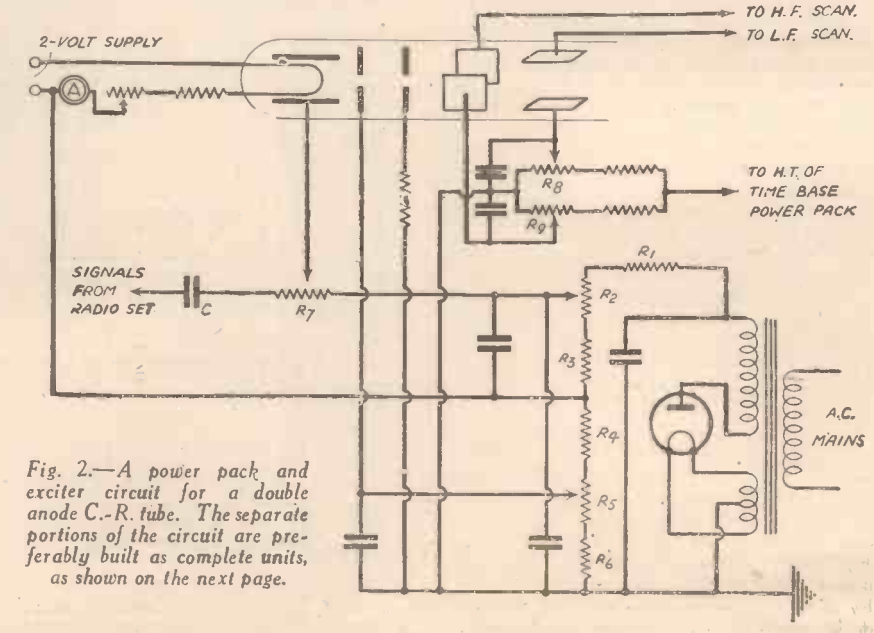



*Fig. 2.—A power pack and exciter circuit for a double anode C.-R. tube. The separate portions of the circuit are preferably built as complete units, as shown on the next page.*

fixed condenser C, which of course serves to isolate the cathode-ray tube proper from the radio set.

## "Shift" Voltages

Instead of one of each pair of the electrostatic deflector plates being joined direct to earth, they return by way of a double potentiometer $R_8$ and $R_9$. This furnishes the "shift" voltage, to which reference was made in an earlier article (batteries can be used if desired), and serves to adjust the position of the electron beam on the fluorescent screen in order to obtain a centralised scan. In this arrangement, therefore, as far as the exciter unit is concerned the potentiometer $R_2$ is adjusted to furnish the intensity of the beam and in some measure a degree of focus. $R_5$ is the prime focusing control, while the extent of the intensity modulation which produces the final picture for a given radio signal input is governed by the amount of adjustment given to $R_7$ by the user of the tube. The anodes of the separate gas-filled relays of the time bases connect to the deflector plates in the manner shown in previous instalments in this series, and in this way the beam is made to trace out the scanning lines either vertically for low-definition television, or horizontally for high-definition signals.

For ordinary reception purposes the complete equipment is not unduly bulky, and can be sectionalised into separate units if preferred. An interesting example of this practice as applied to a cathode-ray tube monitor panel, such as would be used to check transmissions, is furnished by a reference to Fig. 3. This tall unit has compartments allotted to separate functions. That at the top is the double time base unit, and gives a fair impression of the size of equipment of this character. Below this is the back of the cathode-ray tube—the tube projects out from the front panel of the assembly, being shielded by a metal cylindrical cover—together with the requisite focusing and brilliancy controls.

## Another Arrangement

The next two sections house the "B" or power amplifier and its power pack unit, while in the base are two compartments taking the mains eliminators for the time bases and the tube exciter unit. The whole scheme represents present practice for most monitoring or checking purposes, and by using an assembly of unit fashion it is more convenient for servicing or making alterations to parts of the circuit as required.

Yet another scheme for the complete time base and exciter unit is given in Fig. 4. Only one accelerator anode is shown in this case for simplicity, while the power pack and filament feeds for the time base have been omitted for clarity. The rectifying valve to furnish the gun volts is a SU2130 and, as before, half-wave rectification is employed. The cathode or filament of the tube is shown fed from a rectified L.T. source with a large electrolytic condenser to give proper smoothing. Shift voltages for the deflector plates are derived from potentiometers across the time base H.T. feed, the scanning potentials being fed from the cathode end of the fixed condensers joined in parallel across the pair of gas-filled relays.

## Suppressing the Flyback

Input signals from the radio receiver pass *viâ* the fixed condenser C, the appropriate negative bias to the shield (with reference to the cathode) being derived, as before, from a potentiometer device across the

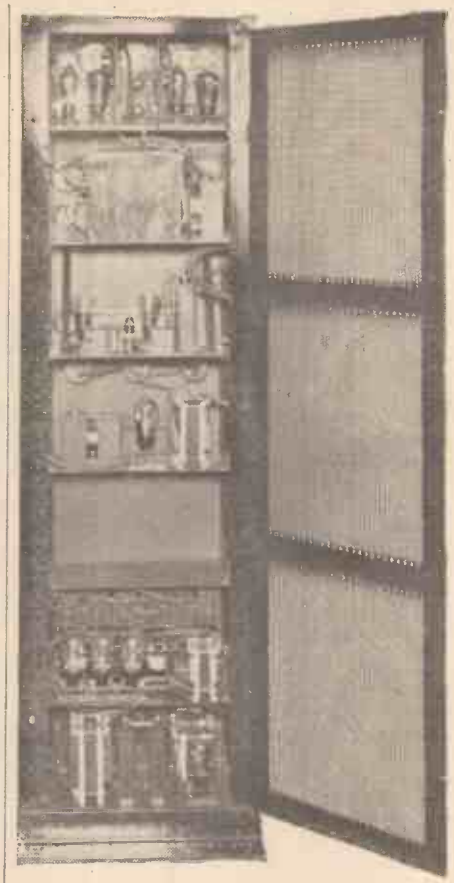


*Fig. 3.—Sectionalising the various auxiliary units used in connection with a cathode-ray tube monitoring panel.*

exciter power pack. It is as well to point out here that one of the precautions taken to obtain a television picture free from untoward blemishes is in connection with the elimination of the visual return stroke of the low-frequency time base. In many cases this will trail very noticeably across the fluorescent screen and tend to mar the picture.

One scheme adopted for suppressing this effect is to make the sharp rise of current in the low-frequency gas-filled relay, as the parallel condenser is discharged, produce an inductive voltage "kick" in the secondary of a transformer through the primary of which this current is caused to pass. By applying this kick voltage with suitable polarity to the modulation cylinder of the cathode-ray tube, a momentary static field is produced which will completely cut off the electron beam and so render the return stroke invisible.

In order to ensure that the active life of the cathode-ray tube shall be the maximum possible, it is necessary to treat it with the care it merits. One factor which has extended the life of this component when compared to its earlier prototypes is the inclusion of the negatively biased shield, which ensures that the bulk of the electrons emitted from the cathode reach the front fluorescent screen. The earlier gas-filled tubes brought about a rather intense cathode bombardment as a result of ionisation, and this caused a gradual destruction of the filament.

## Preventing a "Burn"

While the application of a large positive potential to the gun or accelerating electrodes results in a bright picture, to prevent undue disintegration within the tube this should be kept as low as is convenient for the provision of pictures bright enough for normal observation. In addition, when using high accelerator voltages do not at any time allow the spot to remain at full brilliance and stationary on any one portion of the screen. This will "burn" the chemical surface and so bring about unnecessary damage owing to loss of fluorescence. It is for this reason that makers frequently recommend that adjustments to beam focus, intensity, etc., should be carried out when the spot is expanded into a single scanning line, or even made to cover its complete scanning area.

Again, it is a precautionary measure to switch on the filament supply first and allow this to become incandescent before the high tension is applied. When "shutting down" the reverse process will hold; that is, break the H.T. supply first and then the filament feed, as this will avoid any undue strain arising from the absence or decrease in the electrons available from the cathode when that electrode is allowed to cool.

Contrary to general belief, the modulation voltages required for the successful production of pictures on the C.-R. tube screen is quite small. In many cases a change of negative shield bias of only 15 volts will give ample brilliancy. Quite moderate receiver outputs can be used, and in some cases the tube can be worked direct from the detector stage.

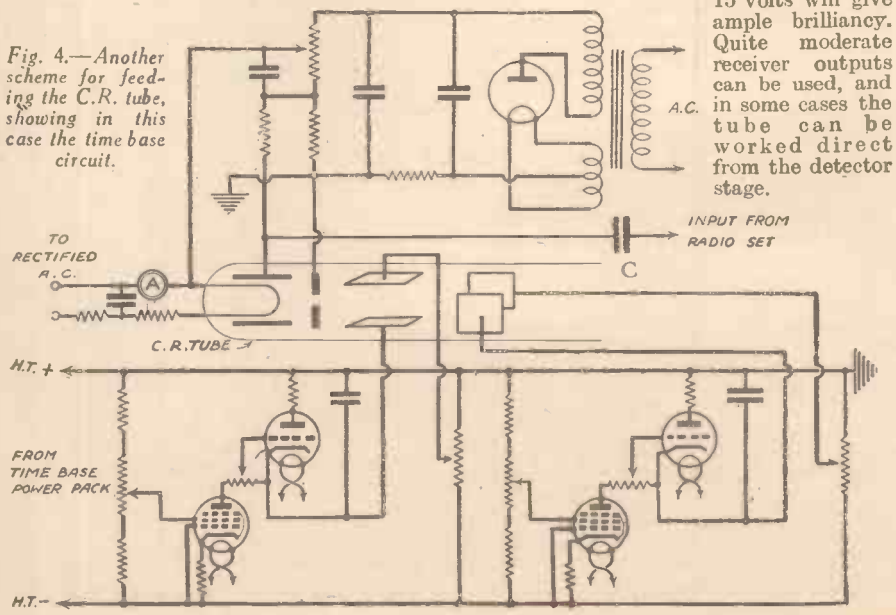



*Fig. 4.—Another scheme for feeding the C.R. tube, showing in this case the time base circuit.*

# MR. F. J. CAMM'S ALL-WAVE "SILVER SOUVENIR"

**FREE FULL-SIZE BLUEPRINT NEXT WEEK!**

Preliminary Details of a Set which is an Outstanding Event in the Design of Home-constructed Receivers. Covering Short Waves as well as the Normal Broadcast Bands, this Ingenious Receiver Employs only Three Valves. Read About the Interesting Circuit Details and Other Particulars of this Intriguing Receiver

ON all sides various schemes have been proposed to commemorate the interesting historical event which takes place shortly in this country. Flood-lighting, public holidays, and many other schemes will all mark the Silver Jubilee of His Majesty's reign, and I have taken steps also to provide a token which will rank with other souvenirs of this auspicious occasion. I have designed a receiver which is unlike any previous design which has appeared in our pages. Even more than this—no such design has hitherto been placed before the home-constructor, and undoubtedly the public will be fully appreciative of the utility and ingenuity underlying the design of my latest receiver.

A glance at the theoretical circuit will convey many features to the experienced constructor, but for the benefit of those to whom a circuit diagram is not very clear I will enumerate the many important and valuable features which are embraced in it and which, in view of the occasion for which it has been designed, I have called the Silver Souvenir.

## Only Three Valves

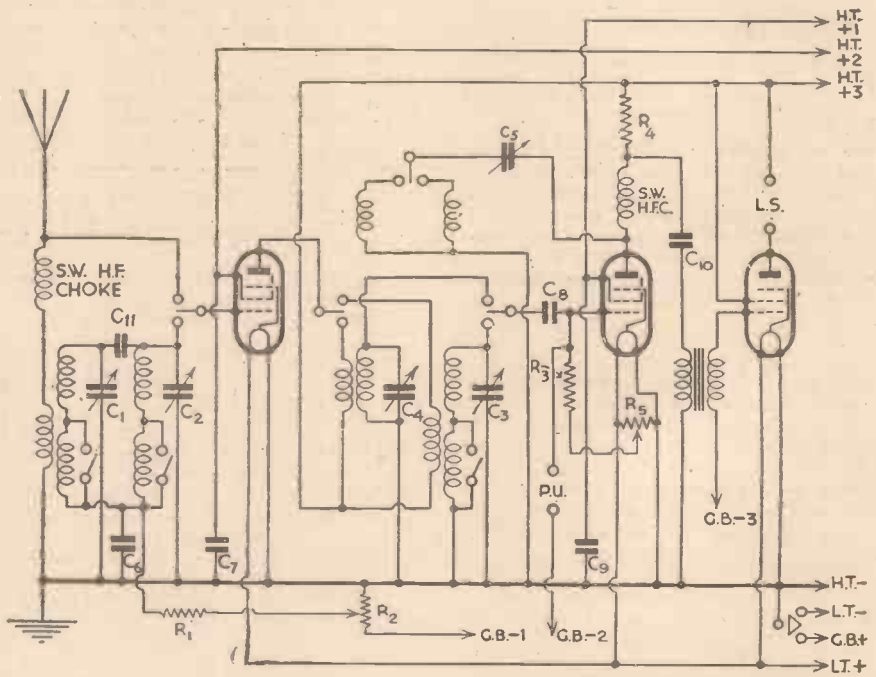
The first important point is the number of valves employed, as upon this depends the cost of maintenance. Accumulator charging is not an inexpensive item, and the fewer the valves which are in use the fewer the visits to the charging station. Similarly, the H.T. consumption represents expenditure on H.T. batteries, and the lower this can be kept the longer will the battery last. Three valves is, in the opinion of the majority of good designers, the minimum which can be employed to give really good reliable results, and accordingly the design of the Silver Souvenir is built around three valves. In order to maintain high efficiency with so small a number of valves these are of the pentode type, and the all-popular H.F. detector and output arrangement is employed.

The first valve is a variable-mu H.F. pentode, using the control of bias to vary the volume and thus provide really smooth volume control. The second valve is a normal H.F. pentode, used as a cumulative grid rectifier, with a special tapped potentiometer to enable a definite bias to be applied to the valve. The value of this will be found on the short waves, but of this more anon. The output valve is a power pentode, delivering an output of 1,000 milliwatts, which is, of course, ample for all normal requirements.

## The Tuning Range

It is in the tuning circuits that the principal novelty will be found. Intense interest has been created in short-wave work since the announcement concerning television has been made. Consequently, many constructors have asked for short-wave receivers. The usual scheme is for the constructor to build an adapter or converter and use this apparatus with an existing set. The complete short-wave set is not found in many listeners' homes, and thus there is a real need for a good short-waver. But listeners also wish to hear the normal broadcast programmes, and the Silver Souvenir, without the employment of any "stunt" arrangements, has been designed to cover both short and normal broadcast bands.

For normal broadcasting, band-pass circuits are used in the input side, with an H.F. transformer coupling H.F. and detector valves. The addition of special short-wave chokes, and a short-wave coil with its own short-wave tuning condenser, has been made to the normal circuit, and a multi-contact change-over switch enables the ordinary broadcast coils to be cut out of circuit, and the short-wave coil and condenser to be brought into use. The aerial circuit then becomes aperiodic, with the special short-wave components coupling H.F. and detector stages. Nothing could be simpler than this arrangement, yet it works in a most effective manner. The provision of the separate tuning condenser means that all the advantages of short-wave receiver design are obtained, and the difficulties associated with coil changing, etc., are completely removed. When switched to the short waves, in fact, the receiver acts exactly like a specially-designed short-waver, and yet the full utility of reception on the broadcast bands is retained.




*Three valves, all-wave, separate short-wave components and all-pentode circuit, are the main features of this interesting receiver.*

Such points as decoupling and other normal circuit improvements have received the full consideration which is always found in PRACTICAL AND AMATEUR WIRELESS receivers, and the receiver behaves on both wavebands in a most efficient and stable manner.

**Full constructional details will appear next week, together with a free full-size blueprint, and you should order your copy now to avoid disappointment.**

It is necessary to emphasise that this receiver, as with all others emanating from our laboratories, has been extensively tested and tried under all conditions. It is not a haphazard collection of parts thrown together to form some new circuit about which to talk. Much thought is expended upon the design before any attempt at construction is made, and then the receiver in its final form is thoroughly tested under all kinds of conditions in order that no possibility of an imperfect performance may arise when copies of the receiver are built by our readers. Consequently, the design is published with the support of our Free Guarantee, and is fully backed by us. Thus, every constructor may unhesitatingly purchase the necessary parts in the full knowledge that he will obtain results comparable to those which we obtained, and should he fail to do so for any reason, our Free Advice Bureau is ready to assist him in every direction.

# SOLVING INTERFERENCE PROBLEMS—2

## NOISE-FREE RECEIVING INSTALLATIONS

**The Purpose of this Article, the Second in the Series, is to Enable the Listener to Absolve his Receiver and Electrical Mains Wiring from Blame in the Way of Producing Noises**

THE definition, "man-made static" does not apply here, because we are concerned with the following symptoms: (1) Steady humming; (2) slight crackling and clicks *not* due to switches; (3) whistles due to (*a*) heterodyning, and (*b*) second-channel interference.

The noises mentioned above are best defined as those which spoil the reception on a receiver, the reproduction from which might be described otherwise as perfect. The writer has in mind high-class radio-gramophones and home-built "quality" receivers, in which every technical refine-

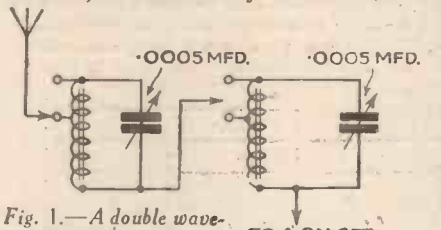



*Fig. 1.—A double wave-trap or acceptor unit using iron-cored coils for reducing the overloading effects of the local stations on the first valve, and thereby avoiding cross-modulation or, in superhets, second-channel whistles. One coil unit (tuned to the long waves) will often prevent similar effects due to 5XX.*

ment has been incorporated to make the reproduction as lifelike and as perfect as possible. It can well be understood that the interjection of noises due to faults in the receiver, or from bad contacts in the mains circuit, when listening, say, to a violin obbligato would be enough to make the fastidious listener well nigh frantic. The abolition of such noises is therefore essential if the installation of a "quality" receiver is to be justified.

For the purpose of our discussion, interferences from outside sources such as picked up on the aerial and mains circuit (and also from electric motors) are assumed to be non-existent. A complete discussion on the latter devices formed the subject of the first of these articles, and it is proposed to deal in detail with other sources of interference in forthcoming issues. Quite apart from the desirability of silencing, as a matter of course, obvious sources of interference within the control of the listener, it is logical to test, examine, and correct any other possible sources of noise within his control before it can be said that the installation is free of radio interferences.

### Thorough Investigation Necessary

The investigation of slight crackles must inevitably commence at the receiver itself. Valves should be removed from their sockets, the pins carefully cleaned, and if of the "banana" type, they should be spread to make firm contact with their sockets. The possibility of the valve-holder sockets themselves having collapsed, or lost their springiness, must not be overlooked. A short test can then be conducted to determine whether any of the valves have developed microphonic tendencies, by flicking each one with the finger and noting whether a reverberating sound occurs in the loud-speaker. Valves which prove faulty in this respect should be replaced, but not before steps have been taken to silence them by applying a lump of plasticine to the top of the glass bulb, or surrounding them with sponge rubber or cotton-wool jackets.

Reverberation may possibly manifest itself between a perfectly good detector and/or L.F. valve and the loud-speaker, due to their proximity in a cabinet which tends to resound when vibrations are set up in walls. In this instance, if damping the valves as indicated is only partially successful, the cabinet can be lined with a non-resonent material, such as thick felt, slag wool, or any of the sound-absorbing sheets generally available for such purposes. Small components mounted separately

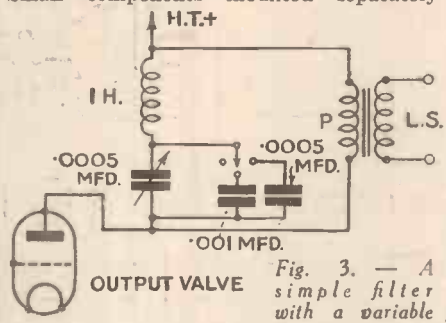



*Fig. 3. — A simple filter with a variable response over quite a wide frequency range. The tuning condenser can be of the bakelite dielectric type, the other condensers being of fixed capacities. For commercial receivers the components can be mounted in a small box and then connected across the primary of the transformer fitted to the loudspeaker, as shown. It is also possible to join the filter across the primary of an L.F. transformer.*

inside the cabinet should be tested while the set is operating by placing the tips of the fingers lightly on them, and noting whether they vibrate on any one note or any particular band of frequencies; mountings of sponge rubber will speedily effect a cure. The intrusion of slight crackles and similar noises can then only be due to the aerial and earth system, the mains, or faulty synthetic resistances or electrolytic condensers. By switching over to the gramophone section it is possible to localise these noises because their cessation will indicate that the L.F. amplifier, loud-speaker, and rectifier equipment are not causing the trouble. It would still be possible for any of the stages before the valve used as first L.F. to be faulty in the manner indicated. The aerial and earth connections must be examined for partial breaks, short-circuits, and intermittent contacts due to dry or dirty joints, and producing high-resistance connections.

Where a battery set is involved, it can be similarly tested as well as the flexible leads to it, and in the absence of voltmeters, a set of new batteries can be tried and their effect noted. Home-built sets should have all their external connections carefully overhauled, and plugs, sockets, lugs, etc., cleaned and examined where they connect to the flexible leads. Should it be definitely established that neither the set nor its equipment are to blame, the proper procedure is then to examine the electrical installation, where accessible in the house.

### House Wiring

Electrical wiring which has been in existence for some years is prone to slight leakage, and should therefore be tested for insulation by an electrician with a megger. The listener, however, can previously satisfy himself as to effective contacts between lamps and lampholders (taking particular care to examine all filaments to see if they are intact and broken ends not merely touching together), between fuses and clips in the local and master fuse boxes, and that switches are not arcing in their "on" positions, although it is fairly certain that even good switches will create clicks in the set when switched "on" and "off." When the receiver is tuned to the local station it is usually desensitised to an extent which makes these noises inaudible except on the lightest of music.

The provision of a very low resistance earth path (to be dealt with in the next article) and an aerial lead in which is either screened or well away from the lighting wires, are often sufficient safeguards against the switch noises. On superhet receivers, and especially those installed within the swamp areas of powerful stations, whistles may make themselves apparent, due to self-generated oscillations caused by over-

(Continued on page 76)

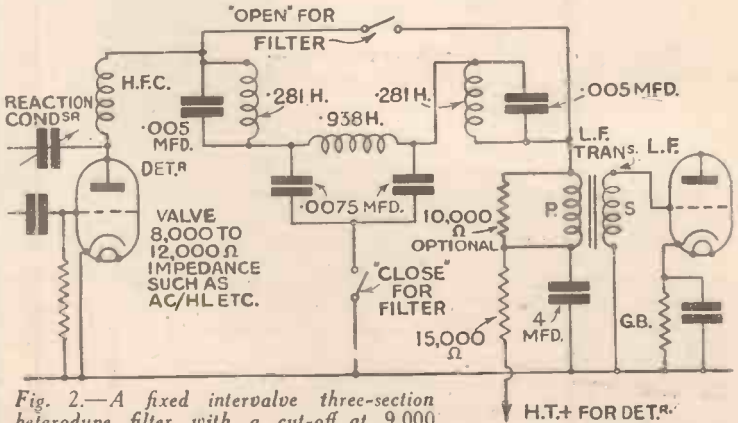



*Fig. 2.—A fixed intervalve three-section heterodyne filter with a cut-off at 9,000 cycles. The two switches can be linked together to operate as denoted, so that for transmissions free of sideband interference the full frequency response of the set may be utilised.*

(Continued from page 74)

loading of the first valve in the receiver. These whistles will often completely spoil programmes on adjacent wavebands. The whistles created are commonly known as second-channel interferences, and may be overcome by limiting the strength of the local stations to the input of the receiver by means of very sharply tuned wave-traps or acceptor units. It is easy to identify these whistles, as they vary in pitch with a change of the condenser tuning dial.

## Using Wavetraps

With two powerful stations it is necessary to provide two coils in series, as shown in Fig. 1, and in order to prevent reduction of strength of other transmissions on adjacent wavelengths, the wavetraps must be very sharply tuned as mentioned. Such units are available commercially and are fitted externally to the receiver and generally in series with the aerial lead. Heterodyne interferences which also create whistles in the loud-speaker are those due to stations working on adjacent wavebands, the carrier waves overlapping to create an audible note of 9,000 cycles or less, depending on the overlap. The note which is heard does not vary in pitch as the tuning dial is rotated.

On high-quality receivers such whistles will manifest themselves at even higher frequencies where stations overlap (at 9 kc. or more), due to the greater high-note response provided. On 1935 sets, and those produced late in 1934, provision has been made for a whistle filter to obviate these interferences. On earlier models, however, the provision of an external whistle filter, preferably having a variable frequency response, and across the loud-speaker or inter-valve coupling leads, is a highly desirable feature. Full details of the various devices available can be obtained from a number of component firms.

## Steady Humming

Our last point has reference to steady humming, as it is felt that a few hints on removing it will be of interest to those who are affected. Briefly, the noise is common to mains receivers, and generally indicates that the degree of smoothing provided in the set is not quite sufficient on the mains which are used for the receiver. On A.C. mains the hum occurs at about 100 cycles (double the frequency of the mains with full-wave rectifying equipments), and on D.C. supplies it varies according to the generators used at the power station. The cause of the hum can be traced to one or more of the following points. (1) On A.C. sets, wiring of filament leads unbalanced, (2) insufficient smoothing of H.T. current, (3) poor earth lead or one which is common to the mains, (4) aerial lead-in parallel to mains wiring.

The provision of midget 30-ohm potentiometers across the heater or filament leads to the A.C. valves, in place of the usual centre taps on the A.C. L.T. secondary transformer windings and as indicated in Fig. 4, will effect a considerable reduction in the hum. The reason is that the slider of the potentiometer can be adjusted while the set is operating to the true electrical centre or nodal point, whereas the normal centre tap on the L.T. secondary is not always at the electrical centre with respect to the heater wiring. On D.C. supplies the addition of small H.F. chokes in series with the mains leads, and additionally further L.F. chokes and condensers will produce beneficial results.

Remedies for the points mentioned in (3) and (4) are obvious, but in the case of (1) further L.F. smoothing can be tried as well as mains H.F. chokes.

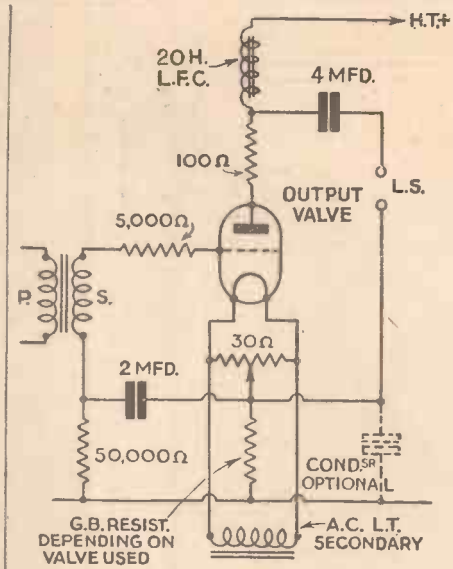



*Fig. 4.—A method of removing hum in the output L.F. stage employing a directly-heated power valve. The 30-ohm potentiometer is suitable for 4- and 6-volt valves. Note the A.C.-L.T. centre tap is not required. Fit the potentiometer close to the valve-holder for best results.*

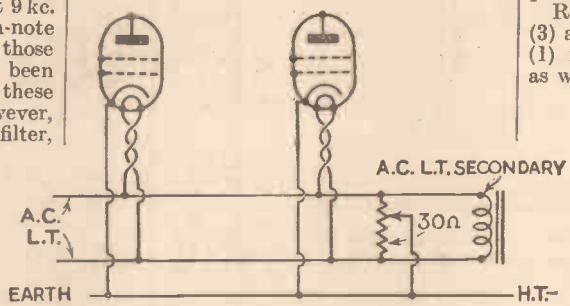



*Fig. 5.—Connections of heater potentiometer for indirectly-heated A.C. valves. There is not usually a critical nodal point, but the potentiometer will often prove preferable to taking the usual centre tap on the A.C.-L.T. winding to the earth lead.*



## New H.M.V. Long-playing Needles

A NEW gramophone needle has been evolved by H.M.V. research engineers at Hayes, Middlesex, after a considerable amount of experiment in an endeavour to produce a needle capable of reproducing the higher frequencies now heard from the better type of modern radio-gramophone.

The needle has to retain the shape of its point throughout the whole of its life. Every time it plays a record it has to resist a friction caused by a pressure of nearly five tons per square inch on its point over a playing track 200 yards long.

The H.M.V. high-fidelity needles will play thirty to sixty record sides without causing serious high-note loss when used on an ordinary acoustic or radio-gramophone. This is a record track length of about five miles.

Owing to the exceptional hardness of the steel and chromium plating, these needles are unlikely to wear the records excessively, even after they have been played a considerable number of times, but it must be emphasised that, after sixty playings on an ordinary instrument, the quality of reproduction will be affected.

A very great degree of care is being taken in the manufacture and testing of these new needles. One secret of their construction is the minute film of chromium which is applied evenly to the actual tips of the steel "cores." The tip of each needle is magnified before and after plating four hundred times, that is, until the tip of the point appears to be the size of an ordinary pocket watch. These tests are carried out in order to ensure that each needle is of the standard dimensions, and that each point is perfectly formed.

The special design of these "His Master's Voice" high-fidelity needles, which are priced at 1s. for a packet of ten, should improve the reproduction of records on whatever instruments they are played.

# ITEMS OF INTEREST

## Schools Musical Festival

A RELAY will be taken from the Seventh Annual Cardiff Schools Musical Festival at the Drill Hall, Cardiff, on April 10th, when Western listeners will hear a choir of 600 Cardiff school children from the Central, South, and Docks area and a Schools' Orchestra of seventy performers. The conductor will be Bumford Griffiths.

## At the Top of the Band

A STATION to which few listeners turn but which can be picked up on most evenings is Radio Kaunas (Lithuania), which you may tune in at the very top of the long-wave band, namely, 1,935 metres (155 kc/s). Although only 7 kilowatts, the signals under favourable conditions are clear and strong. The studio uses a musical box interval signal, and the call: *Allo! Lietuva, Radio Kaunas*, is given out frequently by both man and woman announcers. The station is on the air at G.M.T. 05.30 and usually closes down towards 21.30 by playing its National Anthem.

There are no broadcasting stations working on a longer channel than Kaunas.

## Relays from the Arctic Circle

AFTER considering a number of schemes the Danes have voted against the installation of a broadcasting station in Greenland as the Kalundborg transmissions are well received in the Arctic Circle. Programmes, however, are to be relayed from Julianehaab (Greenland) and also from the Faroe Islands for the benefit of listeners in Copenhagen.

# On Your Wavelength

by Thermion

## Getting the Speed Right

A FRIEND of mine derives intense pleasure from playing his piano with the dance bands which broadcast. I was visiting him the other day, and he was rather concerned because he had had a gramophone outfit added to his radio and he could not get the record to come into pitch with his piano. Practically every radio transmission could be accompanied (his piano was tuned to concert pitch which is now standard), but the records simply would not play in a key to suit his piano, and he asked me if it were possible to balance the gramophone in any way. I soon explained to him how necessary it was to rotate the turntable at the correct speed, and as the original recordings are made with standard instruments (which are tuned to concert pitch) it is obvious that by playing them back at the same speed as was used for recording the pitch would automatically come right. The stroboscope is practically the only satisfactory method of ascertaining that the turntable is rotating at the right speed, and our artist has made a neat little drawing, showing the method I suggested for marking the turntable to enable the speed to be judged perfectly. Remember, however, that an alternating current must be used for illuminating the turntable, and although an ordinary electric lamp run from the A.C. mains will do, more accurate vision is obtained with a neon lamp. To work out the number of divisions for any frequency of supply, and for any speed of record, the following formula should be used

$$\frac{F \times 120}{R}$$

where F is the frequency of the A.C. source used to illuminate the turntable, and R is the number of revolutions per minute required for the record. The makers state this on the label, and thus no difficulty should be experienced in getting the speed really exact. A synchronous turntable or motor will only run at one speed, and this is determined by the makers and cannot be altered by the user.

## Back to the Bench

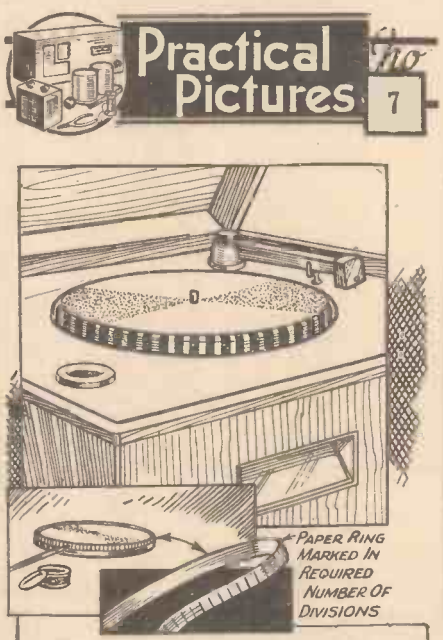
I RAN across an old friend the other day—a wireless fan I had not seen for four years. I remember the last time I saw him he was saying that home construction was dead. He used to spend pounds in wireless gear and was always trying out some new circuit, but he told me on that occasion that he had finished. He had bought an American receiver from one of the big stores at a ridiculous price (it was an all-mains seven-valver if I remember rightly, and cost only £6 with M.C. speaker and gramophone equipment), and he said he had finished with wireless. Last week I met him again—he has been away in the country somewhere on business, and he looked quite bright and happy as he met me. I asked him how the wireless set was going, and he said he still had it, but he was glad that television had come. He was now rigging up his old work-room and bench and was looking forward to the time when he could once again have a keen interest in life trying out circuits and making up apparatus as in the old days. He realises now that life without home-construction and experimentation is dead, and the new era which is opening to us will give him nights and nights of pleasure as of old. I can foresee a great revival of construction and interest in view of the great developments which are coming along in the wireless world.

## All-wave Tuning

A FEW weeks ago I referred to the matter of designing a receiver for all-wave operation, and last week I reproduced extracts from a letter which I received from a reader, in which he gave some details of an all-wave receiver he had made.

I am reminded of this by the fact that a few days ago I had the opportunity of trying Mr. F. J. Camm's "Silver Souvenir," of which preliminary details are given on another page in this issue, and which I learn will be fully described next week. This remarkable little receiver gives astoundingly good results on all wavebands, and is, I am sure, exactly the type of set that will shortly be in very great demand. Despite its utter simplicity and the low price for which it can be built, it gives results equal to those I have ever heard from any other *two* receivers together. The remarkable thing is that the little set functions just as effectively on short waves as any "hot-stuff" three-valver I have ever handled. But, in addition to this, the reception on the broadcast wavelengths is particularly good.

Unlike many short-wavers it gives extraordinarily good reproduction and is very selective indeed. Although it has been "on the stocks" for a good long time, I learn the set has been kept a close secret; thousands of readers will now be glad to find that "the cat is at last out of the bag."




THE EDGE OF A GRAMOPHONE TURNTABLE IF DIVIDED IN ALTERNATE BLACK & WHITE SECTIONS, AS SHOWN ABOVE, FORMS A PERMANENT STROBOSCOPE. FOR 40 CYCLES—120 DIVISIONS: FOR 60 CYCLES—184 DIV.: FOR 25, 50 & 100 CYCLES—152 DIV.

## How Many Valves

THE question concerning the number of valves that should be used in the average broadcast receiver is a somewhat hoary one, but I make no excuse for returning to the subject, for I have lately received numerous inquiries concerning the matter.

Although the idea of using a large number of valves of low stage gain is admirable in its way, it has more than one disadvantage. Quite apart from the matter of cost, and ignoring the point of compact construction, reception is often found to be better when the minimum number of valves is employed. The main reason for this is that background noises of various kinds—due to so-called valve "hiss"—are minimised. The "hiss" referred to is considered to be due to the electron emission from the filament or cathode so that, obviously, the fewer filaments there are the less pronounced should be the "hiss."

I know that several readers will reply to this by pointing out that valve noises are in greater prominence when a valve is worked in such a manner that it is giving its maximum output when it is being operated at a fraction of its full efficiency. Nevertheless, this does not always apply and the matter is worth thinking about.

## Television To-day: A New Newnes Production

ON Wednesday next week will be published the first of about sixteen weekly parts of a new serial work to be entitled *Television To-day*, and which will be by far the most comprehensive work published on this latest development of electrical science. All modern systems of television, whether developed in this country, in America, or on the Continent, will be dealt with, and considerable space is being devoted to the subject of ultra-short-wave reception, in which not only will general principles be included, but also the practical details of the various circuits employed. The completed work will contain detailed information on the subject of such differing components as the cathode-ray tube, the photo-electric cell, various types of drum and disc scanners, neon mercury lamps, the "iconoscope," the electron "camera," the electron multiplier, the Kerr cell, and the zinc-sulphide light valve. No doubt if those who take a serious interest in the development of television and obtain their copies of Part I from the bookstalls they will consider it wise to continue with subsequent issues until complete sets have been obtained.

## Influence

RADIO has had an enormous influence on the national habits and the national outlook. Its influence from an educational point of view is too enormous to be assessed. When you are comfortably seated in your own arm-chair listening to a programme or a speech subconsciously your opinions are being moulded for you. Whilst talks are subject to approval before they are put over the air, no such vetting of

(*Continued overleaf.*)

(Continued from previous page)

musical programmes is enforced. Thus, it is possible to put over in the form of music what can virtually be veiled and sometimes pernicious propaganda. Take some of the nigger spirituals. I am of the opinion that a good deal of this music is intended to advance the cause of the darky. You will probably have noticed the vast amount of such music which is imported into this country and put over the air. Several other instances of musical propaganda will occur to you. It is just as well to bear this point in mind.

## Circuit Lay-out

IN many receivers all the odd resistances and condensers are arranged neatly in rows on a strip of paxolin or on a special multi-way connector. This looks very nice, but it wants careful designing to avoid unwanted couplings, or complicated wiring. For example, it does not seem to be of much use putting a decoupling resistance and condenser in a circuit, and then completing that circuit by a long straggling lead which may pick up all sorts of additional interference. It is mainly for this reason that I prefer the small components to be included in the run of wiring, and I think they should be connected as near as possible to the major components with which they are associated.

## Neatly-insulated Joints

TALKING of joints, I am a great believer in the use of wire end resistors and condensers which can be included in the general run of wiring, and I am also in favour of soldered joints. Moreover, I like to have all the wiring of my sets neatly covered in insulating sleeving, because it makes an attractive-looking job and reduces the risk of accidental short-circuits. The difficulty is to fit sleeving over joints in the wiring without leaving unsightly-looking gaps. My own scheme is as follows: To begin with, I use all yellow sleeving throughout for the main wiring. If there are two wires to be joined together I cut two pieces of sleeving and slip them on the two wires, leaving about half an inch bare on each side of the proposed soldered connection. But before soldering I cut another piece of *black* sleeving this time, of larger diameter than the yellow and about 1½ins. long, and slip this over one of the yellow pieces. After the joint has been made it is an easy matter to push the black sleeving over the junction, thus insulating it and neatening it.

This has the additional advantage that the black sleeving shows at a glance where there are joints, and this comes in very handy if, for any reason, it is desired to disconnect any part of the circuit, as, for example, when testing.

## A Winding Tip

MOST of us at one time or another have tried our hand at winding an H.F. choke or an L.F. transformer, or perhaps attempted to repair one which had a broken winding. The old device of joining the fine wire to a thicker wire for the final connection is well known, but a tip given me by a professional is well worth passing on. Here it is! Do not try to solder the fine wire to the thick one. The reason is that in scraping off the insulation (usually enamel) there is a considerable risk that the fine wire will be nicked and weakened. Moreover, the soldered joint very often makes the wire brittle, and there is also the risk of corrosion.

My friend strongly recommends that a welded, or rather a fused, connection be made. Bare and clean the thicker wire, and twist the thin wire round it several times. You need not scrape off the enamel. Then hold the joint in a spirit or gas flame for a short time and the two wires will melt together, giving a good mechanical and electrical joint.

[*This is doubtful. The fusing point of copper is fairly high, and a blowlamp would be needed.*—ED.]

# Notes from the Test Bench

## Measuring Resistances

LAST week it was mentioned that a 5 milli-ammeter could be converted into a reliable voltmeter. This instrument can also be used for measuring resistances provided that a battery is available. As is well known, the resistance in a circuit is equal to the voltage divided by the current and, therefore, if the milliammeter is connected in series with a battery and the resistance to be measured, the value of the latter can easily be calculated provided that care is taken to convert the values into volts, amperes, and ohms before calculation is made. For example, if a resistance to be measured is connected in series with a milliammeter and a 120-volt battery, a reading of 2 m.a. will indicate that the resistance has a value of 60,000 ohms.

## Short-wave Reception

GREAT interest has recently been taken in short-wave reception, and it is found that very good results are generally obtained when a very simple detector-two L.F. circuit arrangement is used. This circuit was very commonly used on the broadcast bands a few years ago, but nowadays, owing to the congested state of the ether, more selective tuning circuits have to be used, the result being that the straight three has gradually fallen into disuse. Selectivity is not very important on the short-wave band at present, however, and therefore it is worth while converting the medium/long-wave straight three for short-wave reception. This can be done by replacing the medium/long-wave coils by the all-wave type, of course, but a simpler method generally proves quite satisfactory. When two inductances are connected in parallel the resultant inductance is lower than that of the smaller of the two separate inductances. It is therefore possible to reduce the inductance of the medium/long-wave coil by connecting a short-wave coil across it. It is only necessary to connect the ends of the medium/long-wave winding to the grid-winding sockets of a short-wave coil base and the ends of the reaction winding to the reaction-winding sockets of the S.W. base. When short-wave reception is desired, it will only be necessary to plug the short-wave coil into this base. This method of conversion is not as efficient as the use of a well-designed short-wave adapter, of course, but in most cases satisfactory reception is obtained.

## Condenser Shorts

IT is sometimes found that a receiver suddenly develops a dead spot in its tuning range, perhaps between twenty and forty degrees on the tuning scale. This form of trouble is, in most cases, due to the moving vanes of the tuning condenser touching the fixed vanes between the degree settings where no signals are receivable. In the midget type condensers, especially those of the screened type, this fault is difficult to remedy as the plates are normally very near to each other. With the larger type of condenser, however, the plates can easily be separated by means of a penknife.



## Dielectric Properties

I CAME across some interesting figures in a reference book a day or two ago concerning the suitability of different materials for use as dielectrics in condensers. One realises, of course, that mica is used because of its high specific inductive capacity and good insulating qualities, but the actual figures are very striking. Actually mica is from 5½ to 7 times as good as air from the capacity point of view, and is only excelled by flint glass, which is, of course, ruled out on account of its unsuitable mechanical properties. On the score of insulation, mica easily tops the bill, a voltage of 40,000 volts being required to pierce a sheet one millimetre thick. The nearest competitor is ebonite at 30,000 volts.

Another point which these figures showed was the advisabillty of reducing the amount of solid insulation to a minimum where capacity losses must be avoided. For example, the capaoity losses in ebonite are from 2½ to 3 times as great as for an air dielectric, and for rubber 2 to 2¼ times as great as for air.

## Simplified Control

ALTHOUGH much of the "simplicity of operation" advertised so prominently in connection with modern receivers is only just another name for carefully adjusted ganged tuning, set manufacturers are to be congratulated on some of the very clever schemes which they have designed for combining two or more controls for manipulation by a single knob. Of course, a minimum number of control operations have to be provided for, and the mere fact that they are operated by fewer knobs than before does not really simplify the working of the set. The following are essential: mains switch, wave-change switch, volume control and tuning. Tone control and speaker extension with silencing key for the main speaker are advantageous, and an inter-station noise suppressor is also quite useful.

With most of this season's commercial sets, it is found that a twin control represents the minimum number of knobs. In this case, a three-valve straight battery set, one knob operates the battery switch and volume control, and the other the condenser drive, and also the wave-change by means of a push-pull action. Of three-knob receivers, the usual combination is: first control, combined mains switch and volume control; second, tuning; third, wave-change and pick-up. Where four controls are provided the fourth is usually a tone control, sometimes combined with an inter-station noise suppressor.

There seems, however, a tendency to increase the number of knobs—the controls, like speaker switches, sensitivity adjusters, and even tone controls, which are only occasionally used, being tucked away behind the cabinet, leaving only two, or at the most three, knobs on the front of the set.

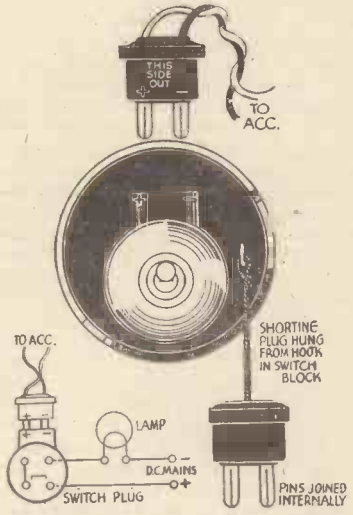
This is a point to which amateur constructors could devote quite a lot of time, for so many home-built sets still have an excess of knobs. While admitting that there is rather a limited range of small components which are so constructed that they may be ganged together, it must not be overlooked that the design of ganged controls is a fascinating task.

# A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

## A Switch-plug for Accumulator Charging

WITH a view to economy when charging from D.C. mains, an accumulator is sometimes connected to the open-circuited




*A handy switch-plug for accumulator charging purposes.*

contacts of a switch controlling an existing source of illumination. This method suffers from certain obvious disadvantages. The same end can be attained in a more convenient fashion, by replacing the existing switch with a switch-plug. A suitable length of red and black flex, terminating in a two-pin mains-plug at one end and spades at the other, forms a convenient method of including the accumulator in the lamp circuit. Polarity of the switch-plug sockets is found by any of the well-known methods, the accompanying sketch showing the scheme adopted to prevent incorrect insertion of accumulator plug. When there is no accumulator on charge, a shorting plug occupies the switch-plug sockets. The lamp, at all times, is controlled by the switch in usual manner.—STEENSON RAINEY (Wishaw).

## Silent Morse Code Practice Unit

ONE disadvantage about morse code practice at home is that the sounds made by the key and buzzer annoy other members of the family. A simple remedy is

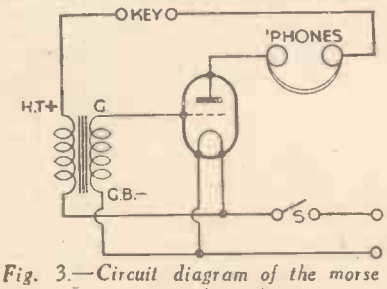



*Fig. 3.—Circuit diagram of the morse code practice unit.*

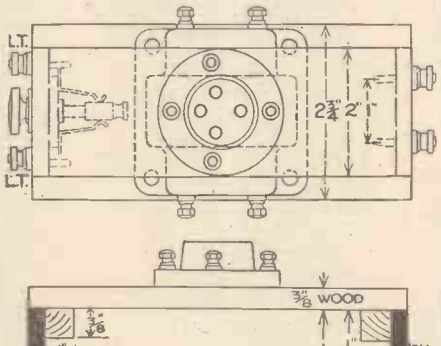
### *THAT DODGE OF YOURS!*

**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., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.**

provided by the unit shown in the accompanying sketches.

A few simple components, all spare parts, are assembled on a small baseboard and panel, as indicated in Figs. 1 and 2. The unit provides a means of practice without anyone sitting near being able to hear; only the person wearing the headphones hears the signals sent with the key.

The key should be connected to the lower pair of terminals by means of a length of flex, and fixed in the most convenient

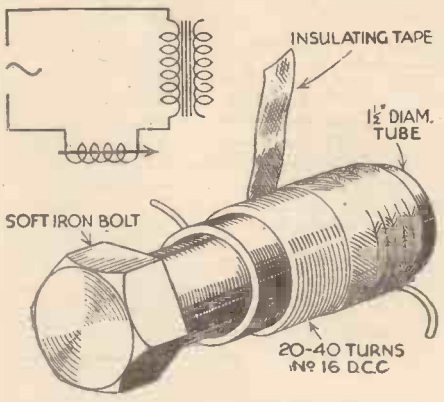



*Figs. 1 and 2.—Plan and elevation of a morse code practice unit for giving noiseless signals.*

position for comfortable working. Two people can use the apparatus, one to send with the key, and the other to listen and put down the signals as heard.—J. VIVIAN (Southgate, N. 14).

## An A.C. Mains Regulator

IN cases where the mains voltage varies, this gadget will be found helpful. Wind 20 to 40 turns of No. 16 d.c.c. copper wire on a piece of 1½in. tubing (cardboard or bakelite). Connect in series with the A.C. supply, then insert an iron bolt or rod into the tube, which should be an easy fit. By removing the bolt gradually, the voltage will rise. With this arrangement a large variation in voltage is possible.

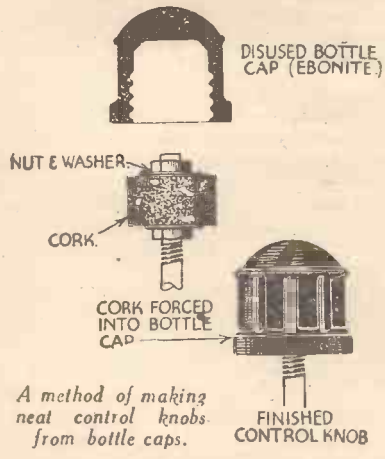



*An easily-made voltage regulator for A.C. mains.*

When not in use it can be shorted out or the bolt can be entirely removed, and then the solenoid will help to keep H.F. interference from the set.—M. LECKIE (Glasgow).

## Improvised Panel Control Knob

THE accompanying sketches illustrate how a disused bottle cap may be adapted for use as a panel control knob. It will be found that most of these composition caps, which contain necessary insulating properties (even for short-wave work) provide a neat finish for reaction and pre-set condensers controls and home-made switches. All that is necessary is a suitable size cork to snugly fit inside the cap. The end of the screwed spindle is




*A method of making neat control knobs from bottle caps.*

passed through the centre of the cork, which is clamped between nuts and washers as shown. The cork is pushed into the cap to the necessary depth, and, by tightening the outside nut, the cork can be made a tight fit in the cap.—B. KING (Cardiff).

# SHORT WAVE SECTION

## A Three-valve Short-wave Portable

### Pointers Which Will Help You in Designing an Efficient Receiver

By G. W. DAVEY

PORTABLE receivers are very much in readers' minds at this time of the year, and there is no doubt that a short-wave portable would prove a source of interest and usefulness to every short-wave experimenter. It can be small, compact, and light, and yet capable of bringing in the whole world. It would prove invaluable as a source of testing the effect that locations, weather conditions, buildings, etc., have upon short-wave reception. For a short-wave enthusiast no more is necessary than a circuit diagram and a few suggestions, and any amateur having experience of short-wave work should find it quite easy to put these hints into practice, and to build a portable to his own requirements.

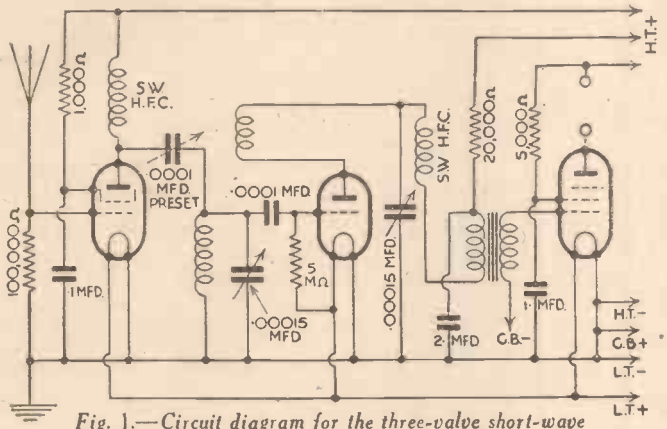



*Fig. 1.—Circuit diagram for the three-valve short-wave portable described.*

### Necessary Components

Unless the constructor is ambitious, I do not think it necessary to build a loud-speaker into the portable. 'Phones are more compact and, as the receiver is hardly likely to be used other than as a source of experiment rather than entertainment, 'phones are most appropriate. Batteries are inevitable, but quite good results will be obtained with 100 volts H.T., in which size first-class, compact batteries are now obtainable at reasonable prices, whilst small, though adequate, unspillable L.T. accumulators are also easily obtainable. The next point to decide upon is the circuit to be used, and for optimum results a three-valve set would be most advisable.

The best valves to use for the sake of compactness are the Osram "K" or Hivac Midget series, and the total space occupied would be quite small. The valves made in these types are a variable-mu screen-grid, triode, and economy power pentode—exactly the types which suit our purpose best—and the circuit recommended for them is shown in Fig. 1. The first valve is arranged as a "buffer," a definite advantage in a portable where aerials are likely to be many and varied, for, besides imparting a certain amount of H.F. amplification, the S.G. valve eliminates all aerial troubles, such as "dead spots," fading due to it swinging, and such-like annoyances.

It is not likely that a volume control, other than reaction, will be required, and, therefore, the v.m. valve is unbiased, being thus worked at maximum sensitivity. The detector is perfectly straightforward, and the coils recommended are home-made, and can be wound upon discarded valve bases. Most constructors have two or three old burnt-out valves at hand, and soaking these for a while in methylated spirit will soon loosen the glass envelope in the base, enabling them to be parted with a gentle twist. Ample room will be found on the base to wind both tuning and reaction coils, and the ends of the windings may be led out and soldered to the valve pins. These coils will be found compact, efficient, and simple to use, not only for a portable but for all short-wavers. Small short-wave variable condensers are easily obtained, as are efficient midget transformers, H.F. chokes, and other requisite components, and the suggested layout is shown in Fig. 2.

### Chassis and Panel Layout

The whole set is built on a light form of chassis consisting of a plywood baseboard with a pillar of correct height mounted at each corner. The panel is then screwed down on top of these pillars by means of a screw at each corner. This chassis can be built to any desired shape or size in order to fi the case for housing it. In my own instance I used an old cheap portable gramophone cabinet made of plywood covered with a leather fabric, and it was ideal for the purpose. You will notice a valve-holder is mounted on the panel, and this is for plugging in the home-made coils, the whole set of which can easily be tucked away in an odd corner. The rod-like arrangement mounted above the left-hand corner of the set is the aerial which may be used when no other aerial is available. It consists of four 1ft. lengths of 2 B.A. rod, and on one end of each of three of these lengths a 2 B.A. nut is half-screwed, and so fixed by a small amount of solder run behind it. Another nut is similarly soldered to a 1in. length of rod, and this small piece is fixed to the panel by means of another nut (Fig. 3), and a lead taken from it to the aerial terminal. The four pieces of rod may be screwed together, and then screwed into the nut on the panel, so forming an exceedingly efficient vertical rod aerial with which no earth need be used. In the normal way, 30ft. of insulated aerial wire slung over a tree, and led direct to the aerial terminal, will generally prove adequate for good results. If an earth is felt to be necessary, a small spiked rod with lead attached may be carried, and pushed into a convenient spot or even simply thrown into an adjacent pond or

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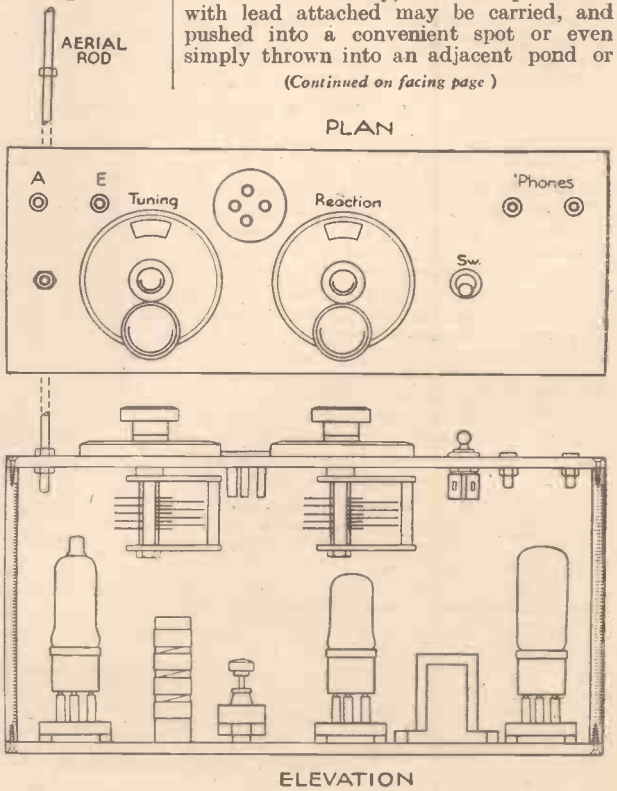


*Fig. 2.—The panel and chassis layouts.*

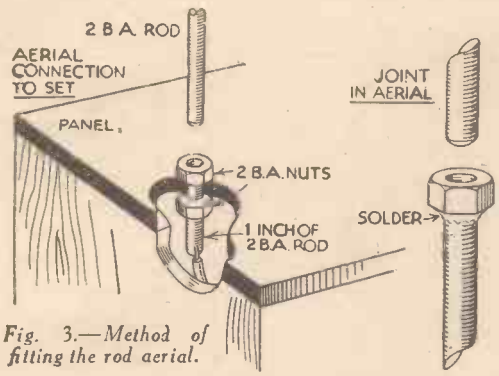


*Fig. 3.—Method of fitting the rod aerial.*

(*Continued from facing page*)

stream. When operating out of doors many and varied aerials may be tried. A barbed or ordinary wire fence, for example, is often very good, particularly if the upright supports are wooden or concrete.

### Suggested Experiments

Operating the set should be found perfectly normal, for there is but the usual one tuning and one reaction control. For those readers who operate transmitters endless sources of experiments with this set will come to mind, particularly if you happen to own a car. With the help of a fellow enthusiast, tests of the home transmitter's local field strength, the extent of its ground ray, how its quality is affected by locality, and similar tests, may easily be carried out, whilst there seems no reason why a small 1-watt transmitter should not be built in the same case, operating off the same batteries. A tremendous amount of useful work could be done in this manner, but it should be remembered that a special portable transmitting licence would be required.

If care is taken in the layout and wiring-up, the set should be easily made to operate down to 6 metres, and three turns on one of the valve-base coil-formers should be about right for this waveband. Here again another great field for experiments opens out. The ultra-short waves of such lengths are only receivable over a comparatively small distance of up to about thirty miles from the transmitter. The reason for this is not properly known yet, and a portable would be of great use to the reader who would like to know more about these waves. For London readers, the Baird Company's transmissions on about 6 metres should prove helpful.

For the set described only one circuit is given, but it is a very simple, compact, and exceedingly efficient one. A superhet circuit could be used, but it would be found that much more space would be required in order to house the additional components necessary. However, for those readers who would prefer a superhet I can recommend any of the many circuits recently described in this journal, but would suggest that for best results a higher voltage than 100 should be used, as well as the largest capacity battery compatible with portability.

# Double Detector Circuits

## In This Article the Writer Makes Some Interesting Suggestions in Connection With Unusual Experimental Detector Circuits

By FRANK PRESTON

DUE to the fact that the majority of short-wave experimenters prefer to use simple receivers of the det.-L.F. variety the choice of circuit often appears to be very limited. This is because the detector stage is the only one into which modifications can be introduced, since the L.F. amplifier has very little effect upon the range of reception which is, after all, one of the first considerations of the average short-wave "fan."

Actually, however, the variety of detector circuit arrangements and modifications which is available is by no means so restricted as may at first appear, even though the constructor limits himself to simple, "straight" circuits, as opposed to various forms of so-called "supers"—which do not often come up to expectations.

### Push-pull Detection

One interesting variation of the usual regenerative detector circuit which is by no means new, but which is certainly worthy of trial, is the push-pull detector arrangement which is shown in Fig. 1. Although this circuit necessitates the use of two valves where one is normally required, the extra valve often proves worth while, and, in any case, modern valves are so economical of current that the slight additional current drain is negligible. The main point is, however, that the push-pull system of detection does in many cases result in considerably increased signal strength on both weak and comparatively powerful transmissions, and it often gives somewhat improved quality which is definitely worth while. Also, due to the reduced damping effect of the two valves (virtually in series) on the tuned circuit, selectivity is likely to be improved and losses reduced in amount.

The push-pull detector circuit is by no means widely used on short waves (or on the broadcast bands either for that matter), but most of those experimenters who have tried the idea have kept to it. There is little difficulty in trying out the circuit shown in Fig. 1, since standard components can be used, although the reaction coil requires to have a centre tapping; this can easily be made by slipping a strip of fibre or mica under the centre turn, scraping away the insulation, and soldering a tapping. Alternatively, the reaction winding can be removed and re-wound, making a centre tapping in the normal manner. The grid winding is that normally used with any other circuit and is tuned in the usual manner by a condenser of about .00015-mfd. capacity.

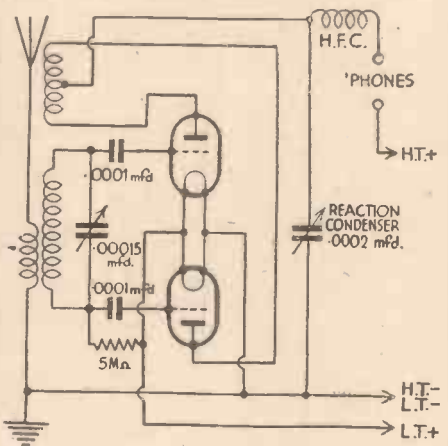


*Fig. 1.—The push-pull detector circuit described.*

### Throttle-control Reaction

The method of applying reaction is not that which is most often employed, the control being that known as "throttle" reaction, due to the fact that the object of increasing the capacity of the reaction condenser is to "throttle" or choke the reaction circuit by allowing a certain amount of H.F. leakage from the reaction circuit to earth.

In practice it is found that throttle-controlled reaction is the only kind that is really convenient for use in the push-pull circuit, although normal "swinging-coil" reaction could be used, but that would preclude the use of 6-pin plug-in coils and therefore tend to limit the receiver to a single wavelength range. When using the form of reaction shown, ordinary coils may be employed, a seventh connection being made to a tapping by means of a crocodile clip.

The output from the push-pull detector can be fed into a pair of 'phones or into an ordinary L.F. amplifier in the usual manner, whilst the detector valves may be of the usual detector class, or of the H.F. type.

### Using a Separate Reactor

Another simple modification of the standard leaky-grid-detector-with-reaction circuit is shown in Fig. 2, where it will be seen that, again, two valves are used in the detector stage. In this case, however, the valves are not wired in series, but may, rather, be considered as being in parallel. The first valve is wired on the anode-bend principle and serves for applying reaction only, whilst the second valve forms a standard leaky-grid detector. The advan-

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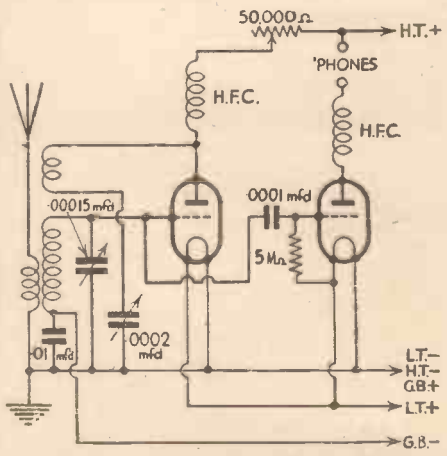


*Fig. 2.—A detector circuit in which an additional valve (the first) is used for reaction control.*

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tage of the separate reaction valve is that it allows the constants of the detector and reaction portions of the circuit to be adjusted individually. Additionally, of course, the circuit makes it possible to secure a more steady and smooth control of regeneration. It is often found, when using the normal oscillating detector valve, that it is necessary to reduce the anode voltage to a very low figure in order to ensure smooth reaction control, and this generally impairs to a certain extent the efficiency of detection. When using the circuit shown in Fig. 2 the degree of feed-back can be controlled between very wide limits by varying the anode voltage on the oscillator by means of the 50,000-ohm variable resistance, which also serves for decoupling purposes. By employing this arrangement the detector anode voltage can often be increased up to 100 or so with beneficial results in the way of volume and sensitivity. Additionally, the most suitable values of grid condenser and grid leak can be chosen with a view to obtaining the most effective rectification and without any fear of upsetting reaction control.

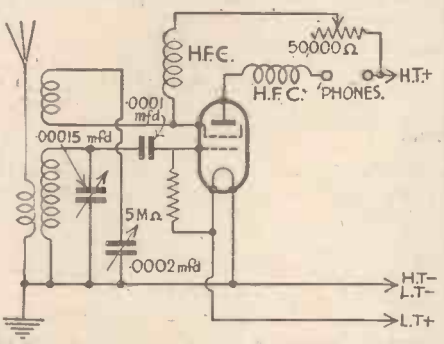



*Fig. 3.—A modified arrangement of the circuit shown in Fig. 2, but using an S.G. valve for detection and reaction control.*

## Using an S.G. Valve

A slightly modified arrangement of the circuit shown in Fig. 2 is illustrated in Fig. 3, where it will be seen that the two separate valves are replaced by a single screen-grid valve. In this case the screening grid is used in the reaction circuit, the anode serving in the detector portion only. The one valve behaves in a very similar manner to the two shown in Fig. 2, due to the fact that the screening grid functions as a second anode in conjunction with the common filament and grid. The results to be obtained, however, are not usually so good as when separate valves are employed; the arrangement is, nevertheless, one which is deserving of trial. If a few different valves are available, these should be tried, preferably noting the effect of substituting an H.F. and an L.F. pentode for the S.G. valve shown.

## Tackling the Fading Problem

A rather involved circuit which often gives very interesting results on stations which normally fade rather badly is that shown in Fig. 4. In this case, two separate detector valves are employed, and each of these has its own tuning and reaction circuits; the arrangement, in fact, is equivalent to using two entirely separate receivers, the outputs from which may be coupled together, or to a common amplifier. When using the arrangement, a normal outside aerial should be connected to one of the tuned circuits, and an indoor one to the other, the two aerials for preference being as far apart as can conveniently be arranged. The idea is that the degree and time of fading is often different in the case of the two aerials, so that by combining the outputs a fairly constant signal strength may be obtained. This does not always work out in practice, as may be expected, but there is scope for experiment.

It is desirable that the two valves should be of similar types and that the two coupling resistances should be alike. When

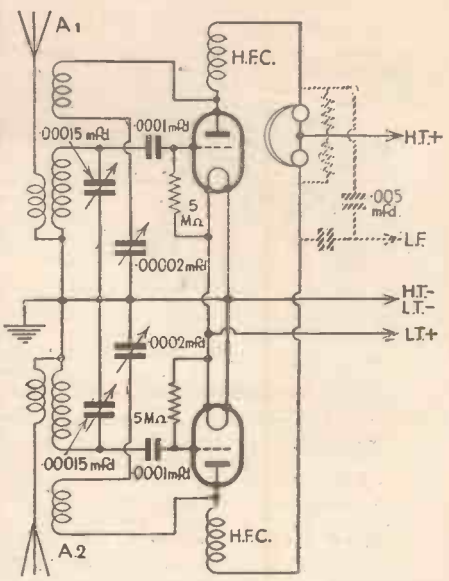



*Fig. 4.—A double detector circuit which is suggested for experimental purposes. Both detectors are individually tuned and have their own aerials.*

'phones are to be used, the two earpieces should be connected in series between the two anode circuits, and the centre tapping taken to high-tension positive. Tuning is made more difficult, due to the fact that there are two individual circuits to control, but it is not necessary to operate both simultaneously, because a station can be first tuned in on one set, and signal strength then increased by bringing the second circuit into balance. As mentioned above, the scheme does not always work out satisfactorily, but in some cases it is particularly good; it is suggested as an experimental arrangement which has been tried out with varying degrees of success.

# An Efficient Microphone and Stand

A VERY effective mike and stand can be made from the following materials: An old headphone-earpiece, a block of wood 3½in. by 3in. by 2in., an old brass telescopic hatstand as used by milliners (which can usually be obtained quite cheaply), a strip of brass 13in. by ¼in. by ¼in., four small brass hooks, three small screw rings, and a piece of cord elastic.

Unscrew the ebonite cap of the earpiece, and by means of a fretsaw remove the thin ebonite which protects the diaphragm. Having done this, replace the cap, which now leaves the diaphragm more exposed and consequently more sensitive to sound. Remove the existing flex and substitute

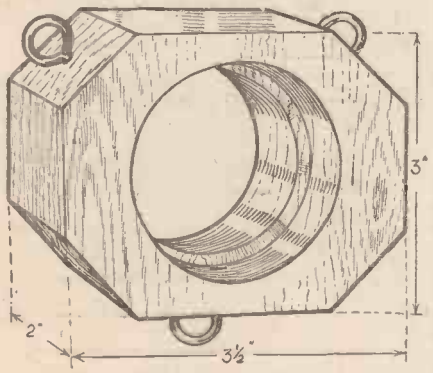



*Fig. 1.—How the wooden block is shaped to form the microphone case.*

a suitable length; or, if it is desired to fit the mike with terminals, leave a sufficient length to enable this to be done.

The block of wood is to form the case, and the corners must first be removed, as shown in Fig. 1. A hole is then bored through the block, large enough to take the metal case of the earpiece, and a further hole is countersunk, by means of a chisel, to take the ebonite cap.

The back and front are cut from 3-ply wood, the front having a hole 2in. by 1½in. cut out for the speech grille. This is made of wire gauze but if this is unavailable, a piece of fishnet glued to the inside of the front serves the purpose. If terminals are to be used these should now be fitted, and the connections made. The earpiece is now fitted into the case. If desired, a microphone button, mounted as shown in PRACTICAL WIRELESS dated December 8th, 1934, may be used. The back and front are now screwed on to the case, and the three suspension rings are screwed in as shown in Fig. 1. A coat of aluminium paint completes the case.

## The Stand

The stand and suspension U can now be made. By means of a vice the brass strip is bent to the shape and measurements given in Fig. 2. Five holes are now drilled

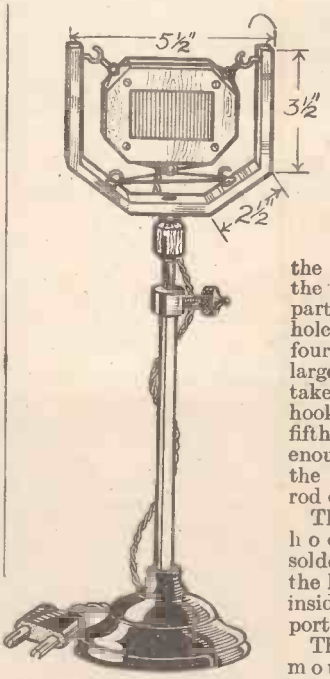



*Fig. 2.—The finished microphone and stand.*

in the U support as follows: one at the top of each arm ⅜in. from the end, one near the base of each arm, and one in the centre of the horizontal part. Of these holes the first four must be large enough to take the brass hooks, and the fifth large enough to take the extending rod of the stand.

The four hooks are soldered into the holes on the inside of support.

The mike is mounted by means of the cord elastic, which is threaded through the rings and over the hooks of the suspension bracket. — S. A. L. (Ruislip).

# IMPRESSIONS ON THE WAX

By T. Onearm

IN this month's Columbia list appears the first Jubilee record, happily distinguished by a silver label. It is one that is peculiarly appropriate as the first of its kind, since it answers a question that may arise in many minds during the Jubilee celebrations—What were the historic events of the year when His Majesty King George came to the throne? This record puts back the clock, and the authors, Leslie Bailey and Charles Brewer (responsible for this and other equally successful broadcast "Scrapbooks"), cleverly bring to life the vivid incidents of 1910, and render it the more vitally interesting by introducing in person Joseph Coyne, telling of his success with Gertie Millar, Grahame-White on his first night-flight, Muriel George in "My Moon" in "The Follies," and Commander Kendall on the dramatic arrest of Dr. Crippen, while the voice of Sir Arthur Conan Doyle is reproduced by permission from a "His Master's Voice" record made at that time. Right up to the thrill of the Proclamation of King George's accession the record, which is *Columbia DX*670, grips with its historic incidents. Truly, there could be no more fitting or successful record for Jubilee Year!

## Sandler's "Merry Widow"

The "Merry Widow," as a film, has renewed interest in the lovely music by Franz Lehar, and Albert Sandler has recorded its two principal melodies, "Vilja," and the famous waltz itself, on *Columbia DB*1484.

Horatio Nicholls, who has written more big song hits than can be remembered, lays down the pen and takes up the baton on *Columbia DX*673, which is a record of his own composition entitled "Memories of Horatio Nicholls." He has given unstintingly of his best—"Wyoming," "Babette," "Delilah," "Shepherd of the Hills," and some half-dozen others—and they are exceedingly well played by Debroy Somers' Band.

Who better than the finely-disciplined, massive B.B.C. Wireless Military Band could play marches in the right swing and volume of tone? To enjoy two examples of sheer exhilaration, the new Columbia record of the band playing "Sing as we Go" as a march (the tune from the film) and a pot-pourri of sea ditties entitled "Ship Ahoy," should be heard. They are taken at a strict marching pace, and Walton O'Donnell has brought out all the rugged beauty of his brass and wind sections. The number of this record is *Columbia DB*1506.

## A New Eric Coates Record

Columbia, who have consistently issued each new work from the composer's pen, offer this month two movements from his "Jester at the Wedding," one of which, the Valse, Eric Coates conducted in a programme of his works on January 28th. The "Jester" music has all those lilting rhythms that have made Coates such a favoured figure in English light music, and, whether in the valse or the march, the merry buffoon, replete with cap and bells, makes his influence felt. The composer himself conducts, and an inspired performance is given by the Symphony Orchestra. The record, which is *Columbia DB*1505, is definitely one of the most refreshing records of the month.

## Humorous Records

The man who complains that there are no funny records nowadays should hear John Tilley's Columbia record of "Missus Lowsborough-Goodby." The song, which is a biting satire on society, was written by Cole Porter, composer of "Miss Otis Regrets." It is done in monologue form. On "Cycling," the subject which forms the reverse side, Mr. Tilley is not altogether clear; he becomes involved in a coffee stall and an artist who cannot carry his works about because they are too heavy, and the more muddled he gets the funnier he becomes. The number of the record is *Columbia DB*1508.

*The new Pye Universal mains receiver model SE/U. The photograph shows how its handsome cabinet design matches its surroundings.*

"A song, a smile, and a piano"—that slogan instantly brings to our mind genial Norman Long, and recalls that he has recorded two topical songs for Columbia this month on *Columbia DB*1510. In the first, he invokes us to "Come and Join the No-Shirt Party," and on the other side, "S-m-y-t-h-e" gives our humorist a chance to indulge his wit at the expense of the gentlemen who change their names from Smith to Smythe in order to become really first-class snobs.

# Leaves from a Short-wave Log

By J. G. ABRAHAMS

AMONGST the "regulars" which have been cropping up in the log during the past week, special mention must be made of HJ1ABB, Barranquilla (Colombia), on 46.53 metres (6,447 kc/s); it has been one of the best signals received from roughly midnight onwards. Although in a fairly crowded band, it is easily identified by its interval chimes, which remind one of the N.B.C. broadcasts, but fortunately are not quite the same. In addition, it makes a speciality of rumbas, boleros, and Mexican pasodobles much less frequently heard from the U.S.A. stations.

Recently I have noticed that some of the more distant short-wave broadcasts are affected by a flutter or wobble, reminiscent of the motor-boating sound with which some of the medium-wave transmitters have been suffering, in particular, Lisbon, Athlone, and one or two others. You will find this happen in a crowded waveband, and in particular when two stations share the same channel. In the case of the latter it is easily understandable; as regards the former, it would appear to be due to interaction between side-bands. The increasing number of transmitters on the relatively restricted channels which are allotted to the short-wave broadcasting stations may spell increased interference—a matter for urgent consideration by the powers-that-be.

## European Transmissions

When turning to our short-wave receivers nightly, it is a mistake to devote all one's time to the capture of broadcasts from across the Atlantic, as there are many worth hearing—and doubtless more easily tuned in—nearer home. Of the European transmitters mention must be made of ORK, Ruysselede (near Bruges, Belgium), which acts as the outlet of the Brussels programmes for the Belgian Congo. Some portions of the wireless entertainment are special to the short-waver alone. The wavelength is 29.04 metres (10,330 kc/s) and the call: *Ici Bruxelles, Poste Colonial Belge*, also repeated in Flemish. So far, the station has limited its working to some seventy-five minutes of broadcast—namely, from G.M.T. 18.30-19.45, during which period it gives gramophone records, topical talks, and news items in both French and Flemish.

Then again, just a short reference to OXY, Skamlebaek, which relays the Copenhagen (Denmark) radio transmissions on 49.5 metres (6,060 kc/s) from G.M.T. 18.00 until 23.00 or 23.30 every weekday and from G.M.T. 16.00 on Sundays. Now and again on special occasions the short-waver is brought into action in the morning, and although not of regular occurrence, the 31.6 metre channel (9,493 kc/s), previously used, will be found to be alive. The call is one we regularly hear from the Danish "long-wave" station: *Kalundborg-Kobenhavn og Denmarks Kortbolgesender*, and the interval signal the familiar carillon on the musical-box. Although the aerial power is only 500 watts, OXY is one of the best stations to search for; the signals are clear and you will find its modulation excellent.

## Nairobi

Incidentally, when you have logged the Dane, make a special effort to find VQ7LO, Nairobi (Kenya Colony). The search must be started in the early evening hours, as at the latest the station closes down at G.M.T. 20.00. The wavelength is the same—within a hair's breadth—as OXY, *i.e.* 6,060 kilocycles, but I have been able to separate them at times. As a rule, the first call is put out at G.M.T. 16.00, and as the announcer possesses a pure English accent, you cannot mistake the broadcast for one from across the Atlantic. It might be worth while to give the dial a twist between 10.45-11.15 on a Monday, Wednesday, or Friday, or on a Tuesday between 08.00-09.00. or Thursday between 13.00-14.00, but the channel is not a favourable one for these daylight hours, and you may not even pick up the carrier-wave. There is just a bare chance that under specially favourable conditions you might hear something. When I mentioned the impossibility of mistaking VQ7LO for an American transmitter, I had in mind W3XAU of Philadelphia (Pa.) on the same channel, and through which you may receive the WCAU, Columbia, programmes in the same city daily from G.M.T. 01.00-04.00. The 49.5-metre wavelength, as you will see, is a very congested one, as it also houses W8XAL, Mason, a 10-kilowatt short-waver taking the WLW, Cincinnati, radio entertainments, on the air from G.M.T. 10.00-01.00 and again from 04.00-06.00 daily.

Almost immediately above we find GSA, Daventry, on 49.59 metres (6,050 kc/s), and this logging provides us with a good landmark for this particular band of frequencies.

It is a useful plan to make a note of the readings of *all* the Daventry channels; they are readily recognised, and thus offer considerable help in establishing either a log or a graph. In this particular instance GSA will assist you in finding HJ1ABG, Barranquilla (49.65 metres, 6,042 kc/s), which, under the call of *Emisora Atlantico*, has been heard in Great Britain on several occasions during the past week or so. It is on the air daily between G.M.T. 23.30-04.00 (except Sundays).

## Relays from Schenectady

W2XAF, Schenectady (New York), on 31.48 metres (9,530 kc/s), is now making a regular feature of operatic relays; every Saturday between G.M.T. 18.30 to roughly 21.30. For its opening and interval signal it claims your attention by a most violent crash which the announcer describes as possibly the grandfather of all statics. It is a record of a ten-million volt artificial lightning "spark"—if spark is still the word to be used. Undoubtedly the Voice of Electricity.

Finally, a correspondent writes me that he has logged a new Colombian broadcast, namely, HJ3ABH, Medellin, on 50.17 metres (5,980 kc/s), of which the interval signal is three notes somewhat similar to those heard in the N.B.C. transmissions. I had received advice that a 25 kilowatt short-waver was to be opened in Colombia in January this year, and this may be the transmitter, as it was then stated that special broadcasts would be regularly made for North America and Europe.

The Galvanometer: Its Theory and Construction

# BEGINNER'S SUPPLEMENT

**A Practical Article Giving Full Particulars for Making a Cheap but Reliable Astatic Galvanometer, and Describing its Various Uses.** By L. ORMOND SPARKS.

IN spite of the fact that the galvanometer is still extensively used in numerous branches of electrical engineering, it seems to have been completely overlooked by the average radio or electrical enthusiast.

Perhaps it is due to a complete lack of understanding of the capabilities and numerous uses of this simple instrument, but more probably the real cause is due to a combination of failure to appreciate the galvanometer's usefulness and, shall we say, the lack of constructional details to enable a serviceable instrument to be made at a low cost.

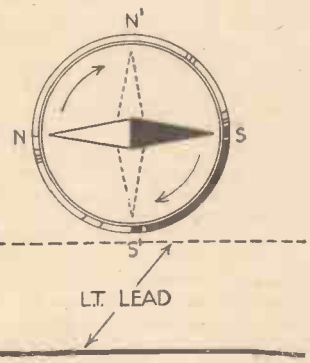



*Fig. 1.—Showing how an electric current has a directive effect on a magnetic needle.*

Most good text-books will tell you that "The galvanometer is an instrument by which the presence, direction, and intensity of electrical currents can be determined." The first galvanometer was introduced by a German scientist, named Schweigger, in 1822. Previously, in 1819, a professor of physics, Oersted by name, discovered that electrical currents have a directive action upon the magnetic needle, and that they always tend to set at right angles to their own direction. This statement can be verified in a very simple manner, as shown in Fig. 1. Obtain a small compass and place it near the L.T. battery connected to your receiver, after it is switched on. See that the needle is free to swing in either direction, and then slowly bring one lead from the battery towards the compass, holding the lead parallel to the compass needle. The needle will commence to move as the wire approaches until it is at right angles, although the actual movement will depend on the current flowing and the sensitivity of the compass.

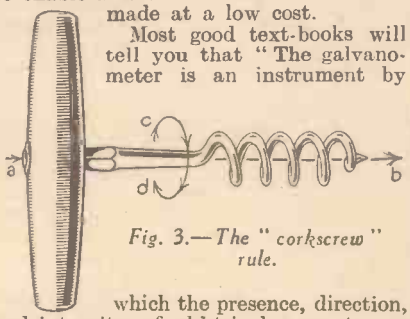



*Fig. 3.—The "corkscrew" rule.*

## Electro-magnetic Effect

Now see what happens when you bring the other wire over the needle and the first one is taken away. The needle swings in the other direction, which seems to bear out Oersted's claim and, incidentally, reveals an easy method of determining the positive and negative leads. Now place the wire under the compass. It will be found that the deflection is reversed, which tends to prove that the magnetic field produced by the current is round the wire in concentric rings. The whole effect was very nicely summed up by another famous scientist, Ampere, whose statement is to the effect that "in the directive action of currents on magnets, the north pole is always deflected towards the left of the current."

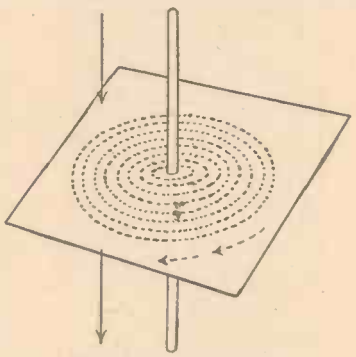


*Fig. 2.—Illustrating the lines of force round a current-carrying conductor.*

More comprehensive details of this electro-magnetic effect are obtained from the investigations carried out by Michael Faraday, who determined, by means of iron filings, that the field produced round a straight conductor carrying a current is concentric, as shown by the dotted lines in Fig. 2. It should be noted that paths are complete circles, and can exist without magnetic bodies being present, or, in other words, they are dependent on and accompany a current flowing along a conductor.

It is obvious that this magnetic field thus produced cannot be overlooked, and as practical evidence of this we have only to remember the screening required in certain radio circuits. One other point worth noting is that there is the relation between the direction of the current flow and the direction of the magnetic lines. While these are shown in Fig. 2 by the arrows, it is handy to know some method whereby the relationship is easy to remember. A good example is that known as the "corkscrew" rule.

(Continued overleaf)

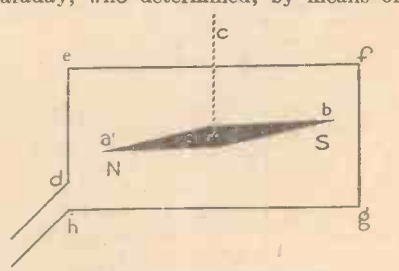



*Fig. 4.—A magnetic needle suspended in a single coil of wire.*

*The finished galvanometer.*

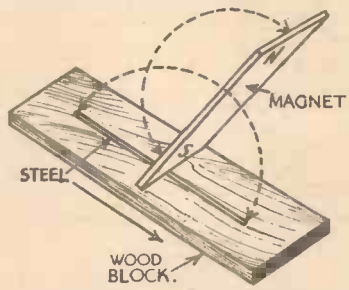



*Fig. 6.—The single-stroke method of magnetising a steel needle.*

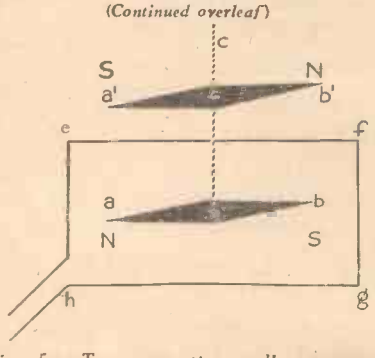



*Fig. 5.—Two magnetic needles suspended with opposite poles adjacent, and known as the astatic system.*

(*Continued from previous page*)

## The Corkscrew Rule

If it is imagined that a line through a right-handed corkscrew, from handle to point, represents the direction of the current, then the direction of rotation of the corkscrew will indicate the direction of the magnetic lines of the field. Fig. 3 shows a right-handed corkscrew. The line a b represents the direction of travel of the current, and the curved line c d the direction of the magnetic lines of force.

The simple circuit given in Fig. 4 shows a magnetic needle a b suspended by a silken thread c. The path d e f g h represents a single conductor in a vertical plane surrounding a b.

Now if we assume that the current is flowing in the direction of the arrows, then the magnetic fields produced in each part of the circuit will be such, remembering the corkscrew rule and the compass test, that they all tend to turn the north pole of the needle in the same direction.

If we now replace the single conductor with several turns, insulated from each other, of course, the effective action of the current will be increased or multiplied. In fact, in the early days a galvanometer was often called a multiplier for this reason. This increase will either produce a greater deflection for a given current or give the same deflection for a much weaker one.

By virtue of the earth's magnetic effect, the needle is tempted to point along the magnetic meridian, or, in other words, along an imaginary line drawn between the north and south poles. This tendency to point always in one direction is very inconvenient, as it means that the galvo. has to be twisted about each time it is moved, to get the zero mark on the scale to line up with the needle, and, apart from that, it tends to oppose the directive action of the current. This defect has been overcome in many ways.

## Counteracting the Earth's Magnetic Effect

In Fig. 5 it will be seen that two needles are suspended by the thread c, their poles being so arranged that they are opposing each other.

This arrangement is known as an *astatic system*, and it has the effect of reducing the action of the earth's magnetic field. But what happens when the electrical circuit is added?

This can best be understood by reference to the same diagram. The action on the needle a b will be exactly the same as in the previous case, but the upper needle $a^1$ $b^1$ will be acted upon by the two contrary currents e f and h g. While the two fields are effective, the nearer one, e f, predominates, and the action is as follows.

Assume that the circuit tends to turn a b to the west. Well, we know from our compass experiment that $a^1$ $b^1$, being above the wire e f, should turn in the opposite direction, to the east. That is so and it would happen, but it must be remembered that the needle $a^1$ $b^1$ has its poles reversed to those of a b, therefore, its movement will be in the same direction. The resultant effect is greater sensitivity.

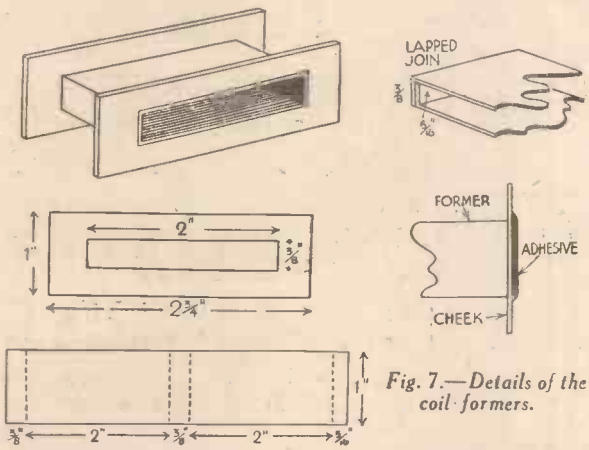



*Fig. 7.—Details of the coil formers.*

## Construction of an Astatic Galvanometer

It will be advisable to obtain or make the magnetised needles first. These should be 1½in. in length, and can be made from ¼in. wide clock spring, or from 1/16in. steel rod. A steel darning needle admirably answers the purpose. A word of warning is necessary here. Make sure that the needles are really made of steel.

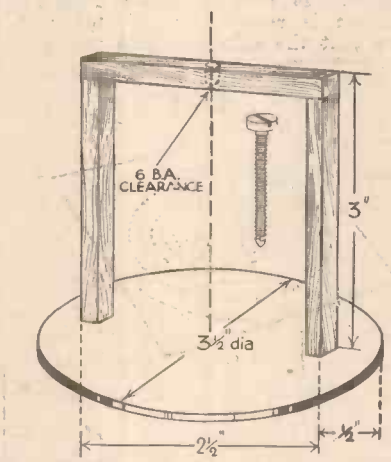



*Fig. 8.—The galvanometer bridge and base.*

## Single Touch Method of Magnetising

The rod, spring strip, or darning needle is laid on a flat wooden surface, and an ordinary bar or horseshoe magnet, which can be purchased for a few pence, is held in the position shown in Fig. 6.

The magnet is drawn from the centre of the needle to the end, care being taken to remove the magnet at the end of each stroke. Repeat this operation several times in the one direction then, turning the magnet and the needle round, so that the other pole makes contact with the centre of the metal, make the same number of strokes as before.

This will produce a north and south seeking pole at the two ends of the needle, and the effectiveness of the operation can be tested by suspending each needle in turn from a long length of silk thread. If they are magnetised they will, of course, come to rest pointing due north and south, irrespective of how much they are spun.

## Coil Formers

The dimensions of these are given in Fig. 7, from which it will be seen that each former consists of three parts—two sides, and a strip for the centre part. The parts are cut from stiff cardboard or, better still, prespahn, about 1/64in. thick.

Mark out the strip first and, where indicated by the dotted lines, mark the material with a knife, taking care not to cut too deeply. A light cut enables a neat right-angle bend to be obtained, and when the strip has been folded to the required shape make a good join by coating the overlap with a quick-drying adhesive. While this is setting, cut out the four cheeks or sides, according to the measurements given in the diagram. One point to watch during these operations is when cutting the centre part out cut along the outside of the marked lines, otherwise the formers will not fit.

When the cheeks are ready, the formers can be fitted into the openings; give the edges a thin smear of adhesive, and make sure that the cheeks are square with the former and parallel with the sides. Leave about 1/32in. of the former projecting through each side, and then run a very small quantity of adhesive right round the narrow ledge so formed, as shown in diagram. The two formers thus made can now be put to one side to dry and harden, while attention is turned to the needles and their suspension.

## Suspending the Needles

The suspension frame is made from ¼in. square beading, and is formed with three pieces cut to the lengths shown in Fig. 8.

See that the ends are square so that a neat flush join is made between the supports and the cross-bar. A hole, large enough to clear a 6 B.A. bolt, is made in the dead centre of the cross-bar. The uprights should be mounted first on the baseboard by means of small panel pins and a touch of adhesive. A small hole must be drilled through each end of the cross-bar to take panel pins for fixing it to the uprights.

The 1-in. 6 B.A. bolt can now be prepared for the suspension adjustment. The end should be filed to form a small hook, as shown in Fig. 8, to enable the silk cord to be held.

The prepared bolt, with a lock-nut fitted, is passed through the hole in the cross-bar, and another nut fitted on the underside.

The pointer should be 2in. long and as thin and light as possible consistent with the required rigidity. A stiff bristle from a carpet broom answers the purpose very well.

A spot of adhesive should be used to hold the pointer and the needles securely in position once they have been adjusted to secure perfect balance. Remember it is vital that the needles are mounted so that a north and south pole are adjacent, otherwise the benefit of the astatic system will be lost. It will be found that ordinary cotton or silk twist has a marked retarding action on the movement of the magnetic system. The finest thing to use is a human hair, and this is what is employed in the instrument illustrated.

A bakelite or stiff cardboard strip ¼in. wide is the next thing to prepare. The size of the holes will depend on the material used for the needles and the pointer.

(*To be continued*)

## REPLIES IN BRIEF

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

**E. J. (Manchester).** You cannot use the tappings, but there is no reason why a bias resistor should not be included in the H.T. negative lead. We cannot give details without circuit information, but the arrangement is quite standard and has been described several times in our pages.

**A. H. (Beckenham).** We have no blue-print of a set on the lines you mention. Have noted your remarks, but chassis construction is always to be preferred—from every point of view. There are several valves of the type you require—Cossor 41 MXP giving 2 watts, 41 MP giving 1,250 milliwatts, 362 type AC.PX.4A giving 2½ watts, etc.

**G. S. (Glasgow).** Long-wave winding consists of three slots each containing 60 turns. At the thirtieth turn in the second slot a tapping loop is made. This point is joined to one switch contact. Yes, ends numbered 3 and 4 are joined in pairs, that is, two 3's together and two 4's together. Medium-wave winding consists of two windings of 30 turns each.

**C. W. (Darnall).** Do not understand your request for details for transformer data for D.C. mains. We know of no use for such apparatus. Transformers for A.C. mains receivers have been described in several back issues.

**G. R. L. (Brixton).** Regret cannot supply wiring diagram for the list of parts you mention. Cannot identify coil from your description.

**A. K. (Egypt).** Probably coil windings are too small, thus preventing the condensers from tuning up to 620 kc/s. Cannot give more detail without coil data. There is a possibility that your set is not sufficiently sensitive to receive the more distant transmission.

**J. F. (Greenhaigh).** You do not state whether you are using batteries or a mains unit for H.T. supply. Set should not motor-boat with batteries unless they are run down. Reversing leads to transformer will not help; decoupling will be necessary for the first two stages. You will probably have to use a Droitwich Rejector or some similar wave-trap device to prevent the long-wave interference.

**L. W. (N.W.1).** You cannot test these parts satisfactorily at home. You can test the electrolytics for shorts and for leakage, but it will not be a reliable test. The rectifier should be returned to the manufacturers for test.

**T. C. R. (N.4).** Coils are inductively coupled. Your idea *re* the binocular choke is worth trying, provided there are sufficient turns on the choke and that you reverse the connections to provide the necessary coupling.

**H. W. (Hornsey).** Regret cannot give details for winding iron-cored coils at home. What iron do you propose to use? Such information is necessary, but we do not think the constructor can purchase the necessary material for the cores.

**B. H. (S.W.18).** Your idea is quite feasible. To reduce amperage on the single valve you must provide artificial load on the secondary transformer winding. You do not give figures. Subtract the amperage of your proposed valve from the total rating of winding, and divide remainder into four (the voltage of the supply). Answer will be resistance of required value in ohms, and this should be of the type capable of carrying the current in question.

**F. C. S. P. (Hoylake).** We would suggest some other factor in your set which is not in order. Valve of lower impedance also passed higher current, and this will reduce inductance of primary. Particular valve you mention exceeded transformer maker's recommendation for current. Remember consequent voltage drop with higher current and increase initial H.T. accordingly.

**G. C. H. (Claverdon).** Droitwich Suppressor will not be effective on the medium-wave band. Separate wave-traps will be required with a switch to change from one to the other. Will bear your suggestion in mind.

**A. B. (S. Africa).** Although the converter will enable you to use the H.T. side of the receiver, there will still be the heater side to be converted. We would suggest rewiring and a rearrangement to enable ordinary indirectly-heated A.C. valves to be used there. A good converter should be quite silent in action, but you may prefer to rewire and redesign the set to use A.C. valves throughout.

**J. L. P. (Kilburn).** We would recommend the H.F. Pen, power-grid detector, and the two 41 M.P.s in push-pull. You may find it desirable to use between the detector and output valves a pair of medium-impedance valves for the necessary phase-reversal for R.C. push-pull working.

**J. W. (Keighley).** You will require a special converter for use with your superhet. If an ordinary converter is used you will probably experience whistles on every station. We would suggest you communicate with the makers of your receiver and obtain their advice regarding the use of such a short-wave device.

**M. J. R. H. (Dagenham).** Regret cannot give details. Would suggest you read various articles we have published on coil design and adhere to a specified arrangement.

**A. C. (Kelvinside).** Resistance of 'phone windings is usually 2,000 or 4,000 ohms each earpiece. Two bobbins to each earpiece is usual, giving 1,000 or 2,000 ohms per bobbin. Higher resistance preferable in the interests of sensitivity.

**E. A. E. (Chadwell Heath).** Cannot understand your remarks. Volume control will not help to separate stations. Do you mean that selectivity requires improvement, or that locals are too loud? Further details are required to give you a definite reply.

**S. A. (Southall).** Regret cannot use the coils in question in the Hall-Mark.

**F. E. P. and I. L. P. (Andover).** Regret cannot understand your query reading "How to make a home broadcasting set microphone piano room L. speaker 2nd Floor." If you can set out your query more explicitly and enclose stamped addressed envelope we may be able to assist you.

**E. L. B. (Teddington).** The Data Sheets are still available at 2d. each, and the binding case at 1s. 6d. The complete set of nineteen sheets in binder may be obtained for 3s. 6d. plus postage.

**R. T. S. (Wendover).** The neon lamp will not operate with the small current you mention. At least 22 m.a. are required.

**R. W. (York).** A length of roughly half the actual wavelength to be transmitted will give the most effective radiation on this particular frequency.

**Y. C. D. (Leighton).** No, it is impossible to convert your balanced-iron armature speaker into a moving-coil speaker.

**G. H. (Worthing).** The field will not be of any use connected in the anode circuit of your output valve. It requires a wattage of at least 10 to be at all sensitive and the anode current of the valve you are using is not more than 5 m.a. The particular speaker will be no more sensitive than a permanent-magnet under these operating conditions.

**P. E. R. (Southend-on-Sea).** Undoubtedly the L.F. transformer is picking up the hum from the mains transformer or choke. Use flexible leads to the transformer and turn it about in all directions until the most hum-free position is found.

**J. T. (Balham).** As we have repeatedly stated, aluminium paint is useless. Try a meter and battery in series across your baseboard and you will find there is no continuity.

**R. W. D. (Cardiff).** Your idea is worth patenting, and we would suggest you take out a provisional specification before offering the idea to any manufacturers.

**K. O. (Blackpool).** We regret we cannot advise the B.B.C. You are either unfortunate, or are using your receiver in the wrong manner, as we have had no similar complaints from any part of the country.

**H. R. (Exeter).** A crystal receiver would not be of much use. A one-valver would provide greater range and would cost very little for maintenance. It would also form the nucleus of a larger set which could be built up slowly without any financial inconvenience.

**A. I. M. (Kensington).** The device was not described by us, and we would advise you to write to the address concerned.

TESTS OF STANDARD RECEIVERS ON OUR AERIAL

# REVIEW OF LATEST RECEIVERS

## THE H.M.V. "FLUID-LIGHT FIVE" MODEL 442 A.C.

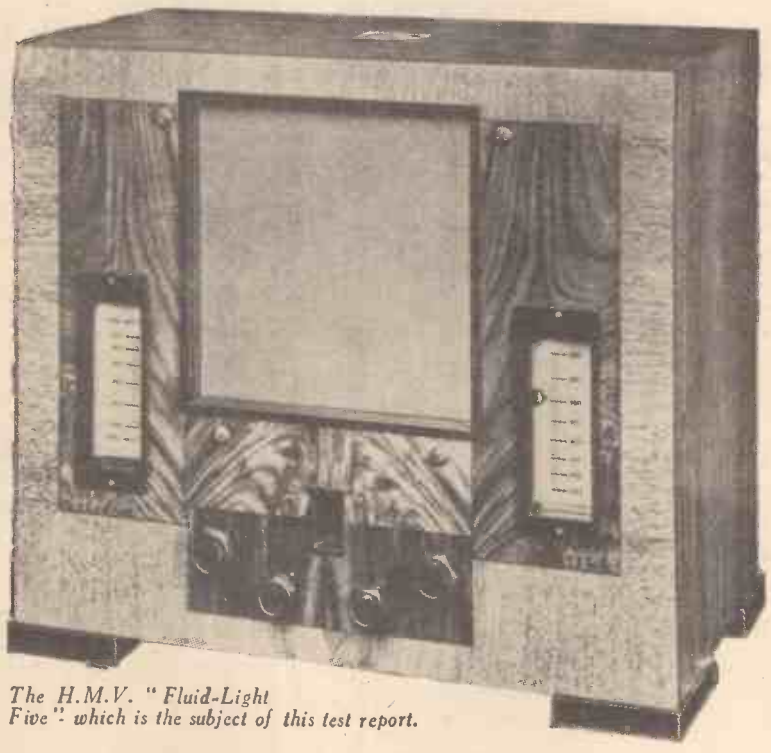
A REMARKABLY efficient, modern, and attractive receiver at a most reasonable price—that is a very brief but accurate description of the H.M.V. "Fluid Light Five" which we have recently had on test over a period of several weeks. That the appearance of the set is neat and dignified can be judged from the illustration on this page, which also shows the simple arrangement of the controls, the excellent disposition of the tuning scales, and the simple, effective design of the speaker opening. One very important detail which is not quite so evident in the picture is the rectangular opening situated centrally between the control knobs, which is the fluid-light tuning indicator. This is a fascinating and valuable device which clearly indicates when the receiver is exactly in tune; this indication is given by a thin column of light which rises and falls according to the strength of the signals being received. Correct tuning is indicated when the column of light rises to its highest point, and when the resonance point is reached extremely high quality of reproduction is assured.

### Fluid-light Tuning Indicator

This ingenious tuning indicator is not merely an appeal to the eye but a practical essential, due to the fact that the receiver incorporates a very effective system of automatic volume control, by means of which all transmissions are reproduced at sensibly the same strength. Of the four control knobs, one is for tuning, another is a volume control, a third is a really satisfactory tone control, and the fourth is a combined on-off wave-change and radio-gram. switch. The volume control serves a dual function, for by pushing in the knob an interference-suppressor device is brought into circuit. The complete assembly, from both mechanical and electrical points of view, can be described as ingenious and thorough.

### Circuit Details

With regard to the circuit, this includes five valves in all, of which one is a full-wave rectifier. Of the other four valves, the first is an MX 40 A.V.C.-controlled heptode frequency changer, the second is a VMS 4B A.V.C.-controlled intermediate-frequency amplifier, the third is an MHD4 diode detector combined with a triode first L.F. amplifier, and the last is a PX4 output valve delivering an undistorted output of no less than 2½ watts. It will be appreciated from this brief description that the superheterodyne circuit employed is of the most modern type, which can be relied upon to provide excellent reception of a large number of transmissions regardless of the type of aerial available.



*The H.M.V. "Fluid-Light Five": which is the subject of this test report.*

### On Test

Immediately we put the receiver on test we had the assurance that it was as good as it looked, and that the performance was quite as high as the excellent specification had led us to believe. Using one of our small aerials (an indoor one consisting of 30 feet of insulated wire running round the laboratory on the second floor), it was almost amazing to note the ease with which station after station could be tuned in on both wavebands, although the test was made in broad daylight. Incidentally, we would point out that the ranges covered are 200-550 metres and 1,000-2,000 metres respectively on the two bands, so that practically every European station is within the tuning range. The fluid-light tuning functioned perfectly, and there was absolutely no difficulty in bringing in a variety of transmissions at full volume and with excellent quality, thanks to the two illuminated and station-calibrated tuning scales. It is a difficult matter to judge the output of a set by ordinary aural means, but it certainly gave the impression of being well over 2 watts, whilst the quality reproduced by the mains-energised moving-coil speaker was as good as we have heard from any receiver costing less than 20 guineas.

### Real A.V.C.

The automatic volume control functioned exactly as it should—not as it very often does with many receivers—with a result that there was only a bare trace of fading on low-power stations which are seldom considered to be of entertainment value. There was no overloading by the London transmitters rather more than twelve miles away, and selectivity was of such a standard that throughout our tests we did not experience the slightest trace of interference or "overlapping."

Later tests were carried out with the receiver fed from a standard outside aerial after dusk, and this proved still more impressive.

As a final test we measured the consumption of the receiver, and found this to work out at rather less than 75 watts—little more than the consumption of a 60-watt lamp. This means that the receiver can be operated for a period of between twelve and fifteen hours for the cost of one unit. Thus, even if current costs as much as 6d. per unit, which is a high rate these days, the set can be operated for less than one halfpenny per hour.

**SPECIFICATION IN BRIEF**

**Circuit:** Four-valve superheterodyne (plus rectifier); heptode frequency changer, variable-mu intermediate-frequency amplifier, diode-triode second detector, super-power output. A.V.C. acting on frequency changer and intermediate-frequency amplifier.

**Loud-speaker:** Mains-energised moving-coil.

**Output:** Two and a half watts undistorted.

**Controls:** Single-knob tuning, volume control with interference suppressor, tone control, combined on-off wave-change and gram. switch.

**Tuning Indicator:** Fluid-light visual indicator.

**Cabinet:** Of selected walnut on ebonised base; specially designed to provide good acoustic properties.

**General:** Provision for connecting pick-up and extra speakers; Separate illuminated wavelength scales for medium and long waves; mains aerial can be used as desired.

**Price:** 13½ guineas or by Hire Purchase.

# 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 CROYDON RADIO SOCIETY

AT a meeting of this society, held on Tuesday, March 19th, in St. Peter's Hall, Ledbury Road, S. Croydon, an interesting talk was given by the hon. librarian, Mr. R. P. Jonas, on "My Quality Receiver." After recalling his pioneer days, he told how the present receiver was evolved with its Hartley-Turner loudspeaker. The permeability tuner was interesting enough, and resulted in frequency and amplification being constant. With regard to the H.F. section, first came an H.F. pentode, followed by a further H.F. stage; two triodes figured separately here. Diode detection was used, and Mr. Jonas insisted on a first L.F. valve with a good five milliamps. The advantages of the paraphrase amplifier were demonstrated in conjunction with this receiver.—Hon. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

### SHORT-WAVE RADIO AND TELEVISION SOCIETY (THORNTON HEATH)

THE weekly meeting of this society was held at St. Paul's Hall, Norfolk Road, on Tuesday, 19th inst., under the chairmanship of Mr. R. E. Dabbs (2BUS). Mr. R. E. G. Copp gave a talk on his four-valve A.C. Short-wave Superhet, which was built on a metal chassis. The first valve was a continental type screen-grid valve which combined the functions of a first detector and oscillator, the aerial being coupled to it aperiodically. This was followed by one I.F. stage, the intermediate frequency being 150 kc. These two stages were directly coupled by means of a condenser. Mr. Copp had found this method preferable to high-frequency transformer coupling. Next followed the second detector, employing the conventional circuit of a leaky grid detector. This was transformer coupled to the output valve, a PM24M, which is a directly heated pentode. The first three valves were of the indirectly heated type.—Hon. Sec., J. T. Webber, 368, Brigstock Road, Thornton Heath.

### INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THE meeting of the London Chapter, held on Friday, March 22nd, was well attended for the "Quality" demonstration given by Mr. P. A. G. H. Voigt, B.Sc., A.M.I.E.E. Mr. Voigt described at length the progress that had been made in perfecting a loud-speaker which would faithfully reproduce the entire band of frequencies. The demonstration of quality reproduction that followed was as near perfect as was ever heard before at these meetings.—A. E. Bear, Secretary, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

### STAFFORD RADIO AND TELEVISION SOCIETY

THE first of a series of lectures "From Microphone to Loud-speaker" was given by F. Sterry and R. J. Billingsby, on Monday, March 18th, at 7.30 p.m. On Wednesday, March 20th, another meeting was held to discuss what type the new apparatus should be, and when it should be installed. On Monday, March 25th, the second lecture in the series, from "Microphone to Loud-speaker," was given. A general meeting was held on Wednesday, March 27th, to elect the committee, and to map out a programme for the present month. Anyone interested is invited to attend. The Society's premises are at the corner of Tixal Road and Dartmouth Street.—Secretary, R. J. Billingsby, 109, St. George's Road, Stafford.

# CATALOGUES RECEIVED

*To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.*

### CONDENSERS AND RESISTANCES

DUBILIER condensers and resistances are well known throughout the world and need but little introduction. They have built up a remarkably sound reputation. The wide range which they maintain for the benefit of their customers is described and illustrated in a twenty-page catalogue, which wireless constructors will be wise to obtain for present and future use. Also included in this catalogue are particulars of motor-radio suppressors, and other anti-interference devices, such as single-stage condenser filters, choke condenser filters, and spark suppressor units.

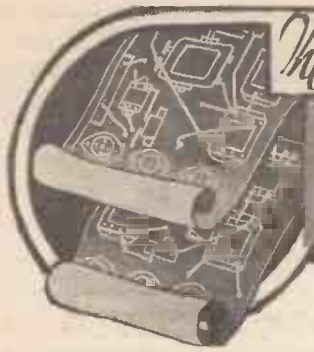
### CELESTION SPEAKERS

WHEN the Celestion firm, as long ago as 1924, first introduced the reinforced-diaphragm speaker they set a standard in loudspeaker reproduction far in advance of set design in those far off days. To-day the quality of radio transmission and reception has reached a very high standard, and every loud-speaker bearing the name Celestion is produced by specialists, and made only of highest-quality materials. The universal transformer, fitted to most models, matches the majority of valves in common use, excepting some outputs, such as Class "B," or Q. P. P., when transformers designed to meet the special conditions are supplied. A leaflet, recently issued, describes and illustrates an interesting range of models from the Model E.5 electro-dynamic "Midget" speaker, priced at only 17s. 6d., to the A. C. antitorium speaker, costing £18 18s. The latter is essentially a speaker for public address, and for operation from high-grade amplifiers. The D.C. speaker of this description is priced at £15 15s. Two of the speakers, P.P.M. 39, and P.P.M. 49, are shown housed in attractive walnut cabinets, the prices being £3 10s. and £4 10s. respectively.

# BOOK RECEIVED

### PIEZO-ELECTRICITY

MANY thousands of pounds have been spent in the last ten years in developing piezo-electric devices. Additional research work is still in progress, and as time goes on new and revolutionary products employing the properties of Rochelle salt crystals will undoubtedly become available. An interesting technical treatise which paves the way to an adequate understanding of the subject on the part of the radio amateur is published by the firm of R. A. Rothermel, under the title of "Piezo-Electricity," the price being 9d. Thanks to the sensitivity of Rochelle salt, quite substantial electrical voltages can be secured in a microphone or pick-up with such minute masses of crystal that inertia effects, and the resonances associated with them, can be confined to the frequency region above the audible range. By their aid Mr. P. Wilson, M.A., technical adviser of *The Gramophone*, has succeeded in obtaining for the first time really natural reproduction of speech. "If there are other methods of achieving this result in equipment of reasonable dimensions," he says, "I can only say that I have yet to come across them—and I have been searching for years." After a brief elaboration of the fact that certain substances when subjected to mechanical strain exhibit voltages on opposing surfaces—the underlying principle of piezo-electric microphones, speakers, and pick-ups—various instruments are dealt with in an interesting and illuminating manner. There is little doubt that piezo-electricity as applied to Rochelle salt is one of the greatest discoveries of the age, and it behoves every true student of sound reproduction to avail himself of the information contained in this book.



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| Nucleon Class B. Four | 6.1.34 | PW34B |
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| A.C. Fury Four Super | 10.2.34 | PW34D |
| Leader Three | 10.3.34 | PW35 |
| D.C. Premier | 31.3.34 | PW35B |
| A.C. Leader | 7.4.34 | PW35C |
| Prima Mains Three | 5.4.34 | PW35D |
| Master Midget Two | 12.5.34 | PW35E |
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| Summit Three | 18.8.34 | PW37 |
| Armada Mains Three | 18.8.34 | PW38 |
| Midget Short-Wave Two | 15.9.34 | PW38A |
| All-Pentode Three | 22.9.34 | PW39 |
| £5 Superhet Three | 27.10.34 | PW40 |
| A.C. £5 Superhet Three | 24.11.34 | PW43 |
| D.C. £5 Superhet Three | 1.12.34 | PW42 |
| Hall-Mark Three | 8.12.34 | PW41 |
| F. J. Camm's Universal £5 Superhet | 15.12.34 | PW44 |
| A.C. Hall-Mark | 26.1.35 | PW45 |
| Battery Hall-Mark 4 | 2.2.35 | PW46 |
| Universal Hall-Mark | 9.2.35 | PW47 |
| Hall-Mark Cadet | 23.3.35 | PW48 |
| F. J. Camm's Silver Souvenir (All Wave Three) | 13.4.35 | PW49 |

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| Four-station Crystal Set | 31.3.34 | AW427 |
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## STRAIGHT SETS. Battery Operated.

**One-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
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| B.B.C. Special One-valver | Out of print | AW387 |
| Twenty-station Loud-speaker One-valver (Class B) | Out of print | AW449 |

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Melody Ranger Two (D, Trans) | Out of print | AW388 |
| Full-volume Two (SG.-Det, Pen) | 17.6.33 | AW392 |
| Iron-core Two (D. Trans) | Out of print | AW395 |
| Iron-core Two (D, QPP) | 12.8.33 | AW396 |
| B.B.C. National Two with Lucerne Coil (D, Trans) | Out of print | AW377A |
| Big-power Melody Two with Lucerne Coil (SG, Trans) | Out of print | AW338A |
| Lucerne Minor (D, Pen) | Out of print | AW426 |
| Family Two (D, Trans) | *Apr.* '32 | WM278 |

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

| | | |
|---|---|---|
| £8 Radiogram (D. RC, Trans) | Out of print | AW343 |
| New Regional Three (D, RC, Trans) | 25.6.32 | AW349 |
| Class-B Three (D, Trans, Class B) | 22.4.33 | AW386 |
| New Britain's Favourite Three (D. Trans, Class B) | 15.7.33 | AW394 |
| Home-built Coil Three (SG, D, Trans) | 14.10.33 | AW404 |
| Fan and Family Three (D, Trans, Class B) | 25.11.33 | AW410 |
| £5 5s. S.G.3 (SG, D, Trans) | 2.12.33 | AW412 |
| 1934 Ether Searcher: Baseboard Model (SG, D, Pen) | 20.1.34 | AW417 |
| 1934 Ether Searcher, Chassis Model (SG, D, Pen) | 3.2.34 | AW419 |
| Lucerne Ranger (SG, D, Trans) | Out of print | AW422 |
| Cossor Melody Maker with Lucerne Coils | Out of print | AW423 |
| P.W.H. Mascot with Lucerne Coils (Det. R.C. Trans) | 17.3.34 | AW337A |
| Mullard Master Three with Lucerne Coils | Out of print | AW424 |
| Pentaquester (HF, Pen, D, Pen) | 14.4.34 | AW431 |
| £5 5s. Three: De-luxe Version (SG, D, Trans) | 19.5.34 | AW435 |
| Lucerne Straight Three (D, RC, Trans) | 9.6.34 | AW437 |
| All-Britain Three (HF Pen, D, Pen) | Out of print | AW448 |
| "Wireless League" Three (HF Pen, D, Pen) | 3.1.34 | AW451 |
| Transportable Three (SG, D, Pen) | *Feb.* '32 | WM271 |
| Multi-Mag Three (D, 2 Trans) | *June* '32 | WM288 |
| Percy Harris Radiogram (HF, D, Trans) | *Aug.* '32 | WM294 |
| £6 6s. Radiogram (D, RC, Trans) | *Apr.* '33 | WM318 |
| Simple-tune Three (SG, D, Pen) | *June* '33 | WM327 |
| Tyers Iron-core Three (SG, D, Pen) | *July* '33 | WM330 |
| C.-B. Three (D, LF, Class B) | Out of print | WM333 |
| Economy-pentode Three (SG, D, Pen) | *Oct.* '33 | WM337 |
| All-wave Three (D, 2LF) | *Jan.* '34 | WM348 |
| "W.M." 1934 Standard Three (SG, D, Pen) | *Feb.* '34 | WM351 |
| £3 3s. Three (SG, D, Trans) | *Mar.* '34 | WM354 |
| Iron-core Band-pass Three (SG, D, QP21) | *June* '34 | WM362 |
| 1935 £6 6s. Battery Three (SG, D, Pen) | *Oct.* '34 | WM371 |
| Graduating to a Low-frequency Stage (D, 2LF) | *Jan.* '35 | WM378 |

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

| | | |
|---|---|---|
| 65/- Four (SG, D, RC, Trans) | Out of print | AW370 |
| "A.W." Ideal Four (2SG, D, Pen) | 16.9.33 | AW402 |
| 2 H.F. Four (2SG, D, Pen) | Out of print | AW421 |
| Crusaders' A.V.C. 4 (2 H.F., D, QP21) | 18.8.34 | AW445 |
| (Pentode and Class-B outputs for above: blueprints 6d. each) | 25.8.34 | AW445A |
| Quadradyne (2SG, D, Pen) | *Feb.* '32 | WM273 |
| Calibrator (SG, D, RC, Trans) | *Oct.* '32 | WM300 |
| Table Quad (SG, D, RC, Trans) | *Nov.* '32 | WM303 |
| Calibrator de Luxe (SG, D, RC, Trans) | *Apr.* '33 | WM316 |
| Self-contained Four (SG, D, LF, Class-B) | *Aug.* '33 | WM331 |
| Lucerne-Straight Four (SG, D, LF, Trans) | *Feb.* '34 | WM350 |
| £5 5s. Battery Four (H.F., D, 2LF) | *Feb.* '35 | WM381 |

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

| | | |
|---|---|---|
| Super-quality Five (2 HF, D, RC, Trans) | *May* '33 | WM320 |
| New Class-B Five (SG, D, LF, Class-B) | *Nov.* '33 | WM340 |
| Class-B Quadradyne (2 SG, D, LF, Class-B) | *Dec.* '33 | WM344 |
| 1935 Super Five (Battery Superhet) | *Jan.* '35 | WM379 |

**Mains Operated.**

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Consoelectric Two (D. Pen) A.C. | 23.9.33 | AW403 |
| Economy A.C. Two (D. Trans) A.C. | *June* '32 | WM286 |

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

| | | |
|---|---|---|
| Home-lover's New All-electric Three (SG, D, Trans) A.C. | 25.3.33 | AW383 |
| S.G. Three (SG, D, Pen) A.C. | 3.6.33 | AW390 |
| A.C. Triodyne (SG, D, Pen) A.C. | 19.8.33 | AW399 |
| A.C. Pentaquester (HF Pen, D, Pen) A.C. | 23.6.34 | AW439 |
| D.C. Calibrator (SG, D, Push-pull, Pen) D.C. | *July* '33 | WM328 |
| Simplicity A.C. Radiogram (SG, D, Pen) A.C. | *Oct.* '33 | WM338 |
| Six-guinea AC/DC Three (HF Pen, D, Trans) A.C./D.C. | *July* '34 | WM364 |
| Mantovani A.C. Three (HF, Pen, D, Pen) A.C. | *Nov.* '34 | WM374 |

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

| | | |
|---|---|---|
| A.C. Melody Ranger (SG, DC, RC Trans) A.C. | Out of print | AW380 |
| AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C. | 8.9.34 | AW446 |
| A.C. Quadradyne (2SG, D, Trans) A.C. | *Apr.* '32 | WM279 |
| All Metal Four (2SG, D, Pen) A.C. | *July* '33 | WM329 |
| "W.M." A.C./D.C. Super Four | *Feb.* '35 | WM382 |

## SUPERHETS.

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

| | | |
|---|---|---|
| 1934 Century Super | 9.12.33 | AW413 |
| Super Senior | *Oct.* '31 | WM256 |
| 1932 Super 60 | *Jan.* '32 | WM269 |
| Q.P.P. Super 60 | *Apr.* '33 | WM319 |
| "W.M." Stenode | *Oct.* '34 | WM373 |
| Modern Super Senior | *Nov.* '34 | WM375 |

**Mains Sets: Blueprints, 1s. 6d. each.**

| | | |
|---|---|---|
| 1934 A.C. Century Super, A.C. | 10.3.34 | AW425 |
| 1932 A.C. Super 60, A.C. | *Feb.* '32 | WM272 |
| Seventy-seven Super A.C. | *Dec.* '32 | WM305 |
| "W.M." D.C. Super D.C. | *May* '33 | WM321 |
| Merrymaker Super A.C. | *Dec.* '33 | WM345 |
| Heptode Super Three, A.C. | *May* '34 | WM359 |
| "W.M." Radiogram Super, A.C. | *July* '34 | WM366 |
| "W.M." Stenode, A.C. | *Sep.* '34 | WM370 |

## PORTABLES.

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

| | | |
|---|---|---|
| General-purpose Portable (SG, D, R.C., Trans) | Out of print | AW351 |
| Midget Class-B Portable (SG, D, LF, Class-B) | 20.5.33 | AW389 |
| Holiday Portable (SG, D, LF, Class B) | 1.7.33 | AW393 |
| Family Portable (HF, D, RC, Trans) | 22.9.34 | AW447 |
| Town and Country Four (SG, D, RC, Trans) | *May* '32 | WM287 |
| Two H.F. Portable (2 SG, D, QP21) | *June* '34 | WM362 |
| Tyers Portable (SG, D, 2 Trans) | *Aug.* '34 | WM363 |

## SHORT-WAVERS. Battery Operated.

**One-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| S.W. One-valve | Out of print | AW329 |
| S.W. One-valve for America | Out of print | AW429 |
| Roma Short-waver | 10.11.34 | AW452 |

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Home-made Coil Two (D, Pen) | 14.7.34 | AW440 |

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

| | | |
|---|---|---|
| World-ranger Short-wave 3 (D, RC, Trans) | Out of print | AW355 |
| Experimenter's 5-metre Set (D, Trans, Super-regea) | 30.6.34 | AW438 |
| Experimenter's Short-waver | *Jan.* 19, 35 | AW463 |
| Short-wave Adapter | *Dec.* 1, '34 | AW456 |
| Superhet. Converter | *Dec.* 1, '34 | AW457 |

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

| | | |
|---|---|---|
| "A.W." Short-wave World Beater (HF Pen, D. RC, Trans) | 2.6.34 | AW436 |
| Empire Short-waver (SG, D, RC, Trans) | *Mar.* '33 | WM318 |

**Superhets: Blueprints, 1s. 6d. each.**

| | | |
|---|---|---|
| Quartz-crystal Super | *Oct.* '34 | WM372 |

**Mains Operated.**

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Two-valve Mains Short-waver (D, Pen) A.C. | 10.11.34 | AW453 |
| "W.M." Band-spread Short-waver (D, Pen) A.C./D.C. | *Aug.* '34 | WM368 |

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

| | | |
|---|---|---|
| Emigrator (SG, D, Pen), A.C. | *Feb.* '34 | WM352 |

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

| | | |
|---|---|---|
| Gold Coaster (SG, D, RC, Trans) A.C. | *Aug.* '32 | WM292 |
| Trickle Charger | *Jan.* 5, '35 | AW462 |

# PRACTICAL LETTERS FROM READERS

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

## Our Helpful Books

SIR,—With regard to T. E. H. Brooker's letter in your March 16th issue, I would like to say how grateful I am for the information you give in reply to same. I am acting as service man for a local firm, and, although I may know a little more than your correspondent, I am occasionally "up against it" when trying to effect repairs. So will your please send me your list of wireless books.—E. R. BENNETT (Wigston).

## A Gibraltar Reader's Appreciation

SIR,—As a reader of your most interesting paper for the past twelve months, I must congratulate you on the excellence of its contents.

It was with great pleasure that I welcomed the amalgamation of PRACTICAL WIRELESS and *Amateur Wireless*.

Having read much about the making of coils, H.F. chokes, condensers, resistances, transformers, etc., in your paper, I must confess that the information has been of great value to me as an electrician. Although I had a knowledge of electricity before reading your paper I did not know much about radio, but after reading your paper for a period of one year I think I doubled my knowledge of electricity, and can now discuss any matter about radio.—JOHN P. GAETTO (Gibraltar).

## From a Scottish(?) Listener

SIR,—About twa years ago a guid fren' o' mine gie me a wee wireless. "Built him wi' them twa han's," as ma fren' tauld me, ye ken? Losh, mon, but I were sae pleased—why, if ma fav'rite mustache Abercrombie, had'a been in moult ye'd ha' seen me a'most smilin'. Roseate days, ye ken. (Ma puir fren' were ta'en awa' in a yellow waggon, that verra same nicht. . . . I can still hear him over my neighbour's loud-speaker—anny nicht. Ye ken the wor-r-rds):—

"Bump along, Yellow Waggon, bump along . . .
Though the door is tied wi' wire
I ken it's strong . . .
Mister lunatic inside
Kens he's goin' for a ride . . .
An' it won't be verra long,
verra lo-ong!"

The fir-r-rst twa years were the worst, I may tell ye. What wi' buyin' a new catwhisker last year, an' ha'in' the "Pirates" roun' las' week—ma puir auld heid! Wireless is a' verra well, ye ken—if your neighbour has a comfortable chair.—JOCK MCSTEINSONG (branches everywhere).

## Back to the Fold!

SIR,—Referring to letters of H. G. Saunders and F. Duncan in the February 23rd issue, I followed this hobby in the U.S.A. up to five or six years ago, till the radio magazines there ran myself, and thousands more, out of the game by devoting themselves excessively to the boosting of elaborate multi-tube high-priced kits, with the result that one could buy a fine factory-made receiver for less than a corresponding type of kit, and devoting too much of their space to highly technical mathematical radio and atomic theory. No doubt both these ideas have a place, but you have a hundred simple minded readers who have to watch their shillings and a thousand who have to watch pennies, to every single one to whom money is no object, or who can follow abstruse mathematical theory. It was accidentally seeing your first combined number on a bookstall and thinking how ideal it was, that got me back to the hobby again.—PHILIP COGAN (Bradford).

## "Of Real Use"

SIR,—I have just received my copy of your "Television and Short-Wave Handbook," and am delighted with it. Although I have not yet read it thoroughly I can tell that it is going to be of real use to me, as your weekly publication is. Although I have always been a regular reader of PRACTICAL WIRELESS, I very foolishly did not take advantage of your first offer, and thank you for repeating it.—FRANCIS J. EADE (Sydenham).

## Visual Tuning Indicators

SIR,—I heartily endorse the remarks of your correspondent, R. I., Oxford, in the March 9th issue, *re* visual tuning scale for attachment to a panel. Do you know of a firm that has yet put one on the market?

My home-constructed set has a slow-motion knob and moving circular bakelite dial. It should not be difficult for a good firm to incorporate a straight line visual indicator scale in a bakelite case for attachment to the spindle of the ordinary .0005 tuning condenser with ordinary spindle or thin slow-motion spindle.—J. W. HUGHES (Llandudno).

[*A description of the Cossor visual tuning indicator was given in* PRACTICAL WIRELESS *dated June 16th, 1934.*—ED.]

CUT THIS OUT EACH WEEK

## Do you know

—THAT the choice of a coupling condenser for an R.C. stage should be made with care in order to guard against the application of a positive potential to the following grid.

—THAT for the above reason mica condensers are to be preferred in this position.

—THAT a fixed potentiometer across the L.T. supply often enables the best working point for the detector valve to be ascertained.

—THAT double earth leads should be avoided in view of difficulties arising from "loops" and similar twin paths for H.F. currents.

—THAT care should be exercised in the placing of resistances dissipating large wattages, in view of the possibility of damage to certain wireless components.

—THAT very heavy gauge flex should be used for wiring the heater circuit of A.C. valves when three or more valves are used.

—THAT novel midget valves are shortly to appear on the market, designed to operate in series from a 2-volt L.T. supply.

*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, *Geo. Newnes, Ltd., 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.*


## A Novel Valve Screen

MANY constructors are aware of the utility of screening which is afforded to the H.F. stage when the valve itself is enclosed in an earthed metal container. Formerly it was the custom to use an aluminium box, which, whilst it was certainly efficient, was inconvenient and clumsy. Then came the coated valve, in which form practically all S.G. and H.F. pentode valves are obtainable to-day. Unfortunately many constructors already possess uncoated valves of the S.G. type and sometimes find it desirable to screen them. Ordinary aluminium paint has many times been suggested by our readers as a contribution to the Wrinkles page, but, as we have repeatedly pointed out, this is ineffective owing to the insulation of the particles of aluminium by the medium from which the paint is constructed. However, Messrs. Colvern have offered a most ingenious solution, and the accompanying illustration will show that a small flexible screen, not unlike a metal gas-mantle, forms the basis of the idea. The screen is made from a double thickness of fine mesh constructed from flat copper strip and it is attached at the upper end to an insulated ring, designed to enable the cap or terminal on top of the valve to protrude for connecting purposes. At the lower end the material is simply folded and a short flexible wire is soldered at one point. The doubled thickness enables the material to be slid over almost any shape of valve and provides a very close grip, whilst at the same time effectively screening the valve. The connection of the short wire to earth completes the screening and in use the device will be found most effective. The price is only 9d., and may be obtained from Messrs. Colvern's London address: 150, King's Cross Road, London, W.C.1.

*A novel screen for unmetallised valves. A new Colvern product.*

## A New Cossor Tuning Indicator

THERE seems to be no end to the ingenious methods of tuning modern radio receivers, and the well-known firm of A. C. Cossor Limited are certainly not backward in this respect, for they have recently brought out an innovation in tuning which goes one point further towards the time when radio sets will tune in a station as soon as they are "*asked.*"

Cossor's latest invention is called "Thermometer" tuning, and the device is, in fact, something like that unpopular medical instrument. Actually there are two "thermometers"—one for the medium and one for the long-wave bands. They are separate and are lighted from within. Station names and wavelengths are marked on the interchangeable dials and, as the tuning knob is rotated, the column in the glass thermometer tube rises and shows immediately the name of the station being received.

The tuning knob is of healthy dimensions and is beautifully geared so that the heaviest hand or the feeblest finger can rotate it with ease. The set, Cossor model 364, is a superhet and gives really outstanding selectivity. The tone, too, is excellent and the price extremely moderate—only eleven guineas (£11.11.0) complete.

## New Drydex Battery

A NEW high-tension battery—the Drydex type H.1116—has just been produced by Exide for use with the Bush S.B.4 receiver. The battery has a maximum voltage of 144 and is not provided with intermediate-voltage tappings. It measures 10 3/16in. by 6⅞in. by 3 3/16in., and is listed at 14s. Although introduced especially for the particular receiver mentioned above, this battery will also prove useful in connection with many other Class B receivers, since it is of the super-capacity type, and capable of delivering the "peak" voltages necessary for sets of that type.


*The Philco set tester.*

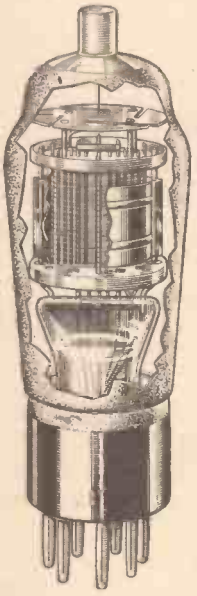


## Improved Philco Set Tester

CONSIDERABLE improvements have now been made in the Philco 048 signal generator set and valve tester, which is now known as Model 048A. The principal improvements include the addition of an ammeter range, so that it is suitable for testing car-radio consumption and so forth. The old meter and voltmeter ranges have been re-allocated from experience gained with the old tester. In addition, the signal generator portion has been redesigned to give even better attenuation and greater battery economy. The whole set has been rehoused in an egg-shell finish mahogany carrying case measuring 11⅛in. by 8 3/16in. by 8in., and is a little lighter than the old tester. The price is still only 12 guineas complete.

## An Octode for Battery Sets

THE Mullard octode has played an important part in improving the efficiency of modern mains superhets. Hitherto, however, valves of this type have only been available in the A.C. and Universal (A.C./D.C.) ranges. It is, therefore, good news that a Mullard octode frequency-changer, suitable for use in battery-operated receivers, has just been released under the type number of F.C.2.



*Showing the electrode construction of the Mullard octode frequency changer, which is a battery-operated valve.*

The filament consumption of the new valve is only 0.125 amp. at 2 volts, and under optimum working conditions the total high-tension consumption is approximately 3 m.A. This low consumption not only assists in the design of really economical battery superhets, but reduces valve noise to a minimum.

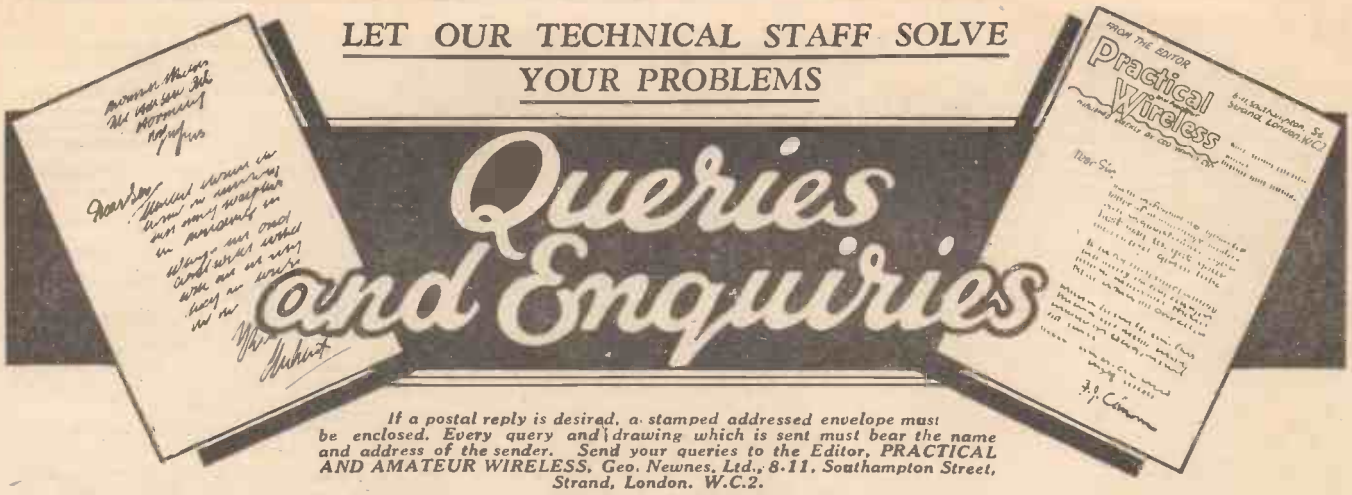
In the accompanying illustration the electrode construction is clearly shown. It will be seen that in addition to the filament and anode there are six grids, one within the other. The filament and the two grids nearest to it operate as the local heterodyne oscillator; the next grid is a high-potential screen. Next comes the control grid, followed by the usual auxiliary grid and suppressor grid, forming a variable-mu pentode mixer.

It should be clearly understood that no external coils are required to couple the oscillator and mixer portions, the coupling being "electronic." This means that the electron stream, in its passage from filament to anode, is first modulated at heterodyne frequency and then at signal frequency, the two frequencies combining to produce the intermediate frequency.

One of the advantages of the Mullard octode is that, owing to the functions of oscillator and mixer being separated by the screen (grid No. 3), A.V.C. can be applied to the pentode mixer portion. The very effective attenuation of 40 dB. can be obtained with a bias of approximately 10 v. applied to the control grid.

The F.C.2 is fitted with the standard seven-pin base, and the control grid is connected to the top cap. It is supplied with metallised bulb only. The list price has been fixed at 18s. 6d.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS




*If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.*

**SPECIAL NOTE**

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

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

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

## AC/DC Two and Pick-Up

**"I wish to add a pick-up to the AC/DC Two published in 'Practical Wireless' on October 7th, 1933. I should be glad if you would indicate the connections and what extra components are needed."—K. E. W. H. (Brighton).**

A bias resistance and by-pass condenser are the only essential extra components, although a change-over switch could be fitted if desired. The pick-up must be joined between the grid of V1 and the earth line, whilst the bias resistance (with the condenser in parallel) must be inserted in the cathode lead of V1. Simply cut the present wire joining cathode to earth and join the ends of the cut to the two terminals on the by-pass condenser. This may be of the ordinary 2mfd. type or one of the larger capacity low-voltage electrolytics. The bias resistance (500 ohms) should be connected across the condenser, and the grid lead (R1) should be removed from its present position and joined between the grid and cathode terminals of V1.

## Not Suitable for Pentode

**"I have a 5-valve portable (H.F., det., and 3 L.F.) and should like to increase the volume by adding a pentode as suggested in your Feb. 23rd issue. The speaker is only a moving iron, so would a pentode work without a tapped transformer? If so, could you tell me of a suitable 2-volt 4-pin pentode?"—W. J. W. (Southampton).**

You must remember that the pentode, generally speaking, will not handle a very large input, although it has a large amplification factor. Consequently, with three L.F. stages you would probably find great difficulty in obtaining distortionless signals, due to overloading of the output valve. Some form of volume control would be required to reduce the input on loud signals, and thus the advantages of the higher amplification would be partly lost. If possible, we would advise the removal of at least one of the L.F. stages if you wish to use a pentode in this particular circuit. Although a moving-iron speaker is in use we would still advise you to use a tapped transformer.

## Picking Up Hum

**"My friend had a 1934 commercial radiogram. He found that if he put an aerial round the floor his set worked well, whereas if he put it round the picture rail there was a continuous hum. Can you give me any possible reason for this?"—R. W. (Bucks).**

The trouble was no doubt due to the fact that some of the house electric wiring was running through the walls near the picture rail, and thus when the aerial was placed in that position hum was induced from the electric wiring. On the floor the aerial was well clear of all wires and thus no hum was experienced. If there is no electric system in your house, it may be found that the adjacent house is so wired and the induction was obtained from this wiring.

## Curing Hum

**"Could you tell me how to reduce mains hum from a 3-valve (plus rect.) A.C. receiver? This has an energised speaker. I believe there is a method, using electrolytic condensers, and if this is so, can you give me the connections, etc., also the correct type of condenser?"—A. D. (Nantwich).**

Although the use of electrolytic condensers for smoothing in the mains unit and for grid bias circuits helps to prevent hum, there is a possibility that in your case the hum is due to the speaker or some other component. It may be necessary to change the position of a transformer or L.F. choke, and therefore we would advise you to read the article "Further Mains Hum Pointers" which appeared in PRACTICAL WIRELESS dated November 24th, 1934.

## C.W. and Scrambled Speech

**"To settle an argument, would you mind telling me the difference (if any) between continuous waves, the so-called scrambled or secret messages, and the ordinary waves? I have always thought that C.W. and scrambled speech were one and the same, and that they are unreadable on an ordinary broadcast receiver. My friend says C.W. is just a technical term for the waves that are receivable on the average type of set. Are not the C.W. of a continuous oscillation which requires a specially designed receiver to break up the oscillations and decipher the speech or morse?"—M. B. (Brighton).**

C.W. transmission consists of morse signals obtained by using an oscillating circuit generating a definite note, and this is interrupted by a morse key to transmit the dots and dashes of the morse code. These signals can be heard on any receiver, if the detector is in an oscillating condition. The received oscillation will be heterodyned and the note of the signal will vary as the tuning of the receiver is altered. This gives a characteristic musical note as a C.W. transmission is tuned in. Scrambled speech is a totally different type of transmission, and although the transmission may be heard on an ordinary receiver in an oscillating condition, the speech will be indistinguishable unless certain circuit arrangements are adopted to unscramble the signal.

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

# Miscellaneous Advertisements

**Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.**

## PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 ma. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each: 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, Class B: D.D. Triodes, 5/-.

THE Following American Types, 4/6: 250, 112, 171, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59; send for catalogue of above types.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliamp-meters, 2½ inch outside diameter 18/6, 3½ inch outside diameter 22/6. Westinghouse Rectifiers for above 12/6 extra.

SPECIAL Offer. Huge Purchase of All-Band 2-gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

U.S.A. Cardboard Electrolytics, 2,000 mf. 12 volts 6/-, 100 mf. 12 volts 1/3.

BLUE SPOT P.M. Speaker, Multi-ratio transformer; Special offer, 16/-.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6; all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M. 7in. cone, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

BLUE SPOT 29 D.C. Moving Coil, with Multi-ratio transformer, 7in. cone, 2,500 and 7,500 ohms, 9/11.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working, 1/-; 15 mf., 100v. working, 1/3.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5, 3/-; Philips 6+4+2+1+1, 4/6.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v. 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4v. 2-4 amp., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps., 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9; 250 milliamps, 30 hys., 20/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt, 10/-.

PREMIER L.T. Charger Kits, consisting of Premier transformers and Westinghouse rectifier, input 200-250v. A.V., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Truspeed Induction Type, A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

*(Continued at top of column three)*


G. Marconi

A.V.C., or to be more correct, automatic gain control, is fairly easily applied to most receivers operating on the broadcasting wavebands. Nor does it present difficulty on short waves, but there are a few points to be watched. We have some notes on the subject and shall be pleased to send them to you.

**WRITE TO THE VALVE DEPARTMENT, MARCONIPHONE COMPANY LIMITED, 210 TOTTENHAM COURT ROAD, LONDON, W.1, MENTIONING THIS PAPER.**

**MARCONI VALVES**

THE CHOICE OF THE EXPERTS

*(Continued from foot of column one)*

EDISON BELL Double Spring Gramophone Motors complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and complete dial 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50v., 1/9; 8 mf., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio, output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

RELIABLE Canned Coils with Circuit, accurately matched, dual range, iron core, 2/11.

UTILITY 3-gang Condenser, 0.0005, fully screened, with trimmers, ball bearing, straight or superhet, 6/9; complete with disc drive, 7/11; the best 3-gang available.

T.C.C. Condensers, 4 mf., 450v. working, 4/-; 4 mf., 750v. working, 6/-.

VARLEY Constant Square Peak Coils, band-pass, type B.P.7, brand new in makers' cartons, with instruction and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron flush mounting, accurate, 0-10, 0-15, 0-50 m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg., 2/-; 5,000, 10,000, 15,000, 100,000, 250,000, with mains switch, 2/-.

U.S.A. Electrolytic Condensers, 550v. peak working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

BRITISH Radiophone 2-gang 0.00016 Short-wave Variables, all brass with steatite insulation, 5/6.

1,000 Ohm 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number .18 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

COSMOCORD Pick-ups with Arm and Volume Control, wonderful value, 10/6.

RELIABLE Smoothing Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 12/6.

PREMIER Combined H.T.8. and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3.5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

PREMIER H.T.11 Transformer, 500 volts, 120 milliamps, rectified output, 4 volts 2 amps., 4 volts 2 amps., 4 volts 3-5 amps, 22/6; with Westinghouse rectifier, 42/6.

THE Following Lines 6d. Each, or 5/- per dozen: 4- or 5-pin baseboard or 4-, 5-, 6- or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp., 2/- or 3-point switches. Cyldon double trimmers, 6 yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9 feet resincored solder, 6 yds. push-back connecting wire.

## PREMIER SUPPLY STORES

(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station: Clapham North Underground.

SOUTHERN RADIO'S WIRELESS BARGAINS:

SPEAKERS.—Blue Spot Permanent Magnet Speakers. Universal Transformers for Power, Super-Power, Pentode or Class B. All brand new 1935 series. Type 99 P.M., 30/-; 45 P.M., 24/-.

ELIMINATORS.—Regentone Eliminators, 1935 Series. Brand new and boxed. Type W.5a for A/C mains, 200/250v. With Trickle Charger for 2, 4 or 6 volt accumulators, 39/6. Type WIa (less Trickle Charger) to carry 30 milliamps, 33/-. Type WIC (less Trickle Charger), 30/-.

CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each, standard full size 0.0005 (not midget). Lotus 3-gang 0.0005, 11/-; 2-Gang 0.0005, 7/3. All Lotus Condensers Brand New. Fully screened with trimmers complete with Dials, escutcheons, etc.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 I.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5 with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New.

PICK-UPS.—Marconi Model K.25, 21/- (List 32/6).

RECEIVERS.—Burgoyne Class "B" Three-Valve Sets, complete with 3 Mullard Valves. Exide Batteries and accumulator. Magnavox Moving Coil Speaker. In modern cabinet beautifully finished in chromium plate. Brand new, £3/18/6.

TELSEN.—3-Valve Battery Sets. Model S93, complete with three Mazda Valves, 30/- (List 75/-). Contained in exquisite Bakelite Cabinet.

MISCELLANEOUS.—Westinghouse Metal Rectifiers, Type H.T.8, 8/9. Bifio Static Cut-outs, definitely eliminate all interference, 2/3. Lewcos Spaghetti Resistances, all capacities, new and boxed, 1/6 per dozen assorted. Telsen short-wave Chokes, H.F. Screened, 1/9. Telsen Binocular H.F. Chokes, 2/-. Telsen ACE L.F. Transformers, 3-1 and 5-1, 2/9. Deemark Dual Range Coils, with circuits, 2/-.

STOCK-TAKING PARCELS.—We have gathered at our Mail Order Dept. a large quantity of odd lines from our various branches. It is impossible to list these articles individually. We are offering them in lots at 5/- per parcel. Each parcel contains components to the value of at least 20/- and include Switches, Fixed Condensers, Transformers, Resistances, etc., etc. Every article is of present day use in Radio. Telsen and Ready Radio Circuits numbering 10 different circuits included in each parcel, 5/- per parcel.

THOUSANDS OF BARGAINS AT OUR VARIOUS BRANCHES.—All Goods guaranteed and sent post paid. Branches at 46, Lisle Street, W.C.2; 271, 275, High Road, Willesden Green, N.W.10. All Mail Orders to: 323, Euston Road, London, N.W.1.

SOUTHERN RADIO, 323, EUSTON ROAD, LONDON, N.W.1. Near Warren Street Tube. 'Phone: Museum 6324.

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UTILITY SALES.—The "FAERITONE" Short Wave TWO with 3 sets of coils ready made 55/-, separate component list of prices with diagram 6d.

REGENTONE W.5.A 200/250 A.Vc. Eliminator with ½ Amp. charger 20 Milliamp 37/6. Ditto TELSEN 28 M/A 39/6.

10,000 NEW DARIO Valves to clear. Detector H.F., L.F. 2/6, power 3/6, S.G., Pen. 5/6. TRIOTRON, all types 3/-, Power 4/-, S.G., Pen. 6/6.

DARIO 4 Volt Valves: Super H.F., Detector, R.C., L.F. 1/3.

CELESTION 45/- list 7in. Permanent Magnet, Universal transformer 17/6, ditto LOTUS 14/6. Cash with order, 24 hours service, carriage paid.

FAERITONE RADIO, Faeritone Corner, 57, Praed Street, London, Paddington 0251.

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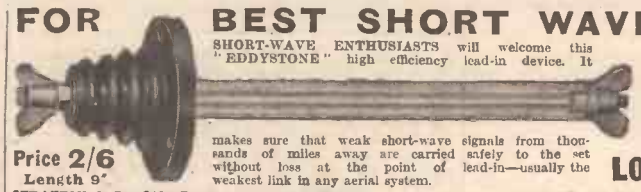

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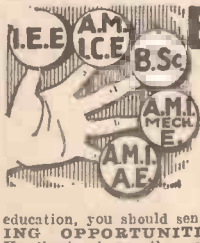


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PRACTICAL AND AMATEUR WIRELESS, 6/4/35.

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# Practical and Amateur Wireless

3D EVERY WEDNESDAY

*Edited by* F. J. CAMM

*A* GEORGE NEWNES *Publication*

Vol. 6. No. 134. April 13th, 1935.

AND AMATEUR TELEVISION


BUILDING

## F. J. Camm's ALL-WAVE SILVER SOUVENIR

# MR. F. J. CAMM'S ALL-WAVE SILVER SOUVENIR

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. VI. No. 134. April 13th, 1935.

# ROUND *the* WORLD *of* WIRELESS

## The Silver Souvenir

**ON other pages of this issue appear full constructional details of Mr. F. J. Camm's All-Wave Silver Souvenir. This is the first all-wave three-valve receiver to be described in these pages and as will be seen from the illustrations, its construction is extremely simple. The results on all wave bands are truly amazing, and stations roll in from almost incredible distances. With the aid of this week's Free Gift Blueprint you will be able to duplicate the same marvellous results as were obtained from the original model. Notice that the Silver Souvenir is constructed from standard components united in an ingenious way into a compact and professional layout.**

## Czech versus Bavarian

IN view of the fact that the Germans are shortly opening a new 5-kilowatt station at Reichenbach, for the purpose of broadcasting to North Bohemian listeners, the Czechs have decided to install a high-power transmitter in the Western part of their country, namely, at Plzen (Pilsen). Pending its installation, it is reported that the old Strasnice (Prague) station may be re-erected temporarily in the neighbourhood of that city.

## Pre-breakfast Comics

TO put the German listeners in good temper for the day, the Berlin studio introduces a lively hour in the early morning to which popular humorists are engaged to contribute. This light programme follows a course of physical exercises and the weather forecast, and is timed to coincide with the listener's first meal, of coffee and rolls.

## More U.S.A. Giants

IN view of the success achieved by the increased power of WLW, Cincinnati, other broadcasting associations have applied for a similar licence. Amongst these is KNX, Hollywood (Cal.), which, if it is conceded, intends to concentrate its transmissions towards the East. Such a step would possibly give European listeners a chance of hearing programmes direct from the Land of (Film) Stars.

## Italy's Radio Network

BOLZANO, which shares the 559.7 metre channel with Wilno (Poland), now relays the Milan-Trieste-Turin programmes. This network also includes Genoa, Florence, and Rome (3). The Rome wireless entertainments, on the other hand, are taken by Turin and Milan (2), Naples, and Bari. Occasionally Palermo (Sicily) is roped in, but as a rule it transmits its own local programmes.

## How Many Hours do You Listen?

IN addition to the time devoted to local programmes, it would be interesting to know how many hours are devoted weekly to listening to Continental programmes. In Denmark, following a plebiscite, the authorities computed that only twenty-five per cent. of the licence-holders restricted themselves to the local station; seventy-five per cent. were found to spend six hours weekly on tuning in foreign transmissions.



## Radio-Tripoli

THE Italian Authorities have been carrying out experiments in the relay of the Rome programmes *via* short-wave channels for the benefit of the white population. In order to encourage listeners, the Italian military posts have been authorised to re-charge accumulators when desired. To permit a regular radio service it is proposed to install a broadcasting station at Benghazi (Cyrenaica), to which the international wavelength of 222.6 metres can be allotted.

## To Encourage Tourists

HITHERTO travellers to France, when possessing portable sets, met with considerable trouble at the Customs. By arrangement with the *Office National du Tourisme* the Authorities have agreed to make a concession to the *bona-fide* tourist. All that is now required is that he should declare the set to the Customs officials on landing, and fill up a few forms.

## Peace, Perfect Peace!

AT Oran, in Algeria, a law was recently passed prohibiting the use of loud-speakers after 10.30 p.m. and before 6 a.m. from April 1 to September 30. Local police regulations also forbid their use during the hot-weather season, namely, June 1 to September 30, between midday and 3 p.m., when the inhabitants enjoy their daily forty—or more!—winks. The same law applies to gramophones at open windows, on balconies, or in gardens where the neighbours' rest is likely to be spoilt. Happy country!

## Increased Power of Spanish Stations

ACCORDING to an official report, pending the reorganisation of the broadcasting network, the Spanish Authorities have permitted four of the stations to work on increased power. They are Barcelona (EAJ1), 7.5 kilowatts; Seville (EAJ5), 410.4 metres (3 kilowatts); Madrid (EAJ7), 274 metres (12 kilowatts), and San Sebastian (EAJ8), 238.5 metres (3 kilowatts). This will facilitate reception of their transmissions in the British Isles.

# ROUND the WORLD of WIRELESS (Continued)

### "The Rio Grande"

CONSTANT LAMBERT'S work for chorus, solo pianoforte, and orchestra, "The Rio Grande," will be broadcast from Belfast on April 12th. E. Godfrey Brown will conduct and Frederick Stone will be the solo pianist.

### "Holiday!"

"HOLIDAY!" is the title of a composite programme for Western listeners which will be given on April 17th. Four or five speakers will come to the microphone to give suggestions for spending Easter Holiday.

### "Week-end out of Doors"

THE first new feature of summer broadcasting in Scotland will be introduced to the microphone on April 18th. "Week-end out of Doors" will consist of information for cyclists, walkers, mountaineers, and anglers, which is likely to make their week-end more profitable and interesting. The feature will be continued throughout the summer months.

### Easter Programme from Morecambe

MORECAMBE is contributing a special Easter programme for Northern listeners on April 17th. This will include a variety relay from the New Winter Gardens, when well-known artists, such as Ella Shields, the male impersonator, will be heard, and a concert party show by the Regional Follies from the Palace Theatre.

### Talk on House Decorating

IN the second of the "Spot of Colour" talks on April 18th, G. H. Matthews, a practical painter and decorator from Leigh, Lancashire, will give his views on colour as applied to domestic interiors.

### "From the London Theatre"

THE programme on April 12th, in the series called "From the London Theatre," will be an excerpt from "Youth at the Helm," which is now playing at the Globe Theatre. Owen Nares and a supporting cast will come to the studio to broadcast a scene from the play for Regional listeners.

### "Thought for To-morrow"

THE Ripe for Development series of talks which have aroused much Midland interest by their outspoken comments on town-planning—or the lack of it—are to be concluded on April 17th, when Geoffrey M. Boumphrey, who has conducted the series, will speak on "Thought for To-morrow."

### Royal Artillery Mounted Band

ON Easter Saturday the Royal Artillery Mounted Band are revisiting Leamington Spa, where they are always popular visitors. Their programme is to be relayed from the Pavilion in the Jephson Gardens. T. J. Hillier will be the conductor. This band was for many years the largest mounted band in the Service.

### Organ Recital from Liverpool

NORTHERN listeners will for the first time hear a broadcast from the organ of the Paramount Theatre, Liverpool, on April 15th. This huge instrument is said to be the largest Compton in the country, and it has, moreover, the new 'cello stops. The organist, F. Rowland Tims, has broadcast before from other places on numerous occasions; he claims that he was the second cinema organist in the country ever to broadcast—this being from the Capitol, in the Haymarket, London.

### "Inquest on Columbine"

THIS is the title of an all-musical play which will be broadcast in the Regional programme on April 17th, and in the National programme on April 18th. The play is based on Compton Mackenzie's "Carnival." The book has been prepared by James Dyrenforth and the music written by Kenneth Leslie-Smith. This team was responsible for "Love Needs a Waltz," "Puritan Lullaby," and "Old Words to New Music," the latter production having since been exported to Radio City, New York, where it created a precedent in America by being broadcast twice on successive days.

### "The Cure"

IN the revue, "The Cure," to be performed for Midland listeners on April 15th, there is a doctor who supplements consultation by prescribing a trip on a yacht (which he owns) and a stay at a Spa (where he and his brother have the chief interests) and does very well out of it. The other characters are two middle-aged and rather cranky patients, and their two young people who, of course, fall in love. Godfrey M. Hayes and F. Keston Clarke are the authors of the revue, while John Morley composed the music. In the cast will be John Bentley, Edith James, Alfred Butler, Doris Nichols, Michael North, Mavis Bennett-Levin, and Helmar Fernback. Martyn C. Webster is producing and H. Foster Clark will conduct the B.B.C. Midland Orchestra.

**INTERESTING AND TOPICAL PARAGRAPHS**

THE YOUNG IDEA

*These youngsters, who are keen radio "fans," are listening to a new Cossor 16-guinea radiogram.*

### Brahms Concert from Landore

A BRAHMS Concert will be relayed from New Siloh Chapel, Landore, on April 16th, for Western listeners, when the artist will be Margaret Tann Williams (contralto) and the Swansea and District Royal Male Choir conducted by Ivor Owen. This choir won the first prize in the chief male voice contest at the Royal National Eisteddfod at Neath in 1934.

### Talks for Welsh Listeners

A NEW series of programmes for Welsh listeners will show in turn a typical day in the lives of Welshmen engaged in various occupations. The first, to be given on April 20th, will deal with the life of a collier. Later programmes will deal with the work of a quarryman, a farmer, a fisherman, and a tin-worker. D. Gwynallt Evans, who has prepared the programme about the collier is already known to listeners as a writer of programmes.

### Another Giant Loud-speaker

SOVIET engineers have designed a new type of loud-speaker to be used in aeroplanes. During recent tests speech and music from this instrument, it is stated, were clearly picked up at a distance of thirty miles! Although the speaker weighs over 2,000 pounds, it has been installed in an army aeroplane and has proved successful.

## SOLVE THIS!

**Problem No. 134.**

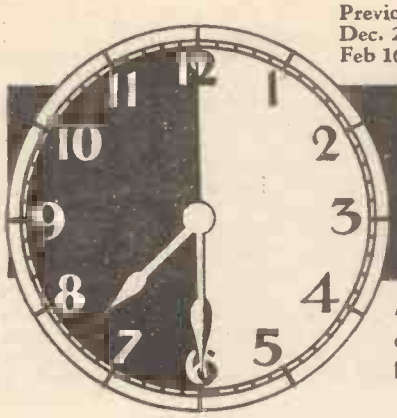
Arthurs had a six-valve A.C. mains superheterodyne, but found that in addition to overpowering signals from the local there was a bad hum. He accordingly removed his outside aerial and fitted an indoor aerial of small dimensions. This cured the trouble from overloading, but hum was still troublesome, and finally he decided that a mains aerial would probably fulfil his needs. He accordingly fitted the usual fixed condenser between aerial and mains leads and this reduced the input sufficiently to give good signals and smooth control of volume, but hum was now intensified. He naturally decided that the hum was being brought through the mains wiring and therefore fitted a noise suppressor to the mains plug. When he switched on, not only was the hum absent, but no signals of any kind could be obtained. What had he overlooked? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes Ltd., 8–11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 134 in the bottom left-hand corner and must be posted to reach this office not later than the first post, Monday, April 15th, 1935.

**Solution to Problem No. 133.**

The accumulator which Atkins had been using was of the thick plate type and had been harshly used. Accordingly the plates were flaking, and when he removed the accumulator for cleaning he turned it about and a large flake dropped between the two plates introducing a short circuit.

The following three readers successfully solved Problem No. 132 and books will be forwarded to them: C. Lewinton, 14, Oakwood Drive, Edgware; G. Ford, 23, Spur Road, Orpington, Kent; J. D. Morris, 17, Lynton Road, Heaton Moor, Stockport.

Previous articles in this series appeared in issues dated Dec. 15th, Dec. 22nd, Dec. 29th, Jan. 5th, Jan. 12th, Jan 19th, Jan. 26th, Feb. 2nd, Feb. 9th, Feb 16th, Feb. 23rd, March 2nd, March 9th, March 16th, and March 30th.



# Half-Hour Experiments

Methods of Comparing the Efficiency of Various Types of Tuning Coil and of Estimating their Selectivity are Explained. Instructions are given for Making the Simple Measuring Equipment Required

IN the previous article of this series it was explained how the wavelengths of stations received could be measured by means of a simple type of wavemeter, and it will be evident that the methods described could be applied in order to find the wavelength range of a tuning coil. But the wavelength range is by no means the only important factor in connection with tuning coils, for the efficiency is the point with which most constructors are more concerned. When we come to consider coil efficiency, however, we soon find that the subject is an involved one, and that direct measurements are by no means easy to take. Then again, there are different kinds of efficiency, of which the dynamic resistance is most often considered.

Rather than attempt to measure dynamic resistance it is more satisfactory, for average requirements, to be satisfied with determining what—for want of a better name—may be called the "goodness factor" of the coil. Here again quantitative measurement is not easy and not generally necessary. If we can make reasonably accurate comparisons between different coils it is possible to secure the information most generally required.

## The "Goodness Factor"

How, then, can we determine the relative goodness factor? Before that question can be answered we must consider what are the principal requirements of a good tuning coil; the first of these is that the highest possible signal voltage must be developed between the ends of the coil, and the second is that the coil should tune sharply.

Fortunately, these two factors are frequently in proportion one to the other, so that a coil which gives the greatest output is also the most selective. Fairly accurate comparisons can thus be made by measuring the voltage developed across different coils when they are tuned to the same wavelength and the input to them remains constant. It is at once apparent that the voltage cannot be measured by the normal type of voltmeter, because the current with which we are dealing is not direct, but alternating at high frequency. For this reason it is necessary to rectify the current in some manner before taking measurements.

## Two Methods

There are two general methods of doing this; one is by the use of a crystal detector or H.F. metal rectifier, and the other is by means of a valve. The former is a rather simpler method, but involves the use of a sensitive galvanometer connected in circuit as shown in Fig. 1. It will be seen here that the circuit is really that of a normal crystal receiver, excepting that the 'phones are replaced by the galvanometer. The detector may be of the crystal type or a Westinghouse style W.X.6 metal rectifier, whilst the galvanometer may be that described in the "Beginner's Supplement" in this and last week's issues. The metal rectifier is certainly to be preferred, because the normal type of crystal detector is subject to wide variations in sensitivity. All coils under test should be fully screened so that signal pick-up can only be obtained on the aerial itself.

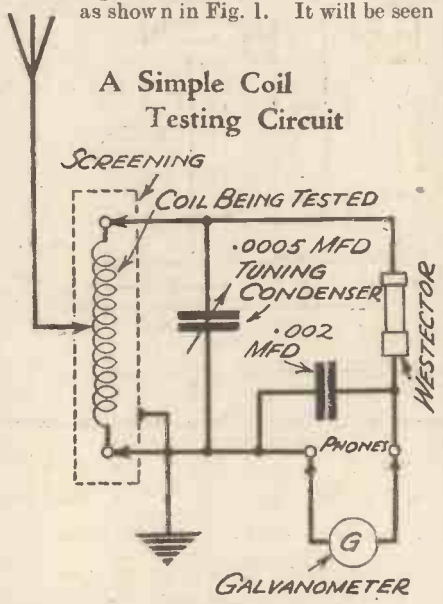



*Fig. 1.—The simple test circuit described, in which an H.F. metal rectifier and galvanometer are connected to the coils to be compared.*

## H.F. Voltage Measurements

The method of testing is first of all to join a pair of 'phones in place of the galvanometer, and then to tune in the local station to the greatest strength. Next connect the galvanometer and note the reading. Try the effect of altering slightly the setting of the tuning condenser so that the highest possible reading is obtained on the meter. After having made an accurate note of the reading the coil in use can be replaced by another and the process repeated. It will be evident that the coil which causes the greatest reading to be shown on the galvanometer is giving the greater output, and it will also be evident that any number of coils may be compared in this manner. It must not always be assumed, however, that the coil which appears to be best by this system of comparison is necessarily the most efficient. This is because there may be a "low" tapping for the aerial on one of the coils, whilst a connection is made directly to the "top" end in the case of another. This point must therefore be borne in mind and, if necessary, the aerial connected to the corresponding terminal in the case of all the coils under test.

The very same method of comparison can be made when it is desired to locate the best aerial tapping point on a coil, for it will often be found that signal strength is increased to an appreciable extent by shifting the aerial tap a few turns "up" or "down" the winding.

It is important that, in taking the various measurements, the signals being received when each coil is in circuit should be of equal intensity. Speech is the most reliable form of transmission for the purpose, but as an alternative the average of a few

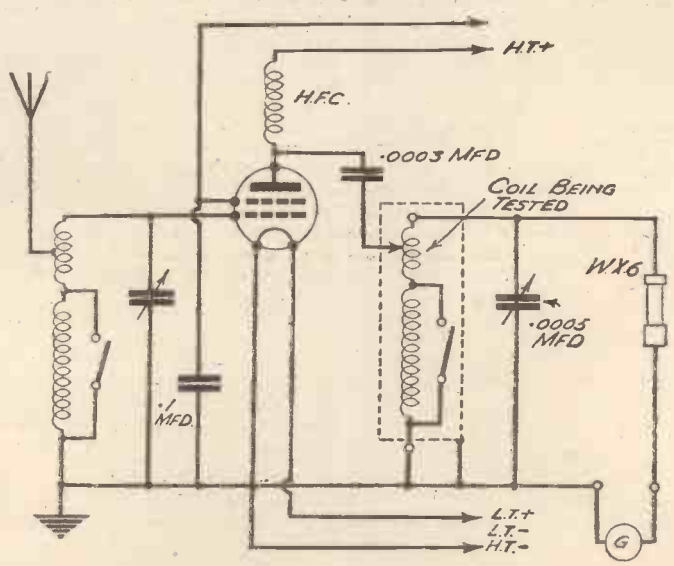



*Fig. 2.—When the receiving aerial is more than ten miles or so from the transmitter it may be necessary to precede the test circuit by an H.F. stage as shown.*

(Continued overleaf)

(Continued from previous page)

measurements taken over several minutes may be used. Yet another alternative is to dispense with the normal type of transmission and employ the "signals" radiated by a buzzer or heterodyne wavemeter, such as was described in the previous article of this series.

### Estimating the Selectivity

The test circuit shown in Fig. 1 can also be used to compare the selectivity of different coils. In this case a note must be made of the dial reading of the tuning condenser when the maximum deflection of the galvanometer reading is shown. Next, the condenser should be turned slowly in an anti-clockwise direction, and a note made of the dial reading when the needle of the galvanometer has returned to zero. Then repeat the test by turning the condenser dial clockwise. By this means the "spread" of the transmission, in terms of degrees on the condenser dial, can be measured. Moreover, the measurement is far more accurate than can be obtained by aural methods, and any number of coils, tapping points, or winding arrangements can be compared.

It is probable that, in many instances, the galvanometer deflection will be so small that it cannot easily be read. This will certainly be the case when the aerial is situated more than ten miles or so from the transmitter, and it will then be desirable either to precede the crystal circuit with an H.F. valve, as shown in Fig. 2, or to use the valve-voltmeter arrangement illustrated in Fig. 3. The circuit shown in Fig. 2 can easily be arranged by making use of an existing receiver and simply replacing the detector and L.F. portions by the meter circuit.

### The Valve Voltmeter

The valve voltmeter shown in Fig. 3 is a standard arrangement which is often used for accurate work. For certain purposes it must be calibrated—and that is not a simple matter without the use of intricate laboratory apparatus—but this is quite unnecessary for our present requirements. It can be seen that the valve is wired as an anode-bend detector, grid bias being applied through the tuning coil. The actual bias and H.T. voltage to be used are dependent upon the particular type of valve, but assuming the use of an H.F. or R.C. valve, voltages of 1½ to 3, and 80 to 100 respectively will be found suitable. The idea is that the valve is biased back to the bottom of its characteristic curve, so that it passes only about .3 milliamp. When a signal is applied to the grid, through the tuning coil under test, the current will rise due to the grid being made less negative. The increase in anode current is proportional to the strength of the signal (or, more correctly, to the signal voltage) applied to the grid, so that the increase in anode current is a measure of the signal voltage passed on to the valve.

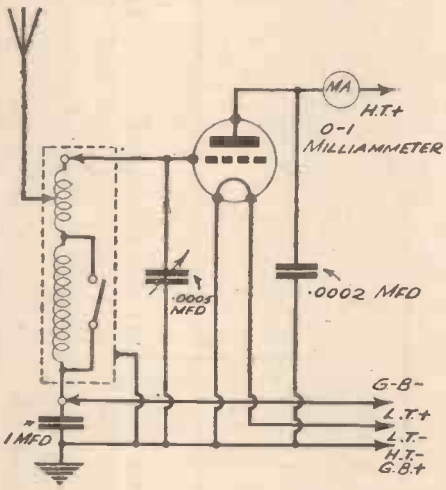



*Fig. 3.—The circuit of the valve voltmeter described.*

The same general methods of comparison will be used as explained in connection with the crystal or H.F. metal-rectifier circuit, and the coils are compared in the same manner. As the increase in anode current will be comparatively small unless the test is carried out very near to a transmitting station, the milliammeter used in the anode circuit should be a delicate one, reading up to a maximum of 1 milliamp. The test would not be impossible if the meter gave a maximum reading in excess of this, but it would be rendered far more difficult and less accurate. When a suitable milliammeter is not available, the galvanometer mentioned above may be used in its place, since this is a very delicate instrument. It is interesting to mention in passing that the circuit shown might be used in place of the normal detector circuit, being followed by the usual L.F. stages, when the meter would serve as a simple and reliable visual tuning indicator.

It is also worthy of note that the valve voltmeter could be used as the second detector of a superheterodyne, when the efficiencies of various intermediate-frequency transformers could be compared. When used in this manner the meter would also register the increase or decrease in efficiency of the set as a whole, which may be brought about by making alterations to any pre-second-detector circuit.

# GUIDING AIRCRAFT IN FOGGY WEATHER

**An Interesting Description of a New Wireless Beacon to be Installed at Liverpool Aerodrome.**

SPEKE Aerodrome, Liverpool, is to be fitted with the latest type of wireless approach beacon to assist aeroplane pilots entering the airport in bad weather. The installation of the beacon equipment will be carried out by the Marconi Company, to the order of the Liverpool Corporation.

The main approach beacon is of the aural type, and will operate on a medium wavelength so that any aircraft fitted with a normal type of aircraft receiving apparatus will be able to use its service. In addition to the main beacon, there will be two "marker" beacons which will indicate to the pilot when flying along the correct line of approach, first, when he is at a distance of three miles from the aerodrome and, second, when he passes over the boundary of the aerodrome.

### How the System Works

The approach beacon constitutes a method of indicating by wireless the best route into the aerodrome, providing a sort of invisible causeway that can be followed by the pilot even when the signs and landmarks that he normally uses are invisible through fog, heavy rain, or low cloud.

This is done by arranging the transmitter to send out a series of distinctive signals directed alternately to each side of the course. At Speke, the beacon will transmit a series of morse dots to one side and a series of dashes to the other. The transmitter will be timed so that the dots on the one side occur exactly during the silence periods between the dashes on the other side. In this way, an aeroplane flying on the correct course will receive the dot and the dash at equal strength and, owing to the timed alternate transmission, it will sound as one continuous signal.

If the aeroplane were to deviate to right or to left from this course either the dots or the dashes would be received at greater strength. This provides an indication to the pilot that he is off course, and also to which side he has deviated.

It fortunately happens that in the case of Speke the best approach course is in a line with the Manchester aerodrome at Barton Moss. As Barton Moss is equipped with Marconi direction-finding apparatus, this means that if a Liverpool-bound aeroplane were lost in fog at some distance from Speke, out of range of the approach beacon, it could be guided by the direction-finder at Barton Moss directly on to its course for Liverpool by taking a series of bearings, and informing the pilot of his whereabouts and direction.

The approach beacon at Speke is not intended to have a long range, as direction-finding facilities of this kind are available, but it is specifically for the purpose of bringing aircraft straight into the airport on the best course. The purpose of the first marker beacon, at three miles from the aerodrome on this course, is to warn the pilot that it is time to begin losing height, while the second informs him that he has passed the boundary of the aerodrome and is actually over the landing field. These marker beacons will be audible to the pilot without retuning his receiver as he passes over them, and each marker will have its own distinctive and easily recognisable signal.

### The Equipment

The main beacon transmitter at Speke will be a compact apparatus contained in a metal-screened cabinet and operated direct from the local electric supply. Its aerial system will be low and unobtrusive, not exceeding a height of 20ft.

Both the approach beacon and the marker beacons will be remotely controlled from the control tower on the aerodrome so that they can be immediately switched into operation when required. When the beacons are switched on by remote control, lamps will light up in the control tower to indicate that they are actually radiating. They will work on a wavelength, to be selected, between 820 and 900 metres, and the main beacon will be crystal controlled to ensure absolute constancy of the emitted wavelength.

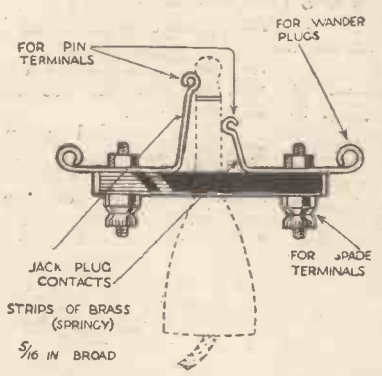
As a final refinement the main beacon is arranged so that it can be used by the Control Office as a telephone or telegraph transmitter in case of emergency. Its use in this way will, however, be restricted to cases when urgent and very important messages can only be passed to approaching aircraft by this means.

# A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

## A Switch Terminal Block

HAVING had occasion to try out several loud-speakers recently, I was annoyed to find that different types of terminals, including a jack plug, were fixed at the extremities of the leads. To enable



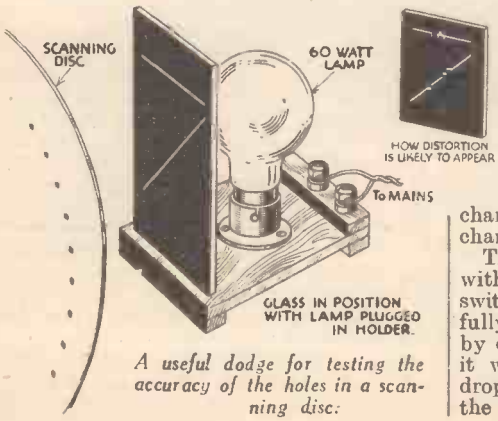

*A neat jack plug switching arrangement for alternative speakers.*

fairly quick change to be made from one speaker to the other, I improvised a terminal block from two springy pieces of brass, a piece of ebonite, and two screw terminals. The enclosed sketch shows the arrangement quite clearly.—F. W. RITCHIE (Macduff).

## Testing a Scanning Disc

AFTER spending a considerable time in marking out and perforating a scanning disc, there is always an uneasy feeling that it may not be correct, and may cause distortion of the image.

Here is a simple way of testing out the disc before the visor is tested on a transmission. First, obtain a piece of ordinary sheet glass about 6in. by 6in. square, and coat it on one side with Indian ink, so that no trace of light is allowed to pass through. Now without scratching the rest of the surface score through the coating of ink a neat, clear line about $^1/_{32}$in. wide at an angle of 45°, and also another the same width horizontally.



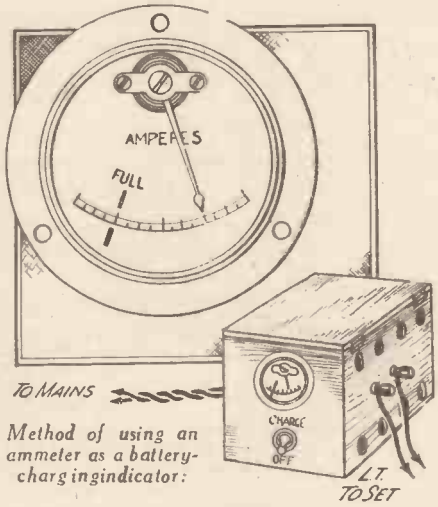

*A useful dodge for testing the accuracy of the holes in a scanning disc.*

### 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., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

Now place the glass upright between the disc and the lamp socket, and plug a 60-watt lamp in the holder in place of the neon lamp, and connect to the mains.

Start the motor up and run it at the correct speed, namely, 750 revolutions, and examine the built-up image on the screen. If there is any defect in the setting out of the holes on the disc, it will become apparent immediately by the distortion caused by it. It is a very simple matter to trace the offending holes, and to correct them.—A. E. RUSHTON (Birmingham).




*Method of using an ammeter as a battery-charging indicator.*

## A Battery-charging Indicator

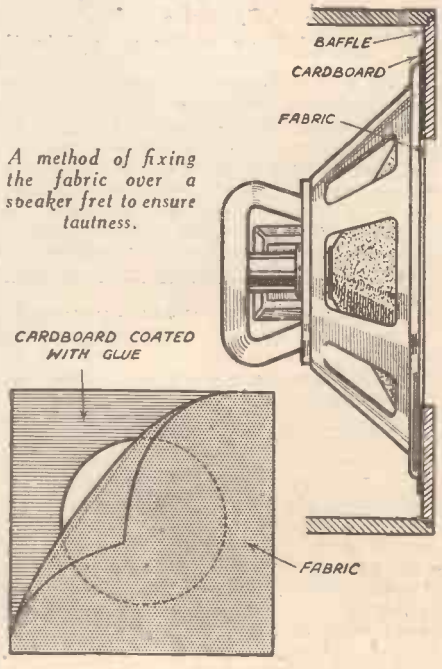
WITH modern, low-filament-consumption battery valves, the strain on the accumulator is quite small, and even a trickle charger can overcharge the battery after a short period. If you have an old ammeter handy, you can easily make an indicator to tell when the battery is fully charged, thus preventing excessive overcharging.

The ammeter is simply wired in series with the charging leads, and the unit switched on. When the accumulator is fully charged (test with a voltmeter, and by observing the gassing in this instance) it will be found that the amperage has dropped below the starting figure owing to the reduction in the difference between the accumulator and the charger voltage. The ammeter reading should then be recorded, either on the dial or on the glass, by any easily-read mark. The meter can be mounted in any easily-observed position, and will serve as a definite indicator of when the accumulator is fully charged.

A voltmeter could be used across the accumulator, but as it is utilised for many other measurements, it could not be wired permanently into position, whereas an ammeter (as distinct from a milliammeter) has no great utility in the average battery set. Trickle-charged accumulators are usually placed out of sight in the cabinet or a cupboard, so that it is usually difficult to observe visually whether they are charged. For neatness, the accumulator, trickle charger, meter, and switch could all be mounted in one box, as shown.—E. PARKER (London, S.E.).

## Fixing L.S. Fret Fabric

WHEN backing the fret of a loud-speaker cabinet, one often experiences difficulty in getting the fabric taut or flat, or the pattern arranged properly. To overcome this, I hit on the following idea. Cut a piece of cardboard to cover the aperture in the speaker cabinet, and




*A method of fixing the fabric over a speaker fret to ensure tautness.*

then cut a hole in the centre the same size as the diameter of the speaker cone. On the cardboard glue the fabric with the pattern arranged as desired. Place the cardboard with the fabric side against the back of the baffle, and then screw the speaker in place. This idea enables the fabric to be fixed behind the fret without wrinkles or creases—G. A. WREN (Deptford).

# The Plus-1 Unit

A Novelty which will Appeal to Every Battery-set User. A simple L.F. Stage Added to any Receiver Without Alteration in Order to Obtain More Volume when Occasion Demands

By W. J. DELANEY

NO matter what type of receiver a listener uses it will always be found that there are two or three stations which are just out of range. Whilst tuning round the dial during the evening a station will be heard very faintly, and the item which is being broadcast is one which you particularly like. No matter how you juggle with the reaction control, or adjust the remaining controls on the receiver, you simply cannot get it loud enough to enjoy the item. On such occasions an additional L.F. stage would prove invaluable, but, unfortunately, it is generally found that the volume normally obtainable on the receiver is ample, and the additional maintenance costs of a further stage do not seem justified. For such occasions the neat little device described in this article will be found of extreme value, as it is small, and may be tucked away in the receiver or with the batteries; it costs very little to construct; it may be added to any battery-operated receiver in less than a minute, and when not required it may be removed just as quickly, and the set returned to its normal condition without the necessity for breaking or disconnecting a single wire in the receiver.

## A Simple R.C. Stage

In Fig. 1 the circuit employed in this unit is given. No illustrations of an actual unit are reproduced, however, as the final arrangement of the parts will have to be undertaken according to the design of the receiver in use. However, two types are shown in Figs. 2 and 3, the former showing all the parts arranged on a simple flat strip of ebonite or plywood, and the second a "built-up" arrangement for use in a receiver which is too compact to enable the first model to be accommodated.

Referring again to the circuit, it will be seen that ordinary resistance-capacity coupling is employed, and that a plug-adapter is used for connection purposes. The grid and filament pins of this adapter are joined to the first valve in the circuit, but the anode is joined to the anode of the *second* valve.

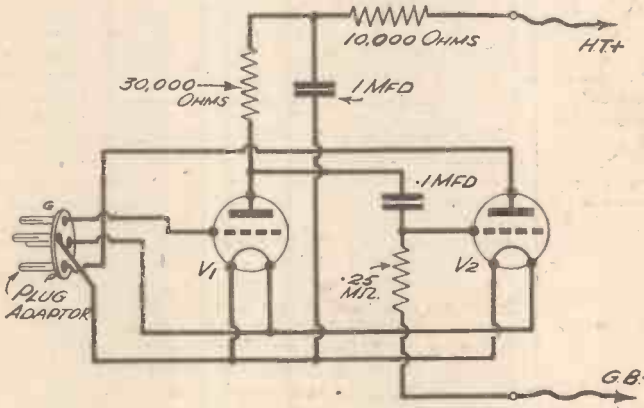



*Fig. 1.—Theoretical circuit of the Plus-1 unit.*

## How It Works

If now we take out the last valve in our receiver, and in its place we plug the adapter of this unit, the grid connection and any biasing circuit will be completed for the first valve of the unit. Thus the first valve in the unit now becomes the last valve in our receiver, but the second valve will feed the loud-speaker circuit. Alternatively, it may be found preferable to remove the first L.F. stage and to insert the adapter there. In this case the anode components of the first L.F. stage will then be fed from the second valve in the unit, and thus to use this useful device it only becomes necessary to purchase a valve of the L.F. type, and then to insert it in the *first* socket of the unit. When required, remove the valve from your receiver, plug it into the second socket of the unit, plug the adapter into the empty valve-holder in your receiver, connect the flexible H.T. and G.B. leads to appropriate tappings and the receiver is immediately one stage more powerful.

## Constructing the Unit

Before commencing to make this valuable accessory it is necessary to decide in which stage you are going to include it. The output stage is preferable in view of the normal biasing requirements in that stage, and the least distortion will be incurred when adding the unit, without any modification of the biasing arrangements already existing. Next, take a piece of stiff card and on it sketch the actual size of the two valve-holders and the plug. The latter is the lower portion of the base of an old valve, sawn off as thin as possible in order to avoid undue height in the complete unit. If you think space will permit, use the arrangement shown in Fig. 2. Try your piece of card and see if it will go into the receiver without fouling any other component. If not, plot a construction similar to Fig. 3, taking great care to choose suitable angles for the side pieces so that the valves will easily clear all other parts. It may not, of course, be possible to arrange the plug in a symmetrical manner, and the unit may have to go into your receiver at an angle. This does not matter, but it is necessary before undertaking the actual building of the unit to be quite certain that it will go into the set without any difficulty.

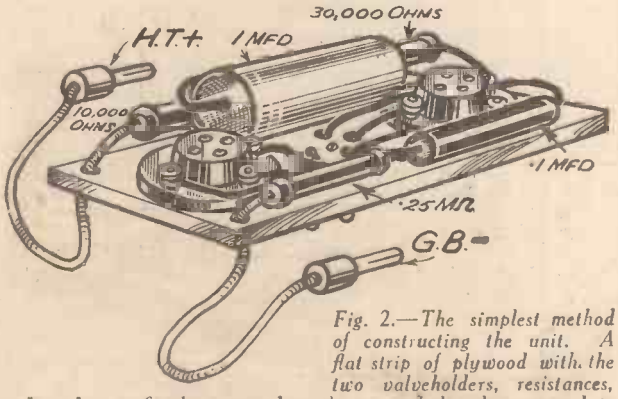



*Fig. 2.—The simplest method of constructing the unit. A flat strip of plywood with the two valveholders, resistances, and condensers firmly mounted on the top and the plug screwed to the underside.*

Having decided upon the type of unit for your particular layout the next thing is to screw the plug to the underside, and to drill holes corresponding to the grid, filament and anode pins. Subsequently, connecting wires may be passed down the holes and soldered at the tips of the pins in the same manner as the normal electrode connections in a standard valve. Now screw on the two valve-holders.

## Wiring Up

There is now one further point to be considered before wiring is commenced. Examine the filament wiring of your receiver and note which filament leg is joined to the earth terminal. This point is essential, as there is a decoupling condenser in the unit, and this must be joined to the filament wire which is subsequently earthed. Having traced the wire, mark the corresponding pin on the plug in your unit, and then mount the two fixed condensers, with the 1 mfd. condenser on the side of the unit adjacent to the earthed filament wiring. The remainder of the construction is quite straightforward, and the condensers and resistances are held in position by their wire ends. To avoid damage, however, the two flexible battery leads are preferably passed through holes in the unit and a knot tied on the underside. This will prevent the two resistances from being pulled about and probably causing a short-circuit.

The values chosen for the anode resistance and decoupling resistance should be quite suitable for all normal receivers, and it is, of course, quite permissible to modify these if the particular valves you are using demand it. Unless you understand the manner of working out anode resistances and voltage drop, etc., it is safer to adhere to the values given. The plug marked

(Continued on page 132)

**LIST OF COMPONENTS FOR THE PLUS-1 UNIT**

Two baseboard-mounting valve-holders.
One tubular 1 mfd. condenser.
One tubular .1 mfd. condenser.
One 30,000 wire-end resistance.
One 10,000 wire-end resistance.
One 250,000 wire-end resistance.
One plug (see text).

# THE GUINEA TWO-VALVER

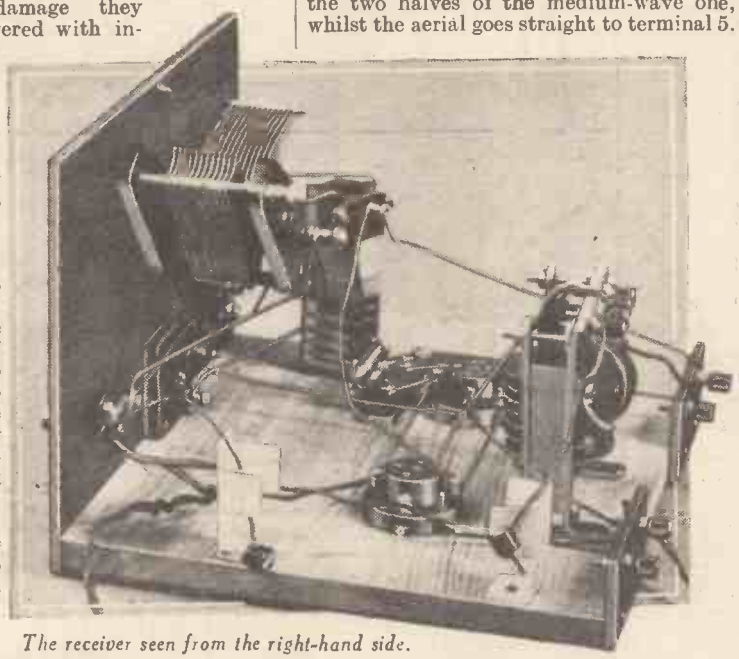
In This Concluding Article Further Constructional Details are Given of This Economical and Efficient Receiver

(*Continued from Page 68, April 6th Issue*)

ON completion of the winding the wire is cut off, a second piece of flex soldered on and taken once or twice round the spool; it should also be held in position by binding with thin string or insulation tape. This end of the winding will be called "O.P." (outside primary) and should be suitably marked. The secondary winding can be put on in exactly the same manner, but it will consist of 20,000 turns and will fill the remaining four slots. Mark the beginning and end "I.S." and "O.S." respectively to assist in future identification. To protect the windings from damage they should be covered with insulation tape or empire cloth.

### Core Clamps

The four core clamps must be made next and particulars of these are also given in Fig. 3. They are made from lengths of mild steel hoop and drilled to receive the four assembly bolts. The terminal block should be prepared according to the particulars shown in Fig. 3.



*The receiver seen from the right-hand side.*

### Assembling the L.-F. Transformer

Finally, the core, which consists of "T" and "U" shaped stampings, can be inserted into the wound spool. Start by putting in a "T" and then a "U" piece from one side, do the same from the other side, and repeat the process until the spool is quite full. It will be found that one side of each metal stamping is covered with insulation, and the insulated sides of all stampings must face in the same direction.

The core clamps and terminal block can now be fitted and the leads passed through short lengths of systoflex sleeving and soldered to the terminals. Do not forget to mark the terminals to correspond with the leads connected to them.

### The Transformer Ratio

The transformer described has a step-up ratio of only 2 : 1, but is nevertheless very efficient, due to the comparatively high primary inductance, and any slight loss in amplification is amply compensated for by the pentode output valve. Actually, of course, a higher ratio could have been provided, but that would have entailed the use of thinner wire—which is extremely difficult to handle—or a sacrifice in the size of the primary. The latter would have had an adverse effect on the quality of reproduction by causing attenuation of the lower notes.

### The Circuit

Having made the three principal components you will be ready to proceed with the construction of the receiver itself. Before dealing with this part of the work, however, let us quickly run over the circuit diagram shown in Fig. 4 and study its main features. The circuit represents a fairly simple detector-pentode arrangement, and the only unusual part is the tuner. As mentioned previously, this is so designed that the aerial is connected to a centre tapping whether receiving on either long or medium waves. It can be seen that when set for long waves (switch contacts open) the long-wave winding is connected between the two halves of the medium-wave one, whilst the aerial goes straight to terminal 5. When the switch is closed, however, the long-wave portion is short-circuited and the aerial connected to terminal 4, which now forms the centre tapping for the medium wave coil. Reaction is on conventional lines, being controlled by a .0003 mfd. differential condenser; this method ensures that tuning is very little affected by reaction adjustments. Grid leak rectification is used, the grid condenser and leak having the fairly usual values of .0001 mfd. and 1 megohm respectively. The detector valve is coupled directly to the pentode output stage through the low-frequency transformer and receives its high-tension supply from tapping "H.T.+1." By using a separate H.T. tapping for the detector there is no necessity to use a decoupling resistance and condenser. The loud-speaker is connected directly in the anode circuit of the pentode, which obtains its high-tension supply from tapping "H.T.+." When using the loud-speaker specified it is not found necessary to include any tone-compensating device, but with other speakers it might be desirable to connect a 20,000-ohm resistance and .01 mfd. condenser in series across the loud-speaker terminals; these latter components will only be required if it is found that the tone is somewhat high pitched.

*Many of the components are home-made.*

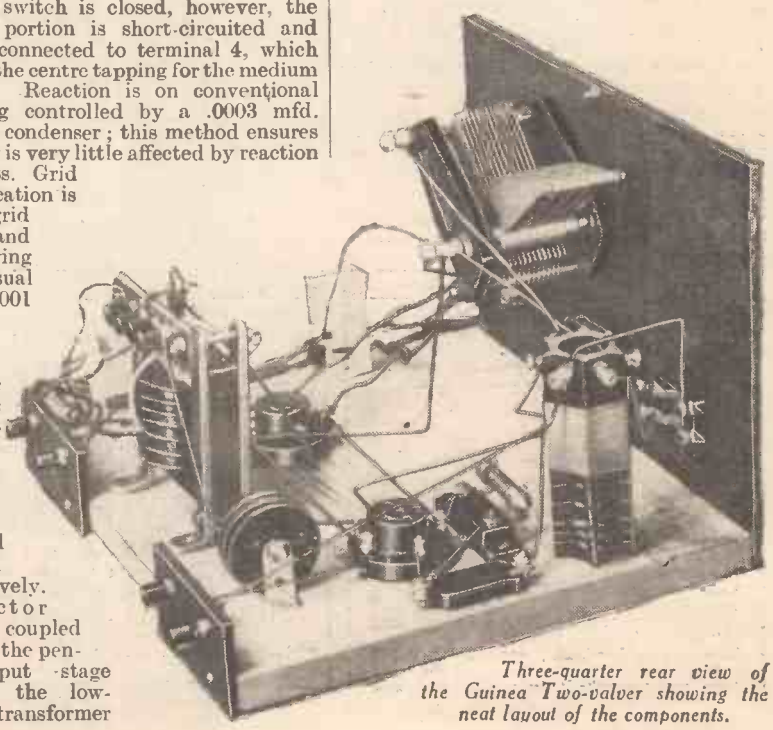
### Components

A list of components is reproduced on page 104, and although this does not give the names of the parts actually employed for the set illustrated it is not by any means essential that special makes should be used; if you have any components of similar values on hand they will be quite satisfactory irrespective of the particular make.

### Making the Set

The constructional work is particularly straightforward and can easily be carried out if reference is made to the wiring plan overleaf and to the various photographs. Start by preparing the panel and baseboard, drilling the former. After the holes have been made, the panel can, of course, be stained and polished to choice. Next attach it to the baseboard and mount the various components. The only comment required is in respect to the tuner, which is attached to the baseboard by fitting it over a short length of wooden rod 13/16in. in diameter.

(*Continued overleaf*)



*Three-quarter rear view of the Guinea Two-valver showing the neat layout of the components.*

(Continued from previous page)

## Wiring

All the principal connections are made in Glazite connecting wire, but, if preferred, ordinary bare tinned copper wire could be used instead. The connections are clearly shown on this page so no further explanation will be necessary in this respect. The battery leads are made in flex and should be of such a length that they will easily reach the batteries. A short length of flex is fastened to the "L.S. +" terminal and is used for making connection with the "priming grid" terminal on the side of the pentode valve base.

## Connecting Up and Using

When the set is complete you will be ready for connecting up the batteries, etc. and giving it a preliminary trial. Put the P.M.2D.X. valve in the left-hand holder and the pentode in the right-hand one, not forgetting to attach the flexible lead to the pentode side terminal. Attach the spade terminals to the low-tension accumulator, put the "H.T.—" plug into the negative high-tension socket, plug "H.T.+" into the 99-volt socket and "H.T.+1" into the 66-volt one. Of the grid bias plugs, the positive will go into the "+" socket of the battery and the negative one into the 4.5-volt socket. Connect aerial, earth, and loud-speaker and switch on by turning the right-hand switch in a clockwise direction. For medium waves, the left-hand switch will point "straight up" and for long waves it should be turned to the left. Turn the reaction condenser "full out" (anti-clockwise) and slowly rotate the tuning dial until a station is heard; next increase reaction to bring it up to full strength and make any necessary slight adjustment to the tuning condenser. This set, like all other detector L.F. receivers, will cause interference if allowed to oscillate, and consequently, the reaction condenser should be slacked off immediately there is any sign of a whistle. Incidentally, there is no reason why the set should be allowed to oscillate, since a slight breathing sound always indicates that it is just off the point of oscillation and, be it noted, in its most sensitive condition.

## Different Voltages

Once you have tuned in the local stations and found that the set behaves properly, you should try the effect of different H.T. and G.B. voltages; start by trying plug "H.T.+1" in sockets giving voltages a little higher and a little lower than that mentioned above. The aim should be to find a voltage at which the set goes into and comes out of oscillation perfectly smoothly and without any sign of a "plop" or "click." To avoid causing any interference whilst making these tests, the set should be tuned away from any transmission. Having found the best high-tension voltage, you can try altering the "G.B.—" tapping; try it first of all in the 6-volt socket and later in the 3-volt one, not forgetting to switch off the set each time a voltage adjustment is made. It will be found, in all probability, that the original voltage is best, but in any case you should always employ the highest G.B. voltage with which good results can be obtained, for by so doing you will reduce the consumption of H.T. current and thus prolong the life of the high-tension battery.

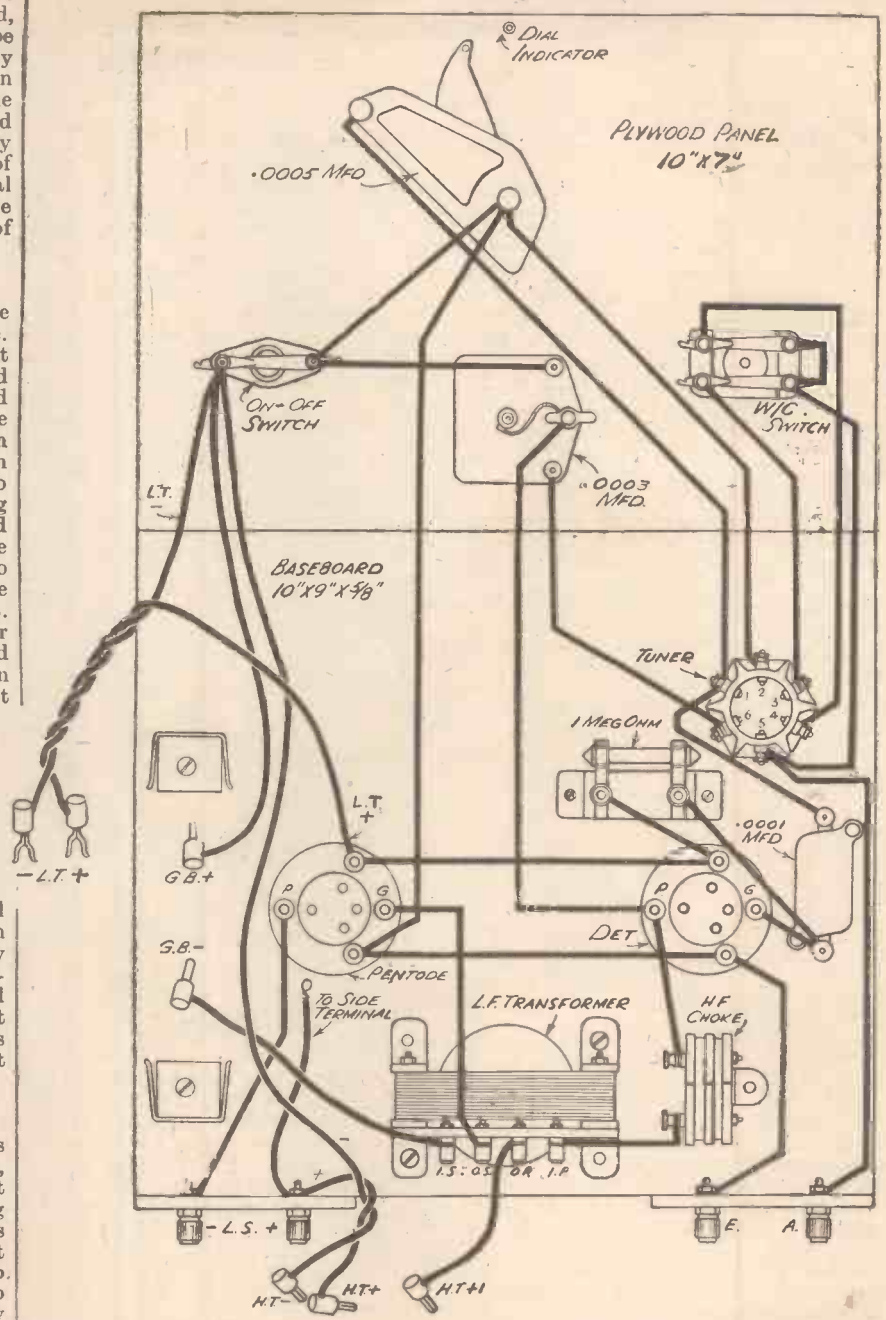
## Current Consumption

It will be useful to know the exact measured current consumption of the original set, so that in case of difficulty, you can make comparisons. With plug "H.T.+" at 99 volts, "H.T.+1" at 60 volts, and "G.B.—" at 4½ volts, the total anode current was found to be rather less than 4 milliamps. It can be seen from this that the high-tension battery should have a useful life of at least six months. The low-tension current was found to measure just .3 amp. and thus the accumulator will give about 150 hours of service before re-charging becomes necessary.

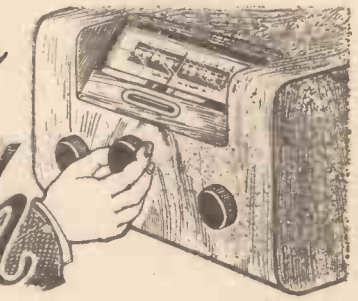
### COMPONENTS REQUIRED FOR THE GUINEA TWO-VALVER

One Three-ply Panel, 10in. by 7in.
One Baseboard, 10in. by 9in.
One .0005 mfd. S.L.F. Tuning Condenser.
One .0003 mfd. Differential Condenser.
One Dial Indicator.
One Double-Pole Switch.
One Single-Pole Switch.
Two Valveholders.
One .0001 mfd. Fixed Condenser.
One 1 megohm Grid Leak.
One Grid-Leak Holder.
One Dual-Range Tuner (home-made).
One H.F. Choke (home-made).
One L.F. Transformer (home-made).
Two strips Ebonite, 3in. by 1½in.
Four Terminals.
One pair G.B. Battery Clips.
Five Wander Plugs; marked "H T —," H.T.+," "H.T.+1," "G.B.+," and "G.B.—."
Two Spade Terminals; marked "L.T.+" and "L.T.+."
One coil "Glazite," 2yds. twin flex, and screws.

# WIRING DIAGRAM OF THE GUINEA TWO-VALVER



# On Your Wavelength



## Pictorial *versus* Theoretical Diagrams

MY recent paragraph as to whether readers prefer theoretical to pictorial diagrams has elicited an unusually large crop of correspondence. Mr. R. S. Francis, of Felixstowe, says that he, with many others, would like to see pictorial diagrams abolished as he finds it impossible to grasp a circuit shown by that means without studying it for some time, whereas theoretical diagrams show at a glance to anyone acquainted with the symbols the whole idea of the circuit. He doubts whether the new-comer to radio finds pictorial diagrams helpful. He thinks that a person really interested in wireless would soon learn the meaning of the most common symbols and that wireless, essentially a technical hobby, should not need such a waste of energy in the interests of ignoramuses (should it be ignorami?) who can't follow a technical diagram.

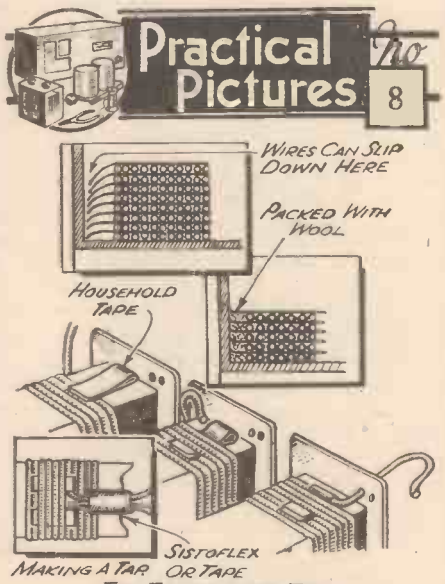
This reader seems to think that the entire contents of the journal should preach to the converted, and apparently forget those new to the hobby and who enter its ranks daily. If you can imagine this journal entirely illustrated by means of theoretical diagrams, you can also envisage such new-comers being entirely scared. PRACTICAL AND AMATEUR WIRELESS is not intended to be entirely devoted to those who know all about radio. Such form a very small, yet valuable, minority! This journal exists to encourage the hobby, not to discourage it. Its diagrams are intended to elucidate, not to confuse. Its articles are intended to teach, not merely to confirm what a reader already knows. Whilst, therefore, I have no hand in dictating editorial policy, I plump for the continuation (even though I have no use for them myself) of pictorial diagrams.

## Trade Apathy

APROPOS the letter from Mr. Jack Harvey in my notes in the March 30th issue, D. C., of Edinburgh, says that he has been trying to build Mr. F. J. Camm's Universal Superhet Three for about two months, but so far has not managed to complete it because he found it impossible to purchase the requisite parts locally. He has searched the town (I am sure his brother Scots will be enormously annoyed at his designation of the Scottish cathedral city), but not one dealer could provide him with a seven-pin chassis valve-holder, either British or Continental. This reader is pleased because he did manage to locate one of the condensers at a cut-price store, but in almost every other case he has had to send direct to the makers. The rest of his letter indicates a sad state of affairs from the point of view of home construction in Edinburgh. I can only suggest that he forms a local club and makes arrangements with one of the kit people to have the components sent direct. If local dealers are apathetic they evidently do not want business in the home-constructor market. This reader also sets on record his opinion that the usual run of assistants in radio shops know little of the subject. I agree.

## More Apathy

ANOTHER reader, Mr. H. A. White, of Holbrook, duplicates the experience of my previous correspondents. He finds that all of the goods offered to the home constructor are of cheap, unsatisfactory, and usually foreign types. He thinks that the dealer is dropping home construction because he gets a greater profit on complete receivers, and does not think that the list of traders suggested by Mr. Harvey would work out in practice, because radio shops are now staffed with men who are chosen for their abilities as salesmen and not for their technical knowledge. Interested manufacturers might make a note of this.




## Jazz, Signature Tunes, and Croonin'

MY correspondence on this particular subject is a very mixed bag. My correspondents have alternated between desires to scatter my entrails to the dogs and to canonise me for my efforts in the cause of true radio entertainment. A minority have gone the whole hog and asked the Editor to unceremoniously precipitate me into the gutter. Ah, well, I must conclude that a number of my correspondents are either members of jazz bands or have relatives in them. I cannot stop them listening to jazz if they want to. Personally, I can well do without it. If it is my opinion that crooners are the parasitic appendages to an exotic era which should be foreign to Great Britain, I am entitled to it. If I think, also, that crooners are those with whom softening of the brain sets in at an early age, I expect people to disagree with me. Here is a selection of opinions :—

A. E. R., of Spark Hill, writes :—

"Why this onslaught on dance music, jazz, and crooners? Are you speaking as an ordinary everyday listener or as a musician? I am both, and one of my vices is that I write music. Now to my case. Everything can be transposed to music, of which there are two branches—straight and serious. As a student of music, I set my course for the latter. You listen to be amused. How often does a symphony concert amuse you? Take any opera. Is it music all through? No. There are one or two tunes that are beautiful and the rest is just makeweight. As to crooners, this, to my mind, is just as musical as any opera singer, but has just that little intimate touch that is so suited to the age. But it will pass. The defence rests."

Here's another, from J. C. P., of Manchester :—

"You have my entire support in your castigation. I share equally with you the detestation of jazz, piffling erotic ballads, crooners, etc., but I cannot share your remarks about the comparative prices of home-built and factory-made receivers. I am whole-heartedly an experimenter and should never buy a ready-made set, but I cannot blind my eyes to the fact that the latter are cheaper in many cases. I have difficulty in getting components when I want them." My correspondent gives some comparative tables to "prove" his point. I will not dilate upon the matter except to say that such figures are patently open to severe criticism.

## And Another

"DEAR Thermion,—With reference to your article on Signature Tunes, I fully agree with you. I wonder to what class our friend who thinks you are another civilised highbrow belongs. Does he really think he is broadminded, because I do not. Not only does he condemn your views, but also classics, which he calls stereotyped, symphonic tripe, which proves he is narrow-minded; also he thinks you are anti-jazz; there he is wrong. The tenor of your article was anti-signature tunes, which, if he was not so narrow-minded, he could easily have gathered.

"The most amusing part of his letter (apart from wishing you the sack) was that jazz can be a wonderful self-expression in music (depression is the word he should have used), which is all piffle. Dance music is for dancing only, and therefore

(Continued on next page)

(Continued from previous page)

there is nothing strange in people not listening to it if they are not dancing. There is, perhaps, one per cent. of dance music with any melody in it at all, but that is generally borrowed. I wonder if he knows the qualifications of a so-called good crooner and where the wonderful self-expression comes in. Can he answer that?

"Being broadminded. I certainly agree that crooners ought to be allowed to live and make a living, but they are sadly over-paid. Hoping he can read some of my letter, and wishing you could lengthen your feature,—C. W. R. (Pont)."

## Another Supporter

"DEAR Thermion.—Please read this letter through, then for the W. P. B. Nothing would give me more pleasure than to be able to chastise some of your correspondents who wish to have you sacked. I have read your page with interest every week and think it is an education to such as me. A. L. W.'s article is very interesting and just the thing I have been longing to hear about, as all-wave reception is something of importance. Some three years ago I had a three-wave set and was pleased with the results on all three wavebands, but the set contained only three valves. Had I at that time been fortunate enough to employ a screen-grid circuit in my set I would still have had it. The reason for changing over to a four-valve receiver on long and medium waves was, firstly, because it was believed that the S.G. valve would not help with short-wave reception, and, secondly, because there was quite a lot of seriously-interrupted programmes through the interference of our local morse signal station. Even now our wireless morse signal station interferes with reception at certain places on the broadcast band with multi-valve receivers. This station is very valuable to shipping, being one of the finest receiving stations in the British Isles, but a serious interrupter of broadcast reception when transmitting morse signals, etc. This bit of information might be of interest to the B.B.C. Now I would welcome a layout or plan for the assembling of components on an all-wave receiver along with the values of each part and how to connect them together. Theoretical diagrams are all very well for experienced constructors, but a plan with a layout of components on the baseboard is very valuable to the inexpert, and I can appreciate that way best of all, for theoretical diagrams are as difficult for me to understand as it is to spell those tongue-twisting scientific words. I hope other readers will write you on wireless reception and be able to glean all the information possible, also enjoy your page as much as I do. Just one word more about wireless, I hope A. H. W. recommends the ordinary valves, such as S.G., det., L.F., power, or pen. for reception on his all-wave battery set.—H. J. F."

## A Useful Device

IT is not often that I care to advertise gadgets made up by various firms, but just recently I have been very forcibly acquainted with a novelty which is of the utmost interest to the experimenter, or, for that matter, to the ordinary husbandman. I refer to the neat little dual adapter which is made by a well-known advertiser in these pages, and which is designed to plug into an ordinary electric lampholder. At its opposite end it separates to reveal two sockets of the normal 5-amp. type. When a plug of this nature is fitted to a lead from any piece of electrical apparatus it may be plugged into either a two-pin adapter or a lamp adapter at will, and I had forgotten about this device until I received a set for test from one of the big firms. When it arrived I commenced to clear the decks ready to use the set when I remembered that the usual two-pin socket which I generally adopted for use with wireless receivers was broken. I had smashed it the day before and had forgotten to get a new one. I was just going to pack the set away again when I noticed the plug neatly tied to the mains flex. It was of this double type, and I was thus able to plug it into a convenient lampholder and proceed with the test. This handy device is now obtainable at the popular stores, and one should be kept in the house for use with experimental apparatus, as it enables another piece of apparatus fitted with only a two-pin plug to be used in a lamp adapter, or vice versa. Other uses will no doubt occur to the keen worker.

# Notes from the Test Bench

## Trimming a Superhet

IN a superheterodyne receiver it is essential that the intermediate frequency be adjusted correctly if maximum efficiency is to be obtained, and in most cases lack of sensitivity in superhets is due to incorrect adjustment of the I.F. trimmers. When checking the frequency it should be borne in mind that the wavelength range covered by the receiver is affected by the frequency to which the I.F. amplifier is tuned, and when the normal wavebands are not covered it can usually be taken for granted that readjustment of the I.F. trimmers is necessary. With our popular £5 Superhet the following trimming procedure will prove sufficiently accurate, provided that the specified components are used. In order to flatten the tuning of the H.F. stage the aerial and earth leads should be transferred from the first coil to terminals 4 and 6 of the second soil—this cuts out the first bandpass coil and tuning condenser. The trimmer of the centre section of the gang condenser should then be adjusted to approximately half-way setting, and the trimmer of the section remote from the panel (*i.e.*, the oscillator section) to between a quarter and half a turn from the full-in setting. A weak transmission on a wavelength of approximately 300 metres should then be tuned in, and the I.F. transformer trimmers adjusted until maximum volume is obtained. If selectivity is not satisfactory with the aerial connected to the centre coil, the A and E leads should be transferred to the first coil, and the section of the gang condenser nearest the panel adjusted; the trimmer of the centre section will also need slight re-adjustment after this transference has been effected.

## Short-wave Receivers

IT is a well-known fact that much greater care must be exercised in the construction of short-wave receivers than in that of sets designed for reception of the normal broadcast bands. This is particularly true with respect to the various earth connections. Whilst experimenting with one of our new short-wave designs it was found that the receiver proved very unstable unless a lead was connected direct from the terminal attached to the moving vanes of the tuning condenser to the earth terminal of the coil. When the receiver was first assembled this terminal was unused, it being assumed that a sufficiently good contact between the coil and condenser was effected through the metal bracket attached to the condenser spindle. This method of connection proved quite satisfactory for medium and long-wave reception, but immediately the receiver was switched over to the short waveband marked instability was experienced. It is therefore emphasised that readers should strictly adhere to the designer's layout and wiring when constructing a short-wave receiver. It is also pointed out that an efficient earth connection is very desirable when listening on the short wavebands. A bad earth connection causes hand-capacity effects and instability.



## Changing the Ratio

A RADIO friend of mine recently built a small quality receiver, in which a L.F. transformer was used. When I called to hear the receiver I was surprised to find him very disgruntled on account of the fact that he found the local overloaded the first stage. He did not wish to change the valves, and upon examination I found he was using a 5 to 1 ratio transformer. This was parallel-fed, and when I suggested that he reduced the ratio of transformation he looked rather surprised and said he did not wish to pull it to pieces. It seems he had forgotten that when the parallel-fed arrangement is employed it is possible to modify the ratio of the transformer, and this is carried out in the following manner. The two windings (primary and secondary) are normally arranged so that coupling takes place between them. The secondary bears a greater number of turns than the primary, and this ratio of turns is the ratio stamped on the transformer. If, now, when parallel-fed, we join the two windings in series, but arrange the connections so that the two windings are still inductively coupled, the transformation will be increased by one. That is, a 4 to 1 transformer would become a 5 to 1 auto-transformer. If the connections are made so that the two windings are still in series, but with the windings in opposition, the ratio will be decreased by one, so that a 4 to 1 would become a 3 to 1. Thus, an ordinary transformer may be used to provide three different ratios. This point is worth bearing in mind.

## Car Radio

THERE is no doubt that the semi-portable wireless receiver for use in the car has been improved immensely of late, and the British car-radio models now on the market can be second to none. I have had a home-made receiver fitted in my car for some time, and it has always given very pleasing results, but after hearing a new commercial instrument the other day I have come to realise that it is time that I improved and modified my own. With the receiver I recently tested I was able to tune in to fully a dozen transmissions, each of which could be listened to in comfort. Moreover, there was hardly any noticeable fading, and the quality of reproduction left little to be desired. The noise-suppression device, used in conjunction with A.V.C., removed all objectionable background noises, so that results were quite as good as one would expect from a normal "home" receiver.

I am pleased to observe that makers of car-radio equipment are insisting that the installation and servicing shall be carried out only by fully qualified and trained engineers.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# COSSOR
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| Mut. Conductance | 1.1 m.a./v. |
| Max. Anode Volts | 150 |
| Max. Aux. Grid Volts | 80 |

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### COSSOR 210 P.G.

| | |
|---|---|
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| Filament Current (amps.) | .1 |
| Mod. Anode Voltage (max.) | 150 |
| Screen Voltage (max.) | 80 |
| Mod. Grid Voltage (Variable) | 0-9 |
| Osc. Anode Voltage (max.) | 150 |

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Here are two very successful Cossor Battery Valves—two worthy types from a comprehensive and successful range.

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# Random Jottings

Interesting News from all Quarters

by *JACE*

## Effect of Damp on Sets

THE effect of damp on some types of receivers in use in districts where humidity is above normal is one of the numerous subjects dealt with in the current issue of the Philco Service Man, which is issued monthly by the British Philco factory to their dealers. Cures are suggested for any troubles that may arise therefrom.

## Ten Years of Broadcasting in Sweden

THE Swedish Radio Broadcasting Service recently celebrated its first ten years of existence by a special programme in which the Minister of Communications, Mr. Leo, took part. Starting with but 40,000 licences the Radio Service now has 730,000, which represents considerably more than one tenth of the total population of the country. In his speech the Minister congratulated the Service on the excellence of its programme due to the constant striving after the best.

## Royal Air Force Expansion

THE Air Ministry announces that the expansion of the Royal Air Force by forty-one squadrons, mainly for home defence purposes, necessitates a greatly increased intake of personnel during the next four years. A large proportion of this increase will consist of well-educated boys, no less than 1,500 of whom will be required during the next twelve months—more than twice the number taken annually before the expansion began. The large majority will be entered as aircraft apprentices, but substantial numbers will also be required for entry as boy entrants and apprentice clerks. No previous experience is required, but candidates must be physically fit and of good education.

The aircraft apprentices are trained for three years in the special technical schools of the Royal Air Force to become fitters, instrument makers, and wireless operator mechanics. These are the most important trades in the Air Force, and the highly skilled aircraftmen employed on these duties receive the highest rates paid in the service. The age limits are fifteen to seventeen. Boy entrants are taught the skilled trades of armourer, photographer, and wireless operator. Their rates of pay and conditions of service are also good. The age limits are 15¾ to 17¼.

The openings for apprentice clerks provide a valuable opportunity to boys who prefer administrative to technical duties. Apprentice clerks are given a thorough training in clerical duties and also receive favourable rates of pay. The age limits are 15¾ to 17¼.

Full information regarding methods of entry and conditions of service in each of these classes can be obtained from the Air Ministry (Apprentices Department), Gwydyr House, Whitehall, London, S.W.1. Details of the vacancies which will be offered at the individual examinations, to be held at local centres throughout the country during the year, will be issued later.

## New Station Registers

FOR the convenience of both wireless traders and of the user public, the G.E.C. are now supplying, at a cost of 2s. 6d. each, revised station registers, incorporating changes in the wavelengths of B.B.C. stations which came into operation on February 17th. Each register has been given a group letter in order to identify it with the particular set or sets for which it is suitable. This greatly simplifies ordering, it being necessary only to state the identification letters, and the number of new registers required.

The list of registers available are as follows:—

| *Register Type* | *Receiver Catalogue Number* | *Register Type* | *Receiver Catalogue Number* |
|---|---|---|---|
| A For | BC.3,335 | F For | BC.3,446 |
| | BC.3,338 | G For | BC.3,480/L |
| B For | BC.3,336 | | BC.3,484/L |
| | BC.3,339 | | BC.3,488 |
| C For | BC.3,340 | H For | BC.3,540/L |
| | | | BC.3,541 |
| D For | BC.3,358 | | BC.3,542 |
| | | | BC.3,544/L |
| E For | BC.3,440/L | | BC.3,548/L |
| | BC.3,441 | | BC.3,558/L |
| | BC.3,442 | | |
| | BC.3,443 | J For | BC.3,545 |
| | BC.3,444/L | | |
| | BC.3,445 | K For | BC.3,566 |
| | BC.3448/L | L For | BC.3,550/L |
| | BC.3,449 | | BC.3,551 |

*Most people know Harold Ramsey, leader of the famous broadcasting band, from hearing him on the air, and on the stage, but not everyone knows him as he is "between acts." Here he is snatching a few moments in his dressing-room with his Pye portable receiver.*

## "Avominor" Competition Results

RESULTS of the "Avominor" Competition, launched last April by the Automatic Coil Winder and Electrical Equipment Company, Limited, in which competitors were asked to enumerate the highest number of tests for which the "Avominor" can be used, are now to hand. The second prize of 10s. a week for one year has been secured by an Ealing customer of the Peto-Scott Co., Ltd., the radio suppliers well known to all our readers. Messrs. Peto-Scott have decided to supplement this award with a further 5s. a week for one year. Those of our readers who are customers of this old-established firm already have had ample evidence of the complete satisfaction and value for money for which Peto-Scott are noted.

## Imported Radio Goods

THE Board of Trade announce that an Order-in-Council was made on February 21st, 1935, under Section 2 of the Merchandise Marks Act, 1926, requiring the following descriptions of imported radio goods to bear an indication of origin:—

- Radio receiving sets.
- Radio gramophones.
- Electrical gramophones.
- Electrical audio-frequency amplifiers.

(whether imported complete or in parts)

- Loud-speakers.
- Loud-speaker units.
- Battery eliminators.
- Chokes.
- Condensers.
- Drives for variable condensers.
- Electrical gramophone pick-ups.
- Volume controls.
- Electrical gramophone motors.
- Gramophone turntable units comprising an electric motor and a turntable.
- Head phones.
- Resistances.
- Valve holders and adapters.
- Transformers.
- Tuning coils.
- Resistance-capacity coupling units.
- Choke-capacity coupling units.
- Chassis or frame carrying or adapted to carry a collection of components.

The Order is the Merchandise Marks (Imported Goods) No. 2 Order, 1935, and will come into force on August 21st, 1935. The order is being published, and copies may be purchased from H.M. Stationery Office, either directly or through any bookseller.

## American Radio Distributors

FOR the benefit of readers who may require information concerning American radio, particularly midget receivers and power sets for short-wave bands, we would mention that John Cullums, Ltd., of 4, Cullum Street, Fenchurch Street, London, E.C.3, are sole importers and distributors for the Crosley Radio Corporation, one of the leading American radio manufacturers.

## Lady Young's Rescue

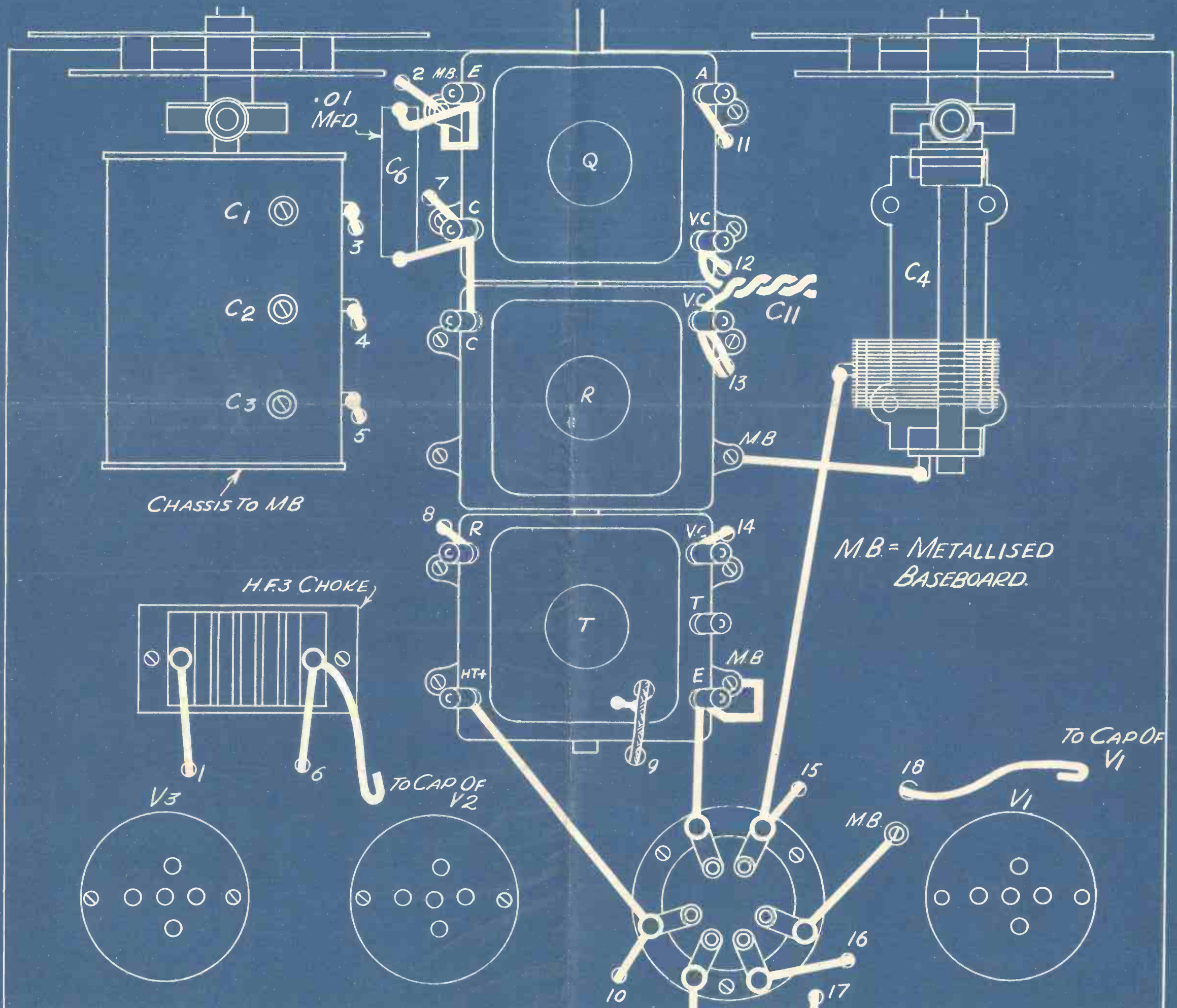
THE first news of the safety of Lady Young, the wife of the Governor of Northern Rhodesia, whose aeroplane crashed in the African Bush, was flashed to Buluwayo by a North London man, Mr. F. A. Marr, Commissioner of Gokwe, Southern Rhodesia, on his home-made wireless set in which he uses an Exide Battery.

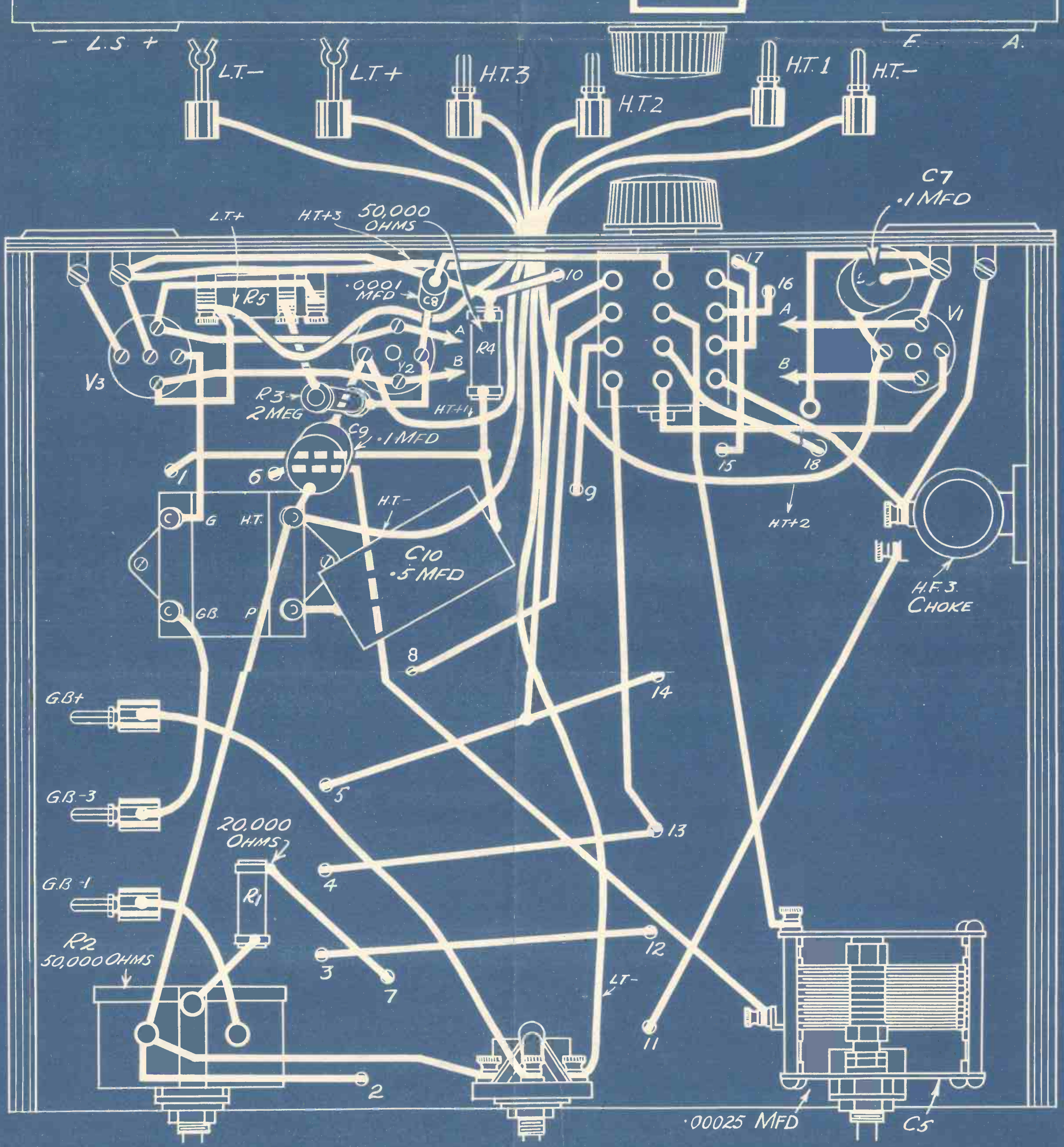
Presented Free with "Practical and Amateur Wireless," dated April 13th, 1935.

"PRACTICAL & AMATEUR WIRELESS" BLUEPRINT NO. P.W.49. PRICE – ONE SHILLING

# F.J. CAMM'S SILVER SOUVENIR

PUBLISHED BY – GEO. NEWNES LTD. 8–11 SOUTHAMPTON STREET, STRAND, W.C.2.

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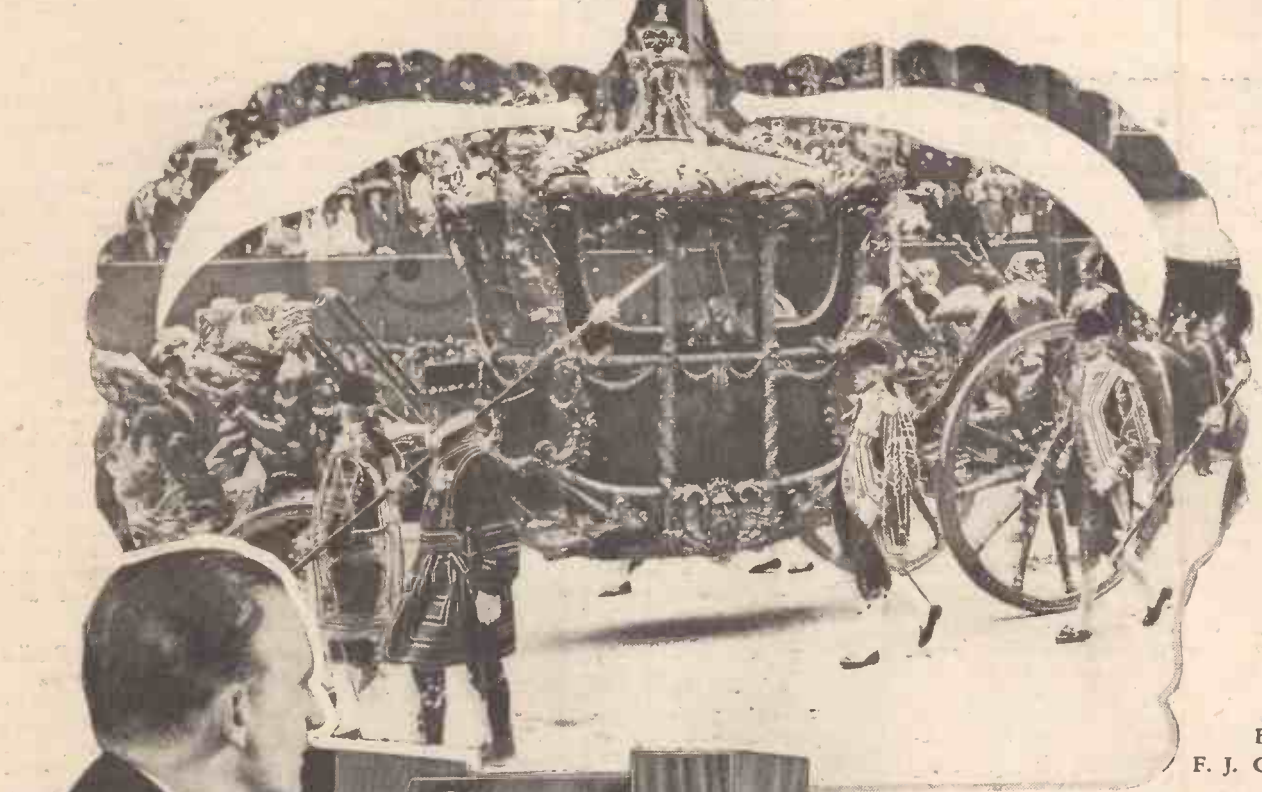
# Presenting F. J. CAMM'S ALL-WAVE Silver



By F. J. CAMM.

HERE in my All-Wave Silver Souvenir you have a receiver cogently in step with modern tendencies. The growing importance of short waves and the limitations of the broadcast receiver in that respect (for an adapter does not provide a really satisfactory gateway to the short-wave world) has for long indicated to designers that the time was ripe to produce a dual-purpose receiver. Experimenters are no longer content to operate two receivers in order to cover the short and broadcast wavebands. A few years ago the short waves presented an entirely different technique, demanding a special receiver designed on somewhat different principles to those which could be successfully used for broadcast. Capacity effects, the use of screening boxes, extension spindles, and other compromises and improvisations provided a receiver which, as is so often the case, tackled an effect instead of a cause.

It has always seemed to me unsatisfactory practice to use adapters or separate receivers in order to listen in on the short-wave band. It is probable that the former lack of interest in short waves did not encourage the designers to devote thought to the subject, for it was a field of experiment explored only by those whose technical knowledge was well developed;

## FULL-SIZE WIRING DIAGRAM FREE WITH THIS ISSUE!

# Souvenir

but as with the broadcast waveband, there are hundreds of programmes radiated on wavelengths of 100 metres and below, and easily receivable.

### The Use of Standard Parts

As in all other branches of science, the demand produces the supply. It would have been of little use to my readers a few years ago to produce an all-wave receiver, since short-wave technique had not at that time caught up with requirements. The insistent correspondence which I receive on the subject of short waves has for a long time guided my thoughts on the production of an all-wave receiver which would satisfactorily encompass with a limited number of controls the wavebands to which I have alluded. I have always felt that whilst it is possible to produce a desired effect by incorporating specially designed and specially manufactured components, an equally satisfactory solution, and one which the home constructor will quickly appreciate, would be provided if such a design could be evolved by using standard parts, readily available from wireless dealers throughout the country.

None of my readers needs to be reminded of the fact that no PRACTICAL AND AMATEUR WIRELESS design ever reaches the printed page unless it has more than satisfied my exacting tests. Every reader will be well aware that I take a personal interest in every receiver constructed from my designs provided that the specified components are used; and so with the Silver Souvenir there is little need for me to dwell upon its performance. It does what I claim it will do. *You* will duplicate my results, and I earnestly suggest that you at once commence to build the All-Wave Silver Souvenir, not alone because it is the first all-wave 3-valve receiver to be described in these pages, but more because I feel that it opens up a vaster, more intriguing, intensely more fascinating field of listening apart from the valuable experiments which can be conducted.

### Below 100 Metres

There can be little doubt that the broadcast wavebands sometimes breed contempt purely by virtue of familiarity. Below 100 metres there are hundreds of stations providing programmes every whit as interesting as anything radiated above it, and more. With the broadcast waveband you can, within reasonable limits, know what station you can receive. With the short waveband there is no such limit, for you may easily receive programmes transmitted from almost incredible distances. These may be received during and after broadcast hours by the simple manipulation of a switch at the back of the set. You do not need to keep to a definite listening programme on the short-wave band. You can switch on the receiver at any hour of the day or night in the assurance that some worth-while transmission may be picked up. Those interested in morse will also find many programmes of interest. The receiver functions as a normal receiver on the broadcast waveband, and hence does not interfere with normal radio requirements.

I do not need to stress the simplicity of the Silver Souvenir. It is apparent from the illustrations and from the circuit diagram. The receiver is housed in a cabinet worthy of its performance and of the event which its introduction signalises.

For the benefit of those readers who did not read the preliminary announcement in last week's issue, I will briefly go over the circuit. It will be observed that it employs only three valves, and that its power is derived from an accumulator and battery. I will anticipate questions by saying now that I propose to produce mains versions of it.

### The Valves Employed

Three pentode valves are employed, the first being a variable-mu H.F. pentode, using the control of bias to vary the volume and thus provide really smooth volume control. The second valve is a normal H.F. pentode used as a cumulative grid rectifier with a special tapped potentiometer to enable a definite bias to be applied to the valve. This will be found of real value on the short waves. The output valve is a power pentode delivering an output of 1,000 milliwatts (1 watt) and such is adequate for most requirements.

A novel tuning system has been incorporated. For normal broadcasting the well-known band-pass system is used with an H.F. transformer coupling between the H.F. and detector valves. Special short-wave chokes and a separately tuned short-wave coil have been added to the normal circuit, such being controlled by a multi-contact change-over switch. The aerial circuit on the short-wave band is aperiodic, and the short-wave components then couple the H.F. and detector stages. This it will readily be conceded is an extremely simple arrangement, and probably because of its simplicity it functions in an astonishingly effective manner. The separate tuning condenser ensures that all the advantages of special short-wave receiver design are enjoyed and, in fact, the Silver Souvenir functions far better than a specially designed short-wave receiver.

The normal circuit requirements have received adequate attention. The circuit has been balanced, and will be found to be remarkably stable.

### The Cabinet

Apart from the originality displayed in the actual design of the Silver Souvenir, a departure from convention will be observed in the design of the cabinet. The usual rectangular box structure which has sufficed in the past has not been considered to meet fully the requirements of the modern listener. Apart from the fact that the cabinet has to become part of the domestic furnishing, it must also accommodate the batteries or other supply source

### SPECIAL FEATURES

- Short waves in addition to normal broadcasting wavelengths without the use of special components.
- Special short-wave circuit employed—the change being carried out by means of a simple switch.
- Simplicity of control—only one tuning knob for each waveband.
- Three pentode valves—providing maximum efficiency in each of the three stages.
- Undistorted output of 1 watt.

## Two First-class Receivers in One!

(eliminator, for instance), and, in addition to this, in the cabinet which has been designed for the Silver Souvenir accommodation has also been provided for books and testing instruments. A list of broadcasting stations, or a paper giving the programmes, is usually required when listening-in, and for periodical tests a meter of some sort is desirable.

The layout of the Silver Souvenir cabinet has been arranged so that the two side portions form small cupboards, whilst the control panel has been sloped after the fashion of a writing or reading desk. Not only does this lend a distinct change of appearance to the finished receiver but it greatly facilitates operation, as the controls are more easy to adjust and the tuning dials are more easily readable. There is no stooping down to see what the dial setting may be, and no cramped manipulation of a dial just out of reach.

Still further to enhance the appearance of this new receiver, the control knobs used in the original model are chromium plated, as also are the handles for the side cupboards. These, together with the cabinet, may be obtained from Messrs. Peto-Scott, and the complete appearance of the receiver will meet with the approval of even the most critical listener.

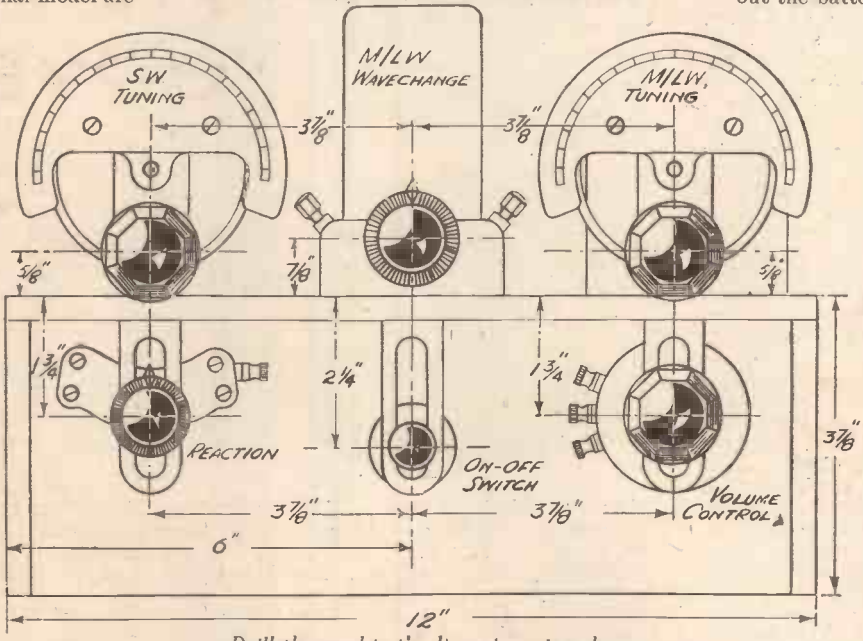
*The Silver Souvenir with the lid off! Releasing the chromium-plated knobs reveals the internals*

## Points in Wiring

Bearing in mind the fact that this receiver is for use on the short waves, there are just one or two points where more accurate and careful wiring is necessary than is customary in a standard broadcast receiver. Fortunately, the design of the complete apparatus does not necessitate wide spacing of components and thick heavy wiring for the tuning circuits, and thus there is not a great deal of difference between this receiver and one which has been designed primarily for the normal broadcast bands. The first point is obviously to mount the components, and the whole task of receiver construction is rendered much simpler if some system is adopted. Many constructors simply screw the parts down in a position which looks something like that shown in the illustrations and then wire up from the circuit.

## The Blueprint

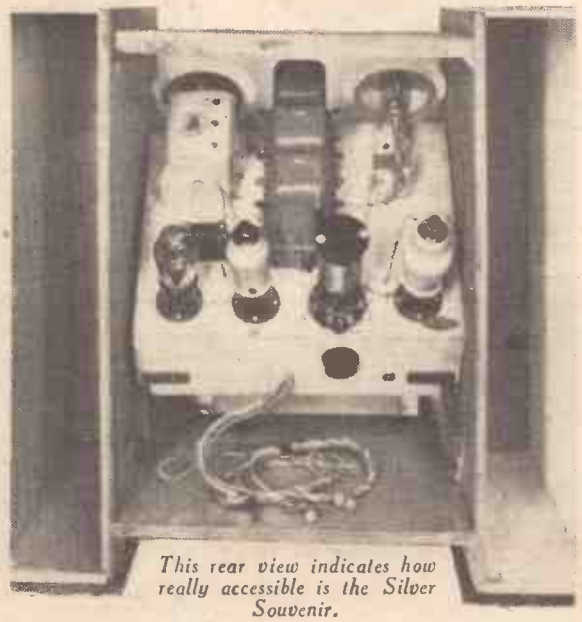
Given free with this issue is a full-size blueprint, and if this is employed in the manner which is intended you can build your Silver Souvenir as an exact replica of the original model, every component and every wire occupying exactly the same position. Get together all the parts, either by ordering them complete from one of the firms who advertise in our pages or by getting your local dealer to obtain them for you. If the chassis is ordered especially for this receiver, as distinct from just asking for a 12in. by 10in. chassis, the requisite holes for the valve-holders and the socket strips will already be made. Thus, construction will resolve itself to a quick assembly of parts and wiring up, for which purpose no other tools than a screwdriver and a pair of pliers will be required. If you obtain a plain chassis, you will have to cut the holes for the various components and for the valve-holders; these are 1in. in diameter, and for the switch on the rear of the chassis a ⅜in. hole will clear the fixing bush. A 11/32in. hole could be used here if such a drill is ready to hand, and then the switch will screw into the hole, the threads cutting into the wood. Also, on the rear strip are two small slots to accommodate the socket strips used for aerial and earth and loud-speaker connections. The slots should be 1in. long by ½in. wide, and to complete the rear strip a ⅜in. hole should be made at roughly the centre point for the purpose of bringing out the battery leads.




*Drill the panel to the dimensions given here.*

## Using the Blueprint

Before commencing to mount any of the parts, lay the blueprint on the upper surface of the chassis, making quite certain that the outline of the chassis agrees with the actual surface beneath it, and with an awl or a fine nail pierce through the print at all the points through which wires have to pass. To facilitate the insertion of screws it is also a good plan to pierce through the centre of the screw head marked on the print, afterwards enlarging these points slightly to give the screw a start. Having marked all holes and drilled out those through which the wires pass, the next procedure is to attach the component brackets to the underside of the chassis, and then proceed to mount the components. In view of the delicacy of the short-wave condenser, it is preferable to leave this until last and thus guard against the vanes becoming bent or otherwise damaged. There is only the L.F. transformer and choke to be attached to the underside of the chassis, all the remaining components being suspended in the actual wiring, or forming the connection between one point and another.



*This rear view indicates how really accessible is the Silver Souvenir.*

## Wiring

No difficulty should be experienced in wiring the components with the full-size blueprint before you. Remember that if you use one of the popular coloured insulated wires, the covering must be scraped clear where the wire is joined to a terminal. If a pair of round-nosed pliers is used to form rings in the ends of the wires, neater connection will be made, and there will be less risk of

(Continued on page 116)

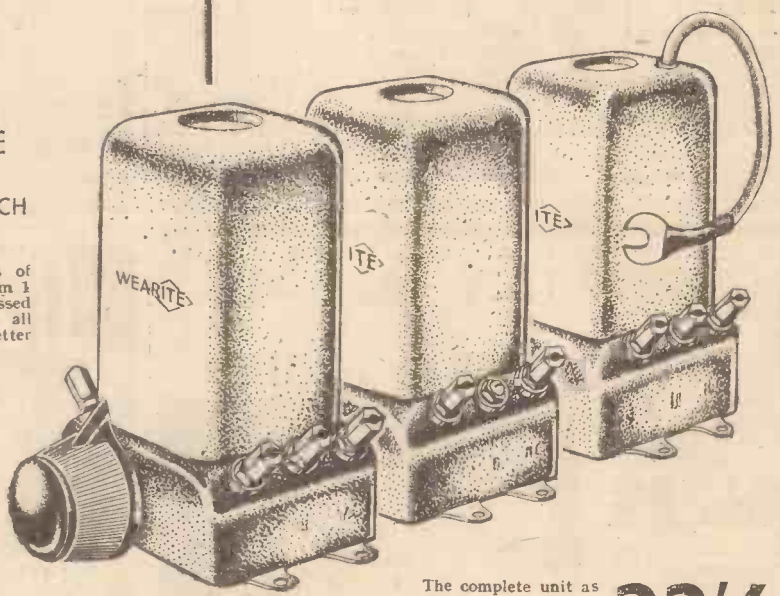
WEARITE
REGD. TRADE MARK

# Q.R.T. COIL ASSEMBLY

## *Specified for the*

## SILVER SOUVENIR

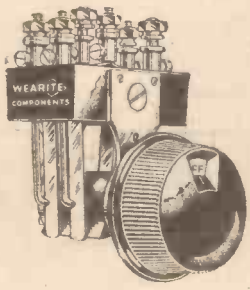
**This unit has been built up specially for the "Silver Souvenir" from the standard range of Wearite Type "W.L." Air-core coils. These incorporate a unique method of construction, employing stranded wiring on special low-loss formers. The "Silver Souvenir" combination, viz., Q.R.T., ensures a very high degree of selectivity and sensitivity.**




Also available as separate coil units (complete with switch and knob). Price 7/6d.

The complete unit as shown comprising Q.R.T. Coil Units, spindle switches and knob. **22/6**

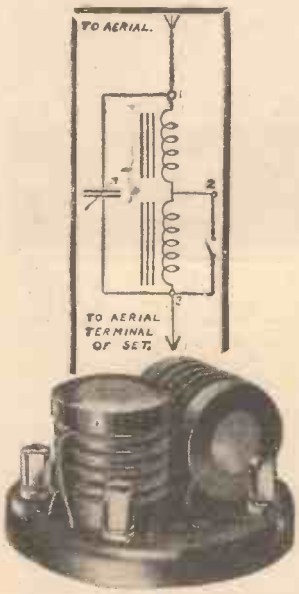
## *. . . also Specified—*




### *The* WEARITE TYPE 1.24 ROTARY C.O. SWITCH (4 WAY)

This is one of a series of change-over switches (from 1 to 6 way) which have passed the most rigid tests in all types of circuits—no better switch is available.

**PRICE 4/6**




### *The* WEARITE IRON-CORED WAVE-TRAP COIL

Here is a wave-trap coil that really does its job. With .0005 Variable Condenser and a Switch, you have a Unit that will cut out that interfering station with ease—and no loss of volume from the wanted station! It works on any Set—'Super'—'Straight' or 'Short Waver.' Coil unit as shown **7/6**

A suitable Wearite Switch is the G.S.P. Price 1/-.

## POST THIS COUPON BEFORE YOU START

**To Messrs. Wright & Weaire, Ltd.,**
**740, High Rd., Tottenham, London, N.17**

Please send me your new booklet G.N.834, together with circuits of the "L.P." (Lucerne Plan) Receivers, and details of the NEW WAVE-TRAP COIL UNIT.

Name .....

Address .....

PRAC. 13/4/35 .....

CA 6692

# ALL THE WORLD IS ITS LIMIT!

## SHORT WAVES

Short-wave reception holds a fascination different from that of all normal listening, largely owing to the unexpected results which are obtained. It is rather uncanny to turn the dial a few degrees and, in doing so, to change from a comparatively nearby European station to another thousands of miles away, in Australia, South America, or the United States. One never knows whether the next transmission to be received may be that of an enthusiastic amateur somewhere in the wilds, or of a mobile police car tracking down a gang of criminals. Quite apart from this, the constructor who experiments on short waves is surely gaining a wealth of knowledge that will be invaluable at a later date when still more use is made of the under-50-metre wavelengths.

# Draw Your Programmes from 5 Continents

(*Continued from page 112*)

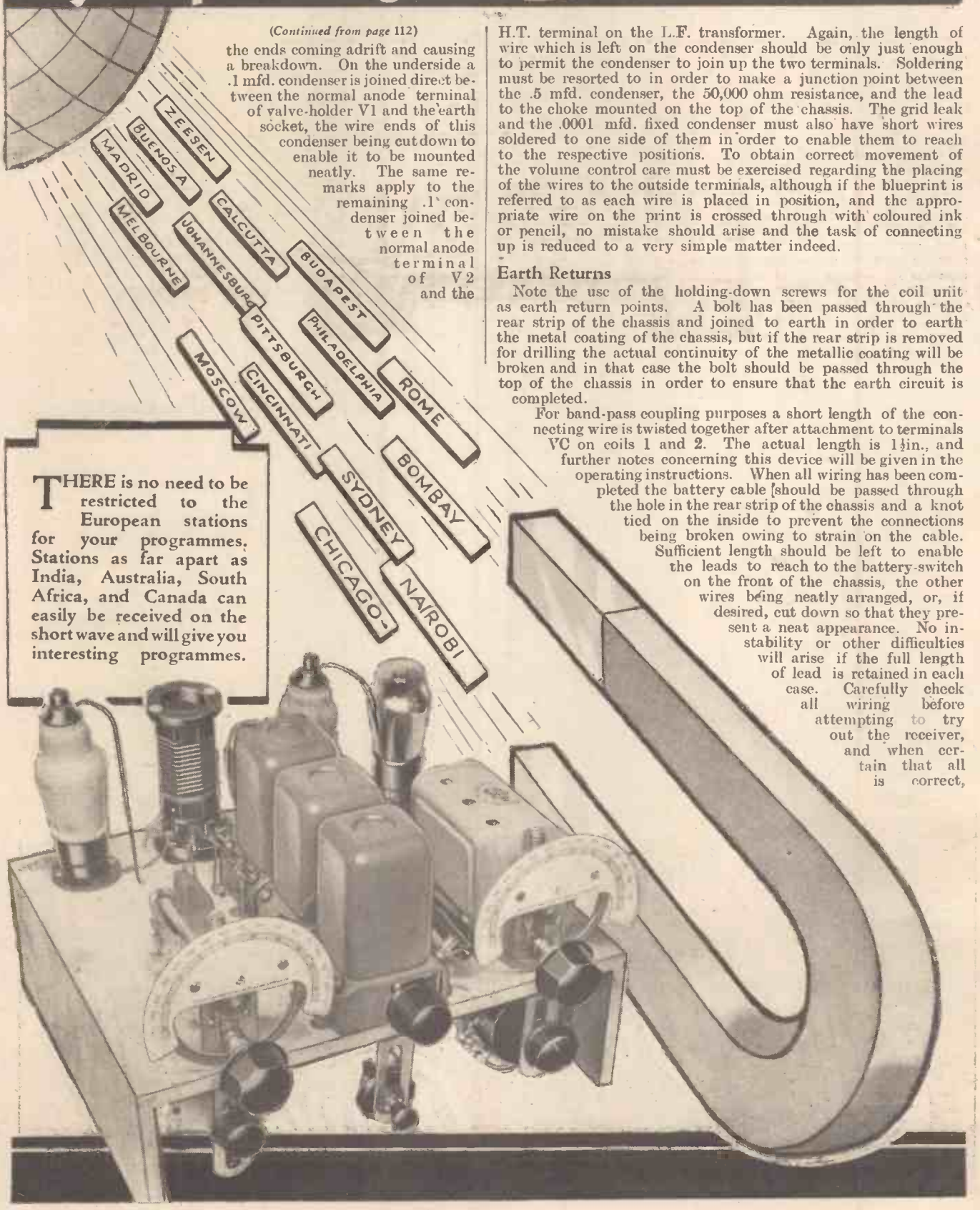
the ends coming adrift and causing a breakdown. On the underside a .1 mfd. condenser is joined direct between the normal anode terminal of valve-holder V1 and the earth socket, the wire ends of this condenser being cut down to enable it to be mounted neatly. The same remarks apply to the remaining .1 condenser joined between the normal anode terminal of V2 and the H.T. terminal on the L.F. transformer. Again, the length of wire which is left on the condenser should be only just enough to permit the condenser to join up the two terminals. Soldering must be resorted to in order to make a junction point between the .5 mfd. condenser, the 50,000 ohm resistance, and the lead to the choke mounted on the top of the chassis. The grid leak and the .0001 mfd. fixed condenser must also have short wires soldered to one side of them in order to enable them to reach to the respective positions. To obtain correct movement of the volume control care must be exercised regarding the placing of the wires to the outside terminals, although if the blueprint is referred to as each wire is placed in position, and the appropriate wire on the print is crossed through with coloured ink or pencil, no mistake should arise and the task of connecting up is reduced to a very simple matter indeed.

## Earth Returns

Note the use of the holding-down screws for the coil unit as earth return points. A bolt has been passed through the rear strip of the chassis and joined to earth in order to earth the metal coating of the chassis, but if the rear strip is removed for drilling the actual continuity of the metallic coating will be broken and in that case the bolt should be passed through the top of the chassis in order to ensure that the earth circuit is completed.

For band-pass coupling purposes a short length of the connecting wire is twisted together after attachment to terminals VC on coils 1 and 2. The actual length is 1½in., and further notes concerning this device will be given in the operating instructions. When all wiring has been completed the battery cable should be passed through the hole in the rear strip of the chassis and a knot tied on the inside to prevent the connections being broken owing to strain on the cable. Sufficient length should be left to enable the leads to reach to the battery-switch on the front of the chassis, the other wires being neatly arranged, or, if desired, cut down so that they present a neat appearance. No instability or other difficulties will arise if the full length of lead is retained in each case. Carefully check all wiring before attempting to try out the receiver, and when certain that all is correct,

THERE is no need to be restricted to the European stations for your programmes. Stations as far apart as India, Australia, South Africa, and Canada can easily be received on the short wave and will give you interesting programmes.



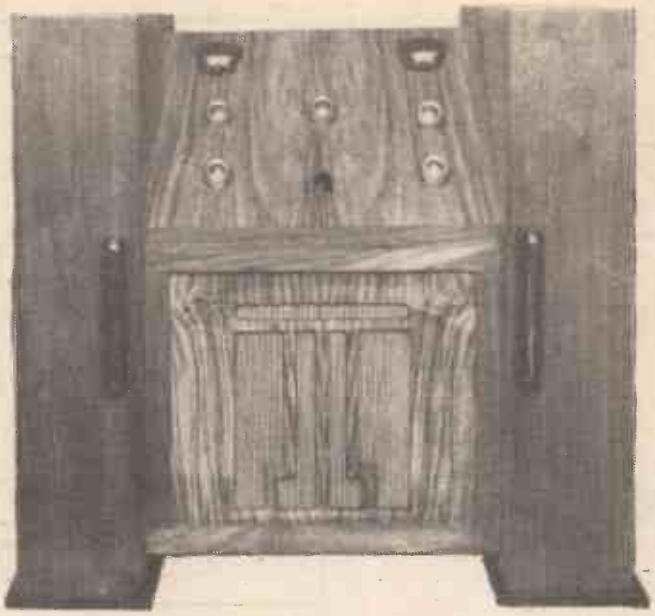
For Theoretical Diagram and List of Components see pages 118 and 119

the appropriate valves and coil may be inserted in the sockets and the batteries connected up.

Two 2in. lengths of connecting wire should be cut and attached to the terminals marked VC on coils 1 and 2, and these should then be twisted throughout their length. This will provide the "top" coupling for the band-pass coils and may be modified at a later date. This point will be explained next week.

## Connecting Up

When wiring is completed the receiver may be given its preliminary test, and for this purpose the normal medium-wave band should be employed. The battery leads are clearly identified by means of the Belling-Lee wander plugs, and the H.T. leads should be plugged into the H.T. battery as follows: H.T. 1 into the 24-36-volt socket; H.T.2 into the 60-72 volt socket, and H.T.3 into the 120-volt socket. The grid-bias leads will be inserted as follows: G.B.—1 into the 12-volt socket, and G.B.—3 into the 9-volt socket. Connect the spade ends to the appropriate accumulator terminals, and the receiver is then ready to be switched on.



*Here is F. J. CAMM'S Silver Souvenir in its new and original cabinet. The panel is inclined for ease of operation. Chromium-plated knobs are used. The two lockers provide accommodation for phones, testing equipment, batteries, books, etc.*

## The Aerial and Earth

As the receiver is to be used for both wavebands some attention should be paid to the actual aerial and earth system. A large 100ft. aerial in an elevated position will not be found the most useful. For short-wave work much more reliable results are obtained when a short vertical aerial is employed, and in many cases it will be found desirable to disconnect the down-lead from the horizontal portion of the aerial, and to use the down lead as an aerial. A short length of insulated material may be inserted to retain the down lead in its position without giving electrical connection with the aerial proper.

The earth is most important, and if a good buried earth is unobtainable, either owing to the fact that you live in a flat or have no easy access to a suitable piece of ground, a good clean connection to a main water pipe should be used. Do not, if you can avoid it, use the water system which comes from an upstairs cistern as this will prove very inefficient.

## Testing Out

Now, looking at the receiver from the rear, turn the short/long wavechange switch towards the left, that is, in an anti-clockwise direction. This will bring into action the ordinary broadcast coils, and the switch control on the three-gang coil assembly should then be turned to the medium-wave position, and the lower central knob should then be pulled out. A rushing noise should immediately be heard from the loud-speaker and will indicate that the set is "alive." Turn the lower right-hand control to its maximum position clockwise and the left-hand lower control to its maximum position anti-clockwise, and slowly rotate the right-hand tuning dial. A station at the lower end of the dial should be located, although if it is found that no such station can be heard, the lower left-hand control (reaction) should be turned a short way in a clockwise direction so as to introduce a small amount of reaction. Do not, of course, allow the receiver to oscillate. Now endeavour to obtain a station, at the lower part of the dial, and get the receiver into the most accurately tuned position.

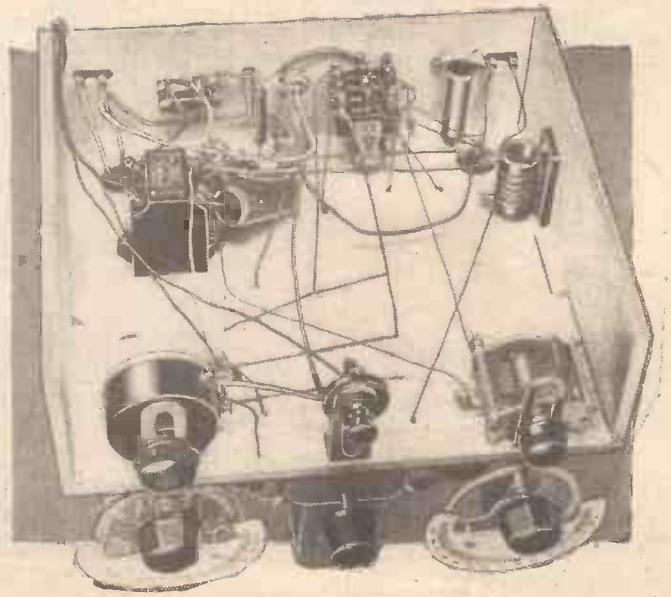
## Trimming

With a small screwdriver, slowly rotate the screws in the upper surface of the three-gang condenser, and as soon as an increase in signal strength is obtained, reduce the volume by turning the lower right-hand control anti-clockwise. Keep the station always at the very weakest signal which can be comfortably heard so that the slightest alteration in signal strength can be identified. When the best setting has been obtained, the ganging should hold throughout the entire medium and long wavebands, although slight adjustments of the trimmers might be found necessary in some cases in order to effect a suitable compromise over the entire tuning range.

## The Short Waves

When this has been done and a number of stations are easily obtained on the normal broadcast band the knob at the rear of the chassis should be turned in a clockwise direction (viewing the chassis from the rear) and the left-hand tuning control will then enable the short waveband from 24 to 52 metres to be explored. Although a slow motion condenser drive is fitted to the .00016 mfd. tuning condenser it should be operated as slowly as possible. As a start,

*This rear view shows the short-wave change-over switch.*



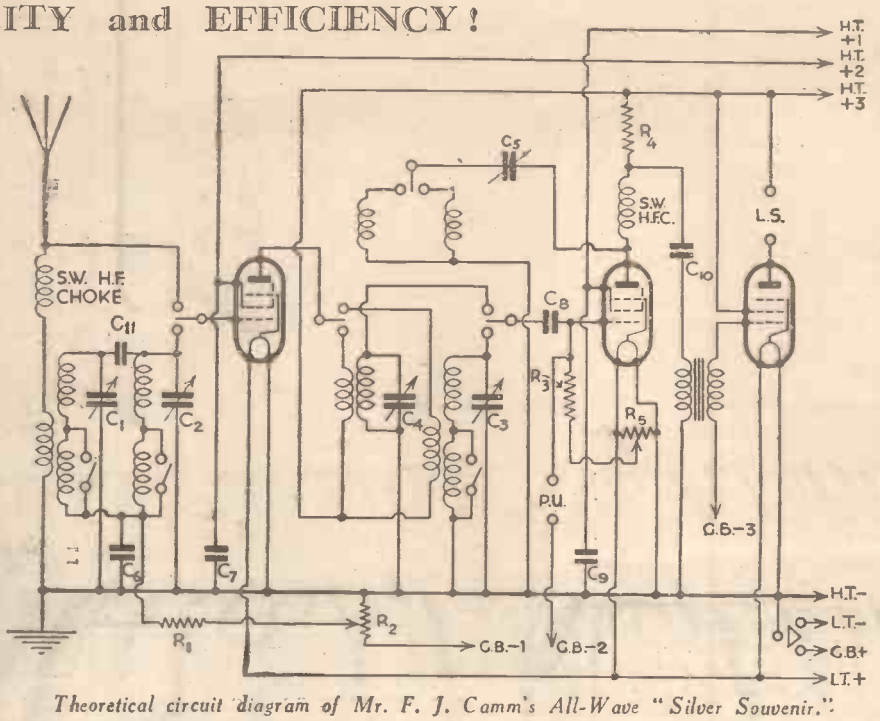
*An underneath view of the Silver Souvenir.*

# SIMPLICITY and EFFICIENCY!

for short-wave work, it will probably be best to tune in a C.W. morse station, and, therefore, the reaction control (lower left-hand knob) should be turned slowly until a rushing sound is heard in the speaker. Keeping the receiver in this condition, slowly rotate the tuning control and a chirp, varying in pitch, will be heard as a C.W. station is brought in. As the exact resonance point is passed the note will vary in the opposite manner to that in which it was tuned in, and this passage through a C.W. station will give

**Two receivers in one—separate tuning circuits for each receiver—yet the same three valves are employed all the time. No specially-designed or stunt components are employed, and the receiver employs standard parts obtainable from any good radio dealer.**

you a very good idea of the sharpness of tuning on the short waves, and will enable you more easily to locate a broadcasting station or other transmitter employing speech or music. To assist in locating the short-wave stations a good pair of headphones has been specified in the list of components, and these should be employed instead of the loud-speaker for preliminary work. Once a number of stations have been located, the 'phones may be dispensed with and these stations tuned in on the loud-speaker. Other ranges on the short waves may be covered by using suitable coils, but more will be said of this next week.




*Theoretical circuit diagram of Mr. F. J. Camm's All-Wave "Silver Souvenir."*

## MAINS VERSIONS

### A.C. Mains Version

So extremely successful has the battery model of the "Silver Souvenir" proved to be that I have already spent a good deal of time evolving a mains-operated version. This work has been in hand for some time, and although the receiver and its design presented a somewhat more difficult problem than the design of the battery model, I am pleased to say that the finished receiver is even better than I had anticipated. All short-wave experimenters know perfectly well the difficulties of entirely avoiding all traces of mains hum when designing a really sensitive and powerful receiver, and I am thus all the more proud to be able to state that the A.C. "Silver Souvenir" is entirely hum-free. It is, at the same time, even more sensitive than the battery receiver, just as easy to operate and, in the completely-finished state, a slightly better receiver.

Those who are unaccustomed to short-wave work might think that this is just as it should be, since the same thing almost invariably applies when building a receiver for normal broadcast reception, but the more "knowing" and critical readers will realise what it means.

### Described in Later Issues

The A.C. version will be described in later issues, and will have a strong appeal to those whose houses are wired for an A.C. lighting supply. It is actually intended to operate on mains supplies rated at 200 to 250 volts at 50 cycles, but only a very slight modification will be necessary when it is wished to use the receiver on mains of different voltage or frequency rating. In any case the rating first mentioned is standardised in most parts of this country, but there are a few instances where the supply is non-standard and the modification will be desired. Probably this will apply principally to those readers who live in countries outside Great Britain, and who form so large a percentage of PRACTICAL AND AMATEUR WIRELESS, and who have so frequently written to me asking for a real all-wave receiver for mains operation.

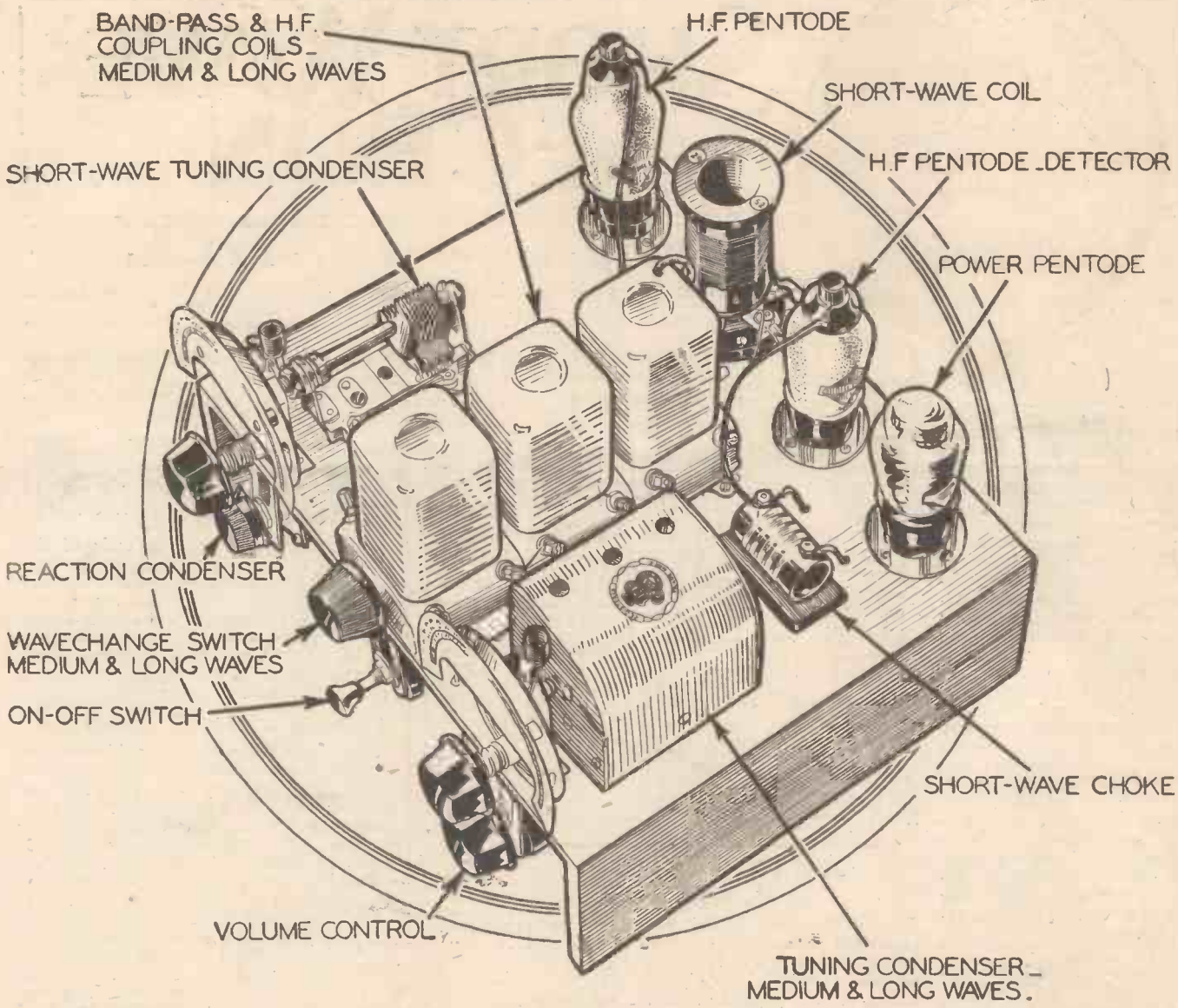
**A unique design of cabinet which not only greatly facilitates operation, but also houses test meters, periodicals, etc. A complete departure from standard practice, carried out in the modern design with chromium control knobs, handles, etc.**

### The Empire Programmes

I should add at this point that the "Silver Souvenir" is, in fact, intended very largely as an ideal instrument for those in distant parts who wish to avail themselves of the Empire programmes. During the past year or more I have received a constant stream of inquiries and pleas from these readers for such a set as the "Silver Souvenir." I have purposely refrained from publishing constructional details for the receiver they wanted, not because I should not have been only too pleased to render them every assistance, but because I felt that there were already a number of receivers available which were quite as good as my earlier experimental models. As soon as I found that I had produced—evolved is, perhaps, a more correct word—a receiver which I knew to be better than most others, and at the same time perfectly simple and reliable, I decided to let my inquirers have the benefit of my experiments.

*These two views of the "Silver Souvenir" show the neat and compact layout of the components.*

## Our Artist's Impression of the All-Wave Souvenir




### A Reliable Receiver

The A.C. version is absolutely reliable in every way, it is easy to build and operate, and just as safe to build and to use as any ordinary battery receiver. It does not differ in principle from the battery set but, as I pointed out above, it represents the result of patient work on the power-supply side. It is well known that the average type of mains short-wave receiver is very prone to give trouble due to the presence of "threshold" howls, capacity effects, and other forms of trouble which render the operation rather unpleasant and sometimes very "tricky." The A.C. "Silver Souvenir," however, is entirely free from all these forms of trouble, and I am satisfied that it is better than any previous receiver of its type which has been described in these pages. Indeed, had not this been the case, the receiver would never have been offered to readers.

I am not going to give any advance details of the parts required, nor of the exact circuit, at the moment, but the set will be described just as fully as the battery model in later issues.

### A Universal Version

It is possible that there are many readers who would like to have a D.C. or universal version of the set, and I have anticipated this by carrying out the preliminary experimental work with this object in mind. Perhaps readers would let me know if they are interested.

### LIST OF COMPONENTS FOR F. J. CAMM'S ALL-WAVE SILVER SOUVENIR.

**COILS.**

One set 3-gang W.L. type QRT (Wearite).
One short-wave coil, type S.P.C., with type S.P.B. base (B.T.S.).

**CONDENSERS (Variable).**

One 3-gang .0005 mfd. Baby condenser with slow-motion drive—C1, C2 and C3 (J.B.).
One single condenser, .00016 mfd., type E, with slow-motion drive, C4 (Polar).
One reaction condenser, .00025 mfd., type No. 4 C5 (Polar).

**CONDENSERS (Fixed).**

One .5 mfd. tubular—C10
Two .1 mfd. tubular—C7 and C9
One .01 mfd. tubular—C6
One .0001 mfd. tubular—C8
(T.M.C.).

**RESISTANCES.**

One 50,000 ohm 1 watt—R4
One 20,000 ohm 1 watt—R1
One 2 megohm 1 watt—R3
(Amplion).
One detector-bias resistor, type No.BR—R5 (B.T.S.)

**CHOKES.**

Two short-wave, type H.F.3 (Bulgin).

**VOLUME CONTROL.**

One 50,000 ohm potentiometer—R2 (Varley).

**TRANSFORMER.**

One Niclet, type DP21 (Varley).

**SWITCHES**

One 3-point on-off switch (B.T.S.).
One 4-way change-over switch (Wearite).

**CHASSIS.**

Metaplex, 12in. by 10in., with 3½in. runners (Peto-Scott).

**VALVES.**

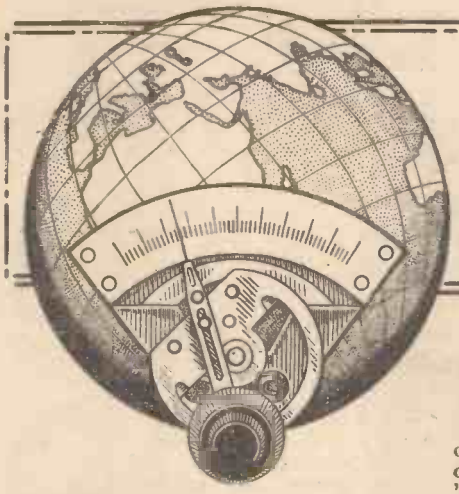
One 210 VPT, one 210 SPT, and one 220 PT (Cossor).

**VALVE-HOLDERS.**

Two 4-pin chassis type airsprung (Clix).
One 5-pin chassis type airsprung (Clix).

**ACCESSORIES.**

Four component brackets (Peto-Scott).
Eight wander plugs, H.T.—, H.T.+1, H.T.+2, H.T.+3, G.B.+, G.B.—1, G.B.—2, G.B.—3 (Belling Lee).
Two spade terminals, L.T.— and L.T.+ (Belling Lee)
Two terminal strips, L.S. A.E. (Belling Lee).
One permanent magnet moving coil Stentorian senior loud-speaker (W.B.).
One 120-volt H.T. battery (Siemens).
One 16-volt G.B. battery (Siemens).
One 2-volt L.T. accumulator (Siemens).
One Silver Souvenir cabinet (Peto-Scott).
One pair high-resistance headphones.



# SHORT WAVE SECTION

## Making a Receiver for Below Ten Metres

### The Construction of an Ultra-short-wave Receiver is by No Means Difficult, and the Main Points to Consider are Explained in This Article

IT is frequently considered that the design of a set for receiving on the ultra-short wavelengths is extremely complicated, and that a variety of special components is required. This is not, in fact, the case, and it is actually possible to use the very same circuit arrangement as for a normal short-waver, or even for an efficient broadcast receiver of the simpler type. The components are not unduly critical, and are now readily available in reliable form. It is not necessary to remove the base of the valves and to mount all the components on tall pillars, as used to be considered essential. In short, any constructor who has successfully made a broadcast receiver can easily build an instrument for use on the wavelengths below 10 metres—and at little expense.

### Available Transmissions

One of the deterrents to experimenters who would otherwise have no hesitation in making an ultra-short-wave receiver is the limited number of available transmissions, but this objection is quickly being removed due to the large number of amateur transmitters who are going down to the 5-metre band. Additionally, of course, there is the imminence of high-definition television programmes to consider, and all live experimenters will wish to be prepared for these transmissions immediately they commence, especially if the accompanying "sound" broadcasts are made on the ultra-shorts—as they most probably will be. The ultra-shorts are comparatively new and, therefore, call for experiment: after the preliminary experiments have been made, and constructors have become familiar with the reception of the high frequencies there is little doubt that the appropriate receivers will be just as reliable in every way as those now used for normal broadcast work.

### A Simple Circuit

The simplest type of circuit for the high frequencies is that shown in Fig. 1, which is seen to be an almost perfectly standard Reinartz arrangement. The principal differences are that there is no earth connection and the lower end of the aerial-coupling coil is left "free." This simple circuit can be used alone (for reception on 'phones), in conjunction with an L.F. amplifier, or as a converter preceding an ordinary broadcast receiver with an H.F. amplifier; the connections for the three different arrangements mentioned are indicated in Fig. 1.

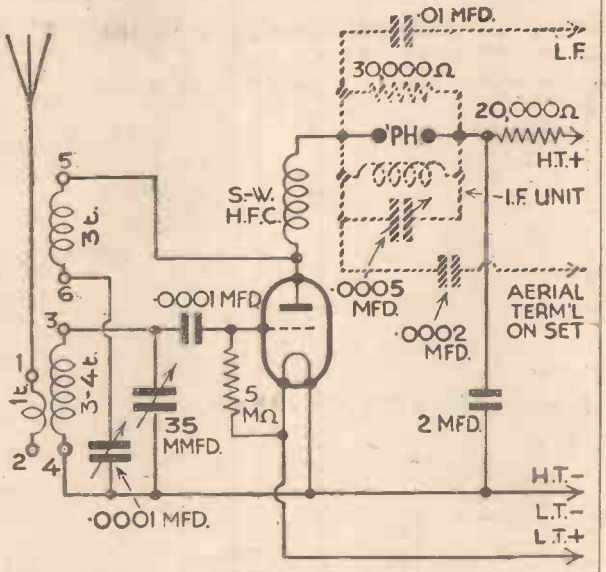



*Fig. 1.—The circuit of an ultra-short-wave unit which may be used either as a simple one-valve receiver by connecting the 'phones to the terminals indicated, as a converter by using the connections shown below the 'phone terminals, or in conjunction with an L.F. amplifier by using the connections shown above those terminals.*

### Making the Coils

The three coils required can be bought ready-made, preferably of the type made from copper tube, or they can easily be wound in "skeleton" form by using 14-gauge enamelled wire. This should be wound round a rod about ⅜in. in diameter, as tightly as possible, after which the turns can be allowed to spring open to a certain extent, when they will become approximately 1in. in diameter. An indication of the number of turns required is given in Fig. 1, but allowances will have to be made if the finished coil is larger or smaller in diameter than the figure mentioned.

It is essential that the coils should be quite rigid, since even the slightest amount of vibration of the turns would alter the frequency to such an extent that accurate tuning would be impossible. Rigidity can be ensured by mounting the coils as shown in Fig. 2 on an ebonite terminal strip, and using a tightly-fitting ebonite "comb" to hold the turns at the correct distances apart.

It is preferable that the ends of the windings should be soldered to the tags fitted under the terminals, and also that the connections to the coils should be soldered to the other sides of the double-ended tags as shown. Incidentally, these tags can be cut from a strip of copper or brass, since they will probably not be available in ready-made form.

### Plug-in Coils

A six-pin steatite plug-in coil former *can* be used in conjunction with a coil base, but this arrangement is not very good for two reasons: one is that the former introduces small capacity losses, and the second is that the friction contact—of the coil in the holder—is liable to give rise to "noise."

If it is proposed to make the coils from copper tubing, it is necessary first of all to anneal the copper by heating it to redness and then plunging it in water. After that the tubing should be cleaned thoroughly until the surface is quite smooth. It can then be wound round a wooden rod, taking care that it is not flattened to any

(Continued on page 123)

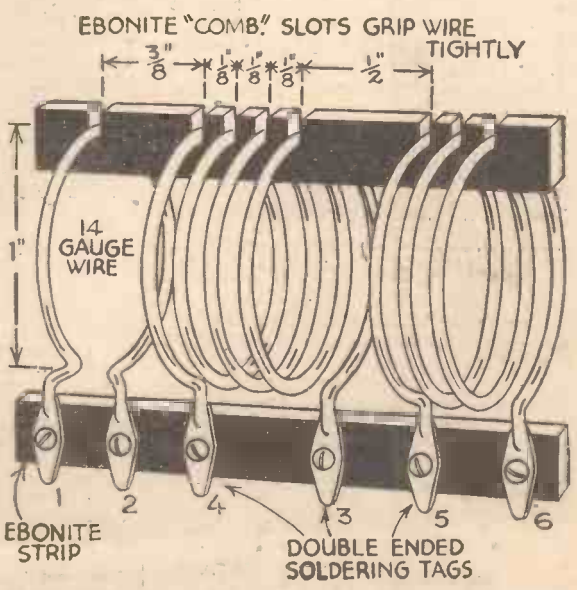



*Fig. 2.—Showing a convenient and simple method of making an under 5-metre tuner.*

[Est. 1919.]

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|---|---|---|---|
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| 1 | B.T.S. 6-pin Short-Wave coil, type S.P.C. | 4 | 6 |
| 1 | B.T.S. 6-pin Coil base, type S.P.B. | 2 | 0 |
| 1 | B.T.S. Detector Bias resistor, type B.R. | 1 | 6 |
| 1 | B.T.S. 3-point on/off switch | 1 | 3 |
| 2 | J.B. Disc Drives | 7 | 6 |
| 1 | WEARITE Set W.L. 3-gang coils | 1 2 | 6 |
| 1 | J.B. Baby, 3-gang condenser | 15 | 0 |
| 1 | POLAR .00016 mfd., type "E" condenser | 5 | 6 |
| 1 | POLAR .00025 mfd., reaction condenser | 3 | 9 |
| 1 | VARLEY 50,000 ohms Potentiometer | 6 | 0 |
| 2 | BULGIN H.F. chokes, type H.F.3 | 5 | 0 |
| 5 | T.M.C. tubular condensers | 5 | 6 |
| 3 | AMPLION fixed resistances | 3 | 0 |
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| 1 | WEARITE 4-way Change over wave switch | 4 | 6 |
| 4 | PETO-SCOTT 2½in. component brackets | 1 | 4 |
| 3 | CLIX Airsprung valveholders | 3 | 7 |
| 8 | BELLING LEE plugs | 1 | 4 |
| 2 | BELLING LEE spade terminals | | 4 |
| 2 | BELLING LEE terminal strips | 1 | 6 |
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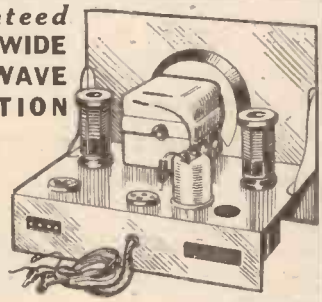

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(Continued from page 120)

appreciable extent. The ends may then be flattened by placing them on a hard surface and striking with a hammer, after which the separate coils can be mounted as shown in Fig. 2 by soldering them to the terminal tags. It should be stressed that the soldering should be well done, or it will be less effective than a friction contact. This means that the metal should be cleaned thoroughly, a non-corrosive flux (such as Fluxite) should be used, and the iron should be really hot, so that the solder "runs" easily.

### Other Components

It is not necessary here to describe the particular properties which the tuning and reaction condensers should possess, for that matter has adequately been covered in previous articles in this "Short-Wave Section." Let it suffice to say that these components must be of reliable make, and provided with good slow-motion drives. The H.F. choke can be made at home if desired by winding thirty turns of 24-gauge enamelled wire on a ½in. diameter paxolin tube. The turns should be slightly spaced by winding on two lengths of wire and removing one of these after attaching the ends of the other to suitable terminals. The latter should again consist of double soldering tags attached to the tube by means of rivets or small bolts.

### Superheterodyne I.F.

When the unit is to be used as a converter the I.F. coupling unit should be tuned to about 650 metres (465 kc/s) but there is a difficulty here, due to the fact that the average broadcast receiver will not tune to so high a wavelength. For that reason it may be necessary to use a wavelength of about 500 metres, although when this is done, there is a possibility of long-wave interference. The best method, therefore, is to use an ordinary screened broadcast coil in conjunction with a .0005-mfd. pre-set condenser. This arrangement will provide a form of band-pass coupling in conjunction with the aerial coil in the receiver. If, however, the latter is already provided with band-pass aerial tuning, it will be sufficient to use a good S.G.-type H.F. choke in place of the I.F. coupling shown. In either case, it will be found that if long-wave interference is experienced, it can be obviated by slightly altering the tuning of the broadcast set and the I.F. coupling.

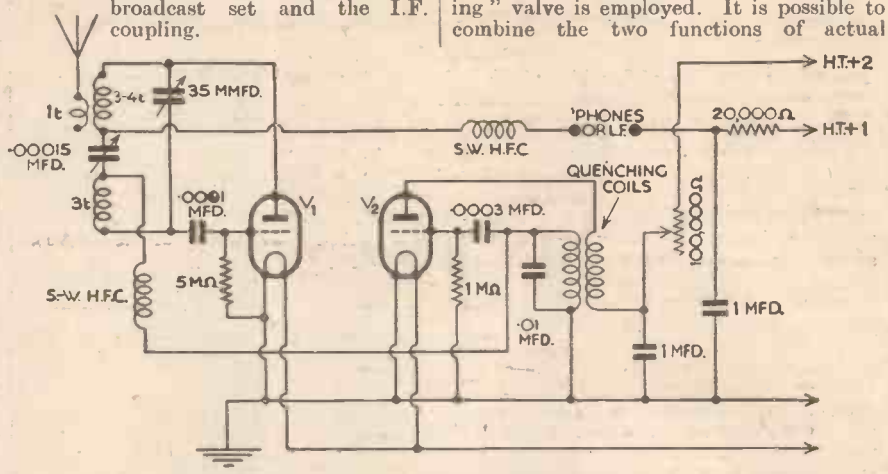



*Fig. 3.—The circuit for a two-valve regenerative receiver which has particular advantages for ultra-short-wave reception.*

### Broad Tuning Desirable

It is more than likely that when the high-definition television broadcasts commence, a circuit such as that dealt with above will not prove quite satisfactory, since it tunes too sharply, whereas a wide frequency-band-response will be required. That need not be a deterrent because the simple circuit will function on "sound," but it is well to consider other arrangements that will be more satisfactory for the "vision" part of the transmissions. One of the simplest circuits for providing comparatively broad tuning is the Armstrong super-regenerative, a circuit of which is given in Fig. 3. This differs slightly from circuits of a similar nature which have previously been described in these pages, since a separate "quenching" valve is employed. It is possible to combine the two functions of actual receiving and quenching by means of a single valve, but better results are obtainable by using the circuit shown.

A form of Hartley circuit is used for the first valve and the coils can be made in the same manner as explained above, but using only three turns for the grid and anode windings. Suitable values for the principal components are indicated, whilst the two quenching coils may be bought as a single unit from advertisers. They may be made at home, but the design calls for a good deal of experiment and, if they are to be really efficient, the construction is a little tedious. Besides, the price is quite low. The main points to observe in the operation of the super-regenerative receiver were described in PRACTICAL AND AMATEUR WIRELESS dated February 16th, so there is no need to repeat the information here.

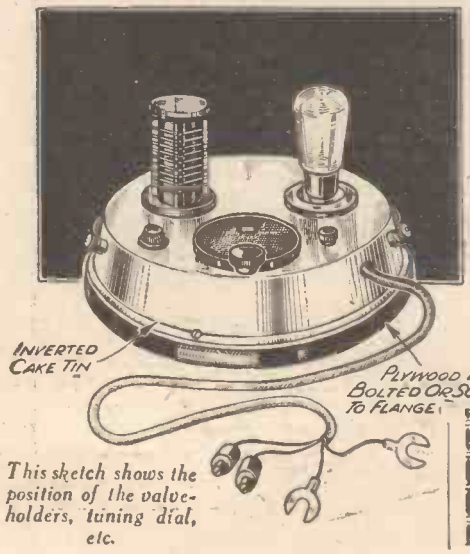
# A NOVEL SHORT-WAVE SET

## An Ingenious Receiver whereby a Cake Tin Constitutes the Chassis, Panel, and Cabinet

THE little single-valve set shown in the accompanying illustration strikes an entirely new note in home-built receivers. Its chief points of merit are cheap and simple construction, general rigidity, and pleasing appearance. It is built in a circular cake-can—obtainable from any general store for about sixpence. This tin forms a combined chassis, panel, and cabinet, and should be exactly the shape shown, with a flanged rim. Aluminium cans are preferable, but heavy tin is an excellent substitute.

The particular receiver shown is a single-valve S.W. set, employing "Eddystone" 4-pin coils; the circuit is a standard one. As it is only intended to convey the general idea, nothing is gained by describing the set in detail. The following constructional points, however, will be helpful:

Fixed condensers, gridleak, and choke are suspended in the wiring ("Glazite"). Terminals, except earth, are insulated. The set is mounted on a wooden disc slightly larger than the flange of the tin by bolts or screws; this keeps the set rigid and dustproof. Aerial condenser is 12 m.mfd., fixed inside set at right angles (or a 7 m.mfd. variable condenser between the valveholders). If used, the variable condenser must be insulated from the tin. The positions of the valve-holders, tuning dial, etc., are clearly shown in the illustration.—F. J. G.




*This sketch shows the position of the valve-holders, tuning dial, etc.*



# ITEMS OF INTEREST

### France on High Power

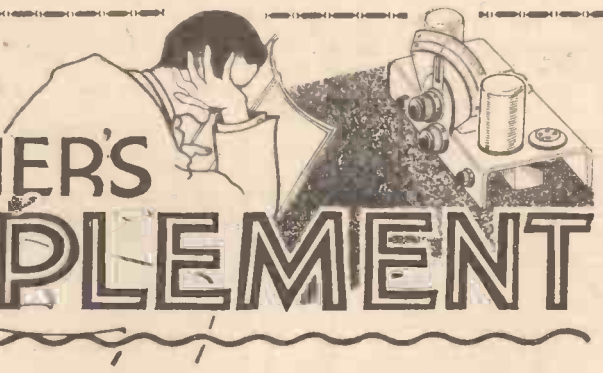
WORK on the new high-power transmitters is being hurriedly pushed forward, and it is reported that Toulouse-Muret (120 kilowatts), PTT Lyons-Tramoyes, and PTT Lille-Camphin (60 kilowatts) will start testing at the end of April.

### A Belgian Radio Train

IN view of the success achieved last year by the Radio Tourist Express, last summer, the Belgian Railways have decided to introduce a similar feature this year. It is a train equipped with radio receiver, gramophone amplifiers, and microphone, which makes a daily circular tour of the kingdom. An appointed guide broadcasts at intervals a running commentary on all points of interest passed during the trip. News bulletins and concerts from the Brussels studio are also transmitted at regular intervals.

In Search of Sensitivity

By H. Beat Heavychurch.



# BEGINNER'S SUPPLEMENT

**The Whole Question of Sensitivity is Examined to Ascertain to what Extent, and with what Efficiency, Different Sections of a Receiver Circuit Play Their Part.**

THE radio-frequency voltage developed across the aerial tuning circuit of a broadcast receiver may be a matter of only a few microvolts—millionths of a volt—yet the audio-frequency voltage which must be applied to the terminals of a loud-speaker of average efficiency, in order to obtain the minimum output of sound which can be considered satisfactory, is between 15 and 20 volts. From this statement it will be gathered that a total amplification of the order of some hundreds of thousands is necessary for the efficient reception of the weaker programmes. It is one of the wonders of radio that modern receivers can easily give this enormous degree of amplification and, at the same time, reproduce programmes with a very satisfactory degree of fidelity.

The overall gain of a receiver is often referred to as its "sensitivity," and is usually expressed numerically by stating the minimum high-frequency signal strength in microvolts, which it will reproduce with an output of 50 milliwatts—this power being the minimum for comfortable listening. For purposes of comparison the high-frequency signal is usually considered to be modulated 30 per cent. Clearly, the more sensitive the receiver, the smaller will be the minimum signal strength which it will reproduce satisfactorily.

## The Earliest Point

When we remember that a modern receiver comprises high-frequency and/or intermediate frequency amplifying stages, a detector which, unless it be of the diode type, also amplifies the signal and one or more low-frequency amplifying stages, it will be clear that the total sensitivity of the set does not reside in any one portion of the circuit. It is a property which is distributed throughout the receiver, and to which every stage contributes its quota.

It may come as a surprise to some listeners to learn that the earliest point in a receiver circuit at which a gain may be obtained is in the aerial tuning circuit itself. Yet it is, nevertheless, a fact that, providing the coils are of really high efficiency design, a voltage gain of up to about two may be experienced here. It is safe to assume, however, that in the average receiver the added sensitivity due to the aerial coil is a very small amount, and this effect will, therefore, be neglected in our review of the subject.

## Stage Gain and Amplification Factor

In these circumstances, attention must at once pass to any high-frequency amplifying stage which may be incorporated in the receiver. Here there are very great potentialities for voltage gain, as will be clear from the statement that modern H.F. pentodes, for example, possess amplification factors in the region of several thousand. But readers must be careful not to run away with the impression that the stage gain is even roughly equal to the amplification factor. The figure known as the amplification factor does, within certain limits, help us to compare the probable performance by way of amplification of two valves. For example, a valve having an amplification factor of 30 would, *in a suitable circuit*, give about twice the voltage gain obtainable with a valve having an amplification of fifteen, again in a suitable circuit. But the actual amplification will certainly not be thirty in the one case, or fifteen in the other.

*Three-quarter front view of the Battery Hall-Mark Four.*

## The Secret Lies in Circuit

It is not intended to go into mathematical explanations here, and it will suffice to remind readers that the actual amplification obtained depends upon the amplification factor of the valve, and also upon the relation between the impedance of the load connected in the anode circuit of the valve and the impedance of the valve itself. The higher the load impedance, within certain limits, the higher the amplification.

## Actual Figures

In the case of the high-frequency amplifying stages, the load impedance depends upon the "goodness" factor of the coils employed and upon the accuracy with which they are tuned to the incoming signals. An average tuned-anode or tuned-grid circuit has an impedance of the order of 100,000 ohms, and it is unlikely that a load impedance of twice this amount can be achieved in amateur-built sets.

Under quite good conditions, therefore, it is safe to assume that the voltage gain in an H.F. stage, using a battery screen-grid valve, will be between 120 and 180, and with an H.F. pentode, between 150 and 250. Somewhat higher gains may be expected in a mains set, and the gain in the intermediate frequency stages of a superhet are more likely to be near

(*Continued on page 126*).

*Rear view of the £5 Superhet Three.*

(*Continued from page 124*)

the higher of the figures just quoted, since losses in intermediate-frequency stages are less than in radio-frequency stages. With care in the choice of components, and in general design, therefore, we may depend on a gain of about 200 in the radio-frequency or I.F. stage, and, one of 40,000 with two such stages.

In the detector stage we have a choice of various methods of detection, but only the two methods which represent the latest practice will be dealt with here, namely, power-grid detection and diode detection. In the case of a power-grid detector coupled to the following stage by, say, a 3.1 transformer, it will be safe to assume that the average gain will be about two-thirds of the amplification factor of the detector valve, this estimate being based on a signal modulated to a depth of 30 per cent.

Using for the detector, therefore, a valve of the usual HL type, a gain of about eighteen can be anticipated in this stage, making, with the two H.F. stages, a gain of about 720,000.

In the case of diode detection, no amplification is obtained in the rectifier, but if the diode is followed by a triode amplifier, either as a separate valve or in a double-diode-triode combination, matters are somewhat evened up. For a mains set using either a power-grid detector or a diode-triode combination, the gain will be of the order of 25.

## Explaining Output Conditions

Finally, we come to the power stage, and here a little explanation is necessary. We have become accustomed to look upon the output valve merely as a device for producing a large amount of audio-frequency power, and are apt to forget that in doing so there occurs what is equivalent to a certain amount of voltage amplification. But this will be easily understood if we consider first the power "recorder" in the output circuit—*i.e.*, the speaker. The usual load impedance is about 7,500 ohms for a pentode type speaker and 4,000 ohms for a "power" type instrument. Taking the 7,500 ohm value, it is clear that, if a minimum output of 50 milliwatts is to be developed, a definite minimum audio-frequency current component must flow through the windings. This minimum current can be calculated, the formula, for those who wish to verify it, being:—

$$\text{watts} = \text{current}^2 \times \text{ohms}.$$

The value of audio-frequency current for 50 milliwatts output in a 7,500 ohm load is a little over 2.5 milliamps., and a moment's application of Ohm's Law will show that to drive 2.5 milliamps. through an impedance of 7,500 ohms requires a voltage of just under 20 volts. Clearly, it will not be necessary to apply 20 volts to the grid of an output pentode to produce 50 milliwatts output, and the 20 volt A.C. drop across the load is a measure of the voltage gain in the output.

Now, unfortunately, it is not an easy matter for the amateur to arrive at this figure. Therefore, for the purposes of this article we shall have to assume that an audio-frequency grid signal of the order of a volt is necessary for minimum reasonable operation for the average pentode, and from twice to three times that amount in the case of a triode.

Using a pentode of average sensitivity, we must, for minimum listening, with a 30 per cent. modulated signal, obtain an audio-frequency voltage of 1 volt or so at the grid of the output valve. We cannot expect a gain of more than about eighteen—say twenty in round figures—from the detector stage, so that the input to the detector must be at least .05 volt, or 50,000 microvolts. A single H.F. stage of efficient design may give a gain of about 200, which means that a set having an H.F. stage, detector, and pentode output will give reasonable reception down to 250 microvolts.

Theoretically, an additional H.F. stage should give a further gain of about 200, making it possible to receive a signal of only 1.5 microvolts. But now we come up against practical difficulties. In the first place, there are numerous small voltage variations generated in a receiver itself—usually referred to as "valve noise"—which act as small signals, and their audible effect will certainly be comparable with the effect of signals as feeble as 1.5 microvolts. It must be remembered that for signals to be enjoyable, they must be many times stronger than any interference, and so a signal much less than 20 microvolts is of very little programme value.

## The Coils

The actual winding of the coils will depend on the use to which the galvo. is to be put. If it is intended primarily for a voltmeter, the windings will need to be of high resistance, but if, on the other hand, it is to be used as an ammeter or milliammeter, then the windings should be of low resistance. On the coils in question there are wound 2,000 turns of 34 enamelled wire, 1,000 turns on each bobbin.

No special precaution is necessary during the winding, other than keeping the turns on each coil in the same direction and making the layers as even as possible without stretching the wire or letting it get too loose.

Once the bobbins have been wound they can be mounted on the baseboard, being held in position by a smear of adhesive and tiny wooden blocks fitted to the outside corners.

It is an advantage to have the magnetic system in position before the bobbins are finally secured, as this allows the distance between them to be made as small as possible consistent with free movement of the needle strip.

The end of the winding of one coil can now be connected to the commencement of the other winding, thus leaving two ends which are brought out to two terminals fitted to the end of a suitable terminal strip.

The scale (Fig. 9) can be cut from stiff white cardboard, after it has been marked off in degrees or sections according to requirements. It is mounted on the upper edges of the bobbins, and held in position with a touch of adhesive.

While a galvanometer of this type is primarily intended for comparison readings, it is quite possible to mark off the

# THE GALVANOMETER: ITS THEORY and CONSTRUCTION

(*Continued from page 86, April 6th issue*)

scale in milliamps. and/or volts, providing some standard is available to enable calibration to be obtained.

With the specified windings, quite a reasonable deflection can be obtained when half a milliamp. is flowing, while a full scale deflection is given by approximately 6 milliamps. If a low reading milliammeter is available, this should be connected in series with a 2- or 4-volt

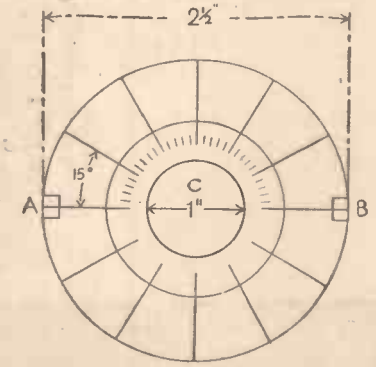



*Fig. 9.—How to mark out the scale.*

battery, a 10,000-ohm variable resistance, and the windings. The resistance should be adjusted until the lowest current is passing which will give a deflection on the galvanometer. When the needle is perfectly steady the milliammeter reading should be marked on the scale at the point indicated by the pointer. This process is repeated for as many values as possible, and it should be noted that the movement is *not directly proportional* to the current flowing.

To enable higher readings to be obtained, it must be appreciated that it is not a difficult matter to arrange external resistances so that multiples of the original maximum current can be measured.

Owing to the sensitivity of this instrument, it will be found that 1½ volts will

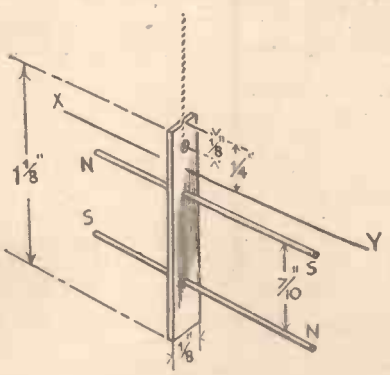



*Fig. 10.—Simple suspension frame for the needles and pointer.*

give a full scale of deflection, therefore it is not a difficult matter to arrange external resistance in series to enable this to be read as 150 volts.

While the details contained in this article relate to one particular form of galvanometer, which provides a cheap, reliable, and useful meter for the radio or electrical enthusiast, it must be appreciated that the fundamental theory can be adapted to suit any specific requirement.

# LEAVES FROM A SHORT-WAVE LOG

By J. G. ABRAHAMS

WITH the advent of spring and the consequent approach of longer daylight hours we must revise our listening hours in respect to the different wavebands.

Starting in the early morning—say, from G.M.T. 06.00-09.00—the best signals on the 30-metre band will be those from Australia; from 09.00 until 14.00 the entire band 19-50 metres will be workable for stations situated on the European Continent, and later, until 18.00, the signals on these channels will be available from the Far East (say, Japan), North America, and Africa. For broadcasts from Canada and the U.S.A. we shall do well from 18.00 onwards to remain on the 30-50-metre band, working up from 40-50 metres for transmissions from North, South, and Central America from midnight until 05.00 the next morning.

We may also expect at this season of the year alterations in time schedules, and also in the wavelengths used by the transmitters. In these columns the changes will be given as and when reported.

## Hungarian Transmissions

In the meantime an amendment should be made to the details you may possess regarding the short-wave Hungarian transmissions. From March 31st, HAS3, Szekesfehervar, which relays portions of the Budapest programmes, works every Sunday from G.M.T. 14.00-15.00 on 19.52 metres: HAT4, from that date, transmits special radio entertainments every Monday from G.M.T. 23.00-24.00 and the wavelength has been lowered from 55.56 metres to 32.88 metres (9,125 kc/s), the power of 20 kilowatts remaining the same as hitherto.

Radio Smeraldo (Rome) has been very active during the past fortnight with transmissions to the United States, South America, and also to the Far East (China and Japan). The four channels mostly used at present are: 49.3 metres (6,085 kc/s), 30.67 metres (9,780 kc/s) and 25.4 metres (11,811 kc/s), but tests have been carried out on other wavelengths, such as 31.25 metres (9,600 kc/s) and, I understand, 31.13 metres (9,635 kc/s). For this reason there is a possibility that at times you may pick up Italian announcements and broadcasts on unusual condenser dial readings.

In addition to the above-mentioned channels, Italy for its short-wave transmissions from Prato Smeraldo is entitled to use 42.98 metres (6,980 kc/s), 48.7 metres (6,160 kc/s), 49.46 metres (6,065 kc/s), 52.4 metres (5,725 kc/s), 53 metres (5,660 kc/s), 53.48 metres (5,610 kc/s) and 54.01 metres (5,555 kc/s). The power of the transmitters is 20 kilowatts.

## Costa Rica

Interesting loggings recently made on channels above 50 metres—a band which, as a rule, the DX listener seldom explores—include San José TIGP3 (Costa Rica), advertised to work on 51.55 metres (5,820 kc/s). This station was found on 5,777 kilocycles, namely, much closer to Lima OAX4D, which was also captured between 1 and 1.30 a.m. on the same morning. At a subsequent sitting, TIGP3 was found on a slightly higher wavelength coinciding with its own declaration that it was working on 51.93 metres. It does not appear to have adopted any distinctive interval signal. OAX4D, Lima, on the other hand, was identified by its slogan added to the call, namely, *La Voz del Peru*, and was striking a gong four times between items. The station closes down at about G.M.T. 04.30 with the call followed by its morse equivalent.

YV5RMO, Maracaibo, which has been steadily operating on 51.28 metres (5,850 kc/s), has also been a repeated "log," as of the Venezuelan stations it is one of the best signals. Although at times a man's voice is heard, most of the announcements are given out by a woman.

A station less frequently mentioned is YNLF, Managua, the Voice of Nicaragua, which, on 50.42 metres (5,950 kc/s), should be tuned in just after midnight. It is usually on the air for two or three hours—the schedule does not seem to be a fixed one—and signs off with a military march replete with bugles and kettledrums.

Finally, HJ1ABC, Barranquilla, 49.65 metres (6,042 kc/s) and YV4RC, Caracas, 47.06 metres (6,375 kc/s) were also secured during the same period.

## Centre of World's Radio-telephony

An interesting fact very clearly revealed in a map of the International Radio-telephone Service comprised in "Newnes' Modern World Atlas," one of the valuable gifts recently given to its readers by PRACTICAL AND AMATEUR WIRELESS, is that London is the centre of the world's radio-telephony network. To listeners on short waves it shows clearly the system which covers not only the British Empire but the entire globe. From it you will also see that if Cape Town, as an example, wishes to communicate with Sydney or Montreal, the wireless messages are relayed through Great Britain. It is this point which is important when, by accident, the listener picks up scraps of conversation on an unusual wavelength, that is to say, not the normal one of a transmitter in the country from which the message emanates. The study of such a map in these circumstances will frequently assist the identification of a station.

# LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.

All letters must be accompanied by the name and address of the sender (not necessarily for publication.)

## Flat Baseboard versus Chassis

SIR,—I have been a reader of PRACTICAL WIRELESS since your first issue, and congratulate you on your success in maintaining such a high standard. I may mention that I have been a keen enthusiast since 1919, when I built my first set. Your paper leaves little to be desired, but there is one point which has frequently struck me when studying the designs you publish.

I notice that you nearly always publish the designs for your sets in more than one version, namely battery, A.C., D.C., and sometimes universal, which is, of course, excellent practice. But always these sets are of the "chassis" type, with so much of the essentials hidden away beneath the baseboard.

Until four or five years ago this practice was the exception rather than the rule, and home constructors' sets were designed to use a flat baseboard, with all the components easily accessible.

While appreciating the fact that the "chassis" type of set is probably preferred by the majority of set builders to-day, I feel there are probably many like myself who, being of an experimental nature, would prefer to build your sets by the older method.

I wonder if you would consider publishing with your designs a small diagram showing the *lay-out* for the set using the older style of baseboard, where everything is on the top? Just the lay-out is all that is necessary, as the theoretical circuit is sufficient for wiring details.

It would be very interesting to learn what other readers think of this idea. Personally, I would particularly welcome a design on the lines I mention incorporating a really "straight" circuit of four valves, viz.: 1 H.F., det., 1 L.F., and power, both latter stages transformer-coupled, with "ordinary" ganged coils and condensers, differential reaction, and without any "frills," which, in the majority of cases, prove to be unnecessary and not worth the additional expense.—ERNEST F. WEST (Tooting, London, S.W.).

## "A Gift at the Price"

SIR,—I have just received my copy of your "Television and Short-wave Handbook," and am highly pleased with its contents, which are written in a clear and concise manner, characteristic of all the excellent articles which are published in PRACTICAL AND AMATEUR WIRELESS.

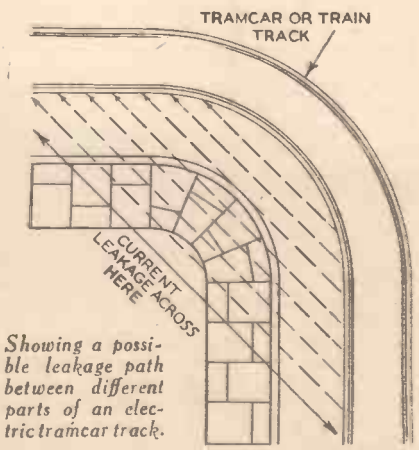
I have been a regular reader of your journal for some years now, and have no hesitation in saying that in my opinion it is the best wireless periodical on the market, and absolutely a gift at the price for the valuable information contained therein.—H. E. FULLER (Acton).

## A Crystal Microphone

SIR,—With reference to my short article on a crystal microphone, which was published in the March 16th issue, a fine copper wire *must* be bound around the piece of crystal *outside* the diaphragm, and locked under the wood screw at the side. Without this, the microphone will not function. After binding on the wire the crystal must be firmly stuck to the diaphragm.—A. BINGHAM (Liverpool).

## An Experience with Earths

SIR,—The accompanying sketch may explain the phenomenon experienced by H. C. E., of Reading. If he lives near to a tramcar or railway track there is a possibility of the return current leaking, *via* earth, to another part of the circuit and causing the voltage drop which he measured. There is also a possibility of leakage from some large electrical apparatus nearby.—ROBERT BARLOW (Prestwick).




*Showing a possible leakage path between different parts of an electric tramcar track.*

## REPLIES IN BRIEF

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

**R. H. (Sheffield 8).** We have no blueprint of a Sensity coil set. Your two-valver could be converted into a three without the use of further tuning arrangements, simply by adding an L.F. stage. A.V.C. will function with a single H.F. stage, but full advantage cannot be taken of the arrangement without a greater degree of H.F. amplification.

**P. S. S. (Norwich).** Care should be exercised as the combined arrangement will become in effect a double-superhet, and whistles may become objectionable.

**R. C. (Purley).** You could use the converter with your receiver, but we would not recommend the use of universal valves and voltage supplies. Connect the converter with batteries, as described in the article.

**D. H. (Worksop).** You could not use S.G. detector followed by Class B. Preferable arrangement would be detector and two L.F.s. Valves could be placed as close as desired to accumulator without ill-effects. Would advise you to watch our pages closely in the near future.

**W. P. (Liverpool).** Either the switch is wrongly wired or of the wrong type, or the coil is not a standard dual-range coil for the broadcast band. Cannot give further information without a diagram of the coil windings and connections.

**G. G. (Alfreton).** The recent article on pick-up and instability will probably have been of assistance to you.

**G. M. (Fishpool).** Method of curing the hum depends on the type of hum. It may be mains fed, or it may be picked up by the aerial. Would recommend you to read the various articles which we have published on the subject.

**W. L. (Finsbury Park).** The differences in tuning are probably due to the differences in the condenser capacities. Although they both have the same maximum capacity the minimum capacity may be different, and the "law" of the condensers may be different, thus providing a different capacity change for a given dial reading.

**J. M. (Derby).** A three-point switch should be required. Join terminals 6 and 7 together and connect to earth and to one contact of a three-point switch. Terminal 4 then goes to another contact on the switch and terminal 3 to another. This is all that is required, as the reaction winding is common to both bands. We cannot understand your problem regarding the volume control.

**H. S. (Roath).** The A.C. Hall-Mark] employed a straight push-pull circuit, not Q.P.P.

**G. P. W. (Hove).** A 5,000-ohm resistance should be joined in the grid-lead of your output stage. Simply remove the present lead and connect to one end of the resistance, and join the other end of the resistance to the grid terminal. This should cure the trouble. A tone-control circuit across the loud-speaker may also be found necessary if reproduction is too shrill.

**I. A. (Maryport).** Would suggest that the present output valve be removed and the preceding valve be classed as a driver. This would leave the receiver as a four-valver, but with Class B output. If this is not done you might experience difficulty due to the driver overloading.

**A. L. (Westcliff).** Trouble may be due to a defective resistance which increases in value when it gets hot. Examine all resistances to check this point; also make certain the mains choke is not defective. Condensers will not increase the output.

**G. F. (Dublin).** Probably the coils are incorrect. Cannot tell you without further details, but obviously something was seriously wrong.

**I. V. E. (Eastbourne).** We are sorry that the information you give does not help us to diagnose your troubles. Rearrangement of the parts might have introduced some mistake in wiring.

**C. J. B. (Liverpool).** We think the alteration you suggest will be quite in order, but cannot say for certain without remaining circuit details.

**W. E. D. (Birkenhead).** Subject is too complicated for a brief reply. A complete constructional article would be required, and we do not think there is sufficient demand for an article of this type.

**L. R. (Cheshunt).** An extra valve should be used in your case, so as to use the additional unit as a converter and thus employ the superhet principle.

**A. A. C. (King's Lynn).** We would not advise the use of extra stages. Five valves should be ample, and there must be something seriously wrong with the set if you can only hear one or two stations. Further details are required for a complete reply.

**W. A. B. (N.W.1).** There is obviously a breakdown of some description, but we cannot locate it without further details. Are you using a common earth for set and eliminator? Remember that with D.C. the earth terminal of the set should not be joined to earth, but to a 2-mfd. fixed condenser interposed between earth and set.

**G. C. (Dundee).** We see no reason why the proposed changes should not function. As we have not tried the circuit in that condition we cannot guarantee the results.

**F. R. C. (N.W.5).** Your speaker would be quite satisfactory and no alterations should be necessary.

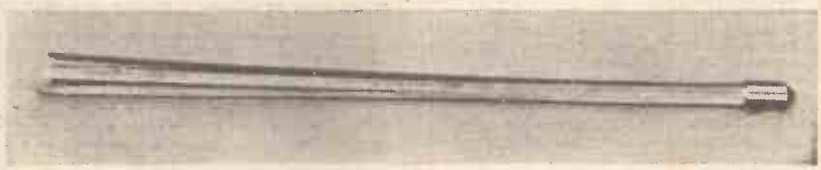
**R. P. J. (Llanarth).** The fact that the valve is metallised will not affect results. The metallising should be earthed, by joining the appropriate pin to earth.

*(Continued on page 132)*

# FACTS & FIGURES


## Spreadbury Earth Rod

MANY ingenious types of earth connection have been produced from time to time, and the latest, which is illustrated in the centre of this page, has certainly overcome many of the defects found with ordinary "single contact" systems. Even when a chemical earth is buried round the earth plate, the actual constituents of the earth at that point may not be the most suitable for an earth connection, owing perhaps to dryness or some other peculiarity of the earth's composition. One does not expect to go round the available ground digging and trying the various places in order to find the most suitable spot, and thus the Spreadbury device has a certain field of utility. As may be seen from the illustration, instead of using a single rod of copper, a number of strips of that material are attached firmly at one end but left free at the other. In all there are six such strips, and they are sufficiently flexible to enable them to penetrate the earth in a certain manner, whilst being sufficiently strong to avoid fracture. When pushed into the earth the six strips obviously take the easiest path and thus open out and go into the earth rather in the manner of the roots of a plant, so that should one strip penetrate into a naturally dry area, one of the remainder at least will find a spot which is more suitable for a wireless earth. Greater area of contact is also obtained, and thus the earth will be very effective, and no trouble is occasioned in fitting the device. The price is 3s.



*The Spreadbury earthing device.*

## Clix Seven-pin Anti-microphonic Valveholder

A SEVEN-PIN anti-microphonic, air-sprung chassis type valveholder is now added to the extensive Clix range and may be obtained in two different styles. One has terminals at the end of the sockets for connection purposes, and the other is intended for soldered connections. The price is 1s. 1d. for the latter pattern, and 1s. 4d. for the former.

## Microfuses

THE range of microfuses is now very complete and a fuse of this type may be selected for almost any purpose. As we have previously pointed out these do not employ the customary length of fuse wire, but the element consists of a thin gold film. Thus, it cannot deteriorate with time and will always give reliable service. There are now twenty stock ratings, ranging from 1 m.a. to 1 amp. The price of these fuses is 6d. each or 1s. with holder. In addition, some special light fuses are available rated from 20 milliamps. to 1 milliamp. and these cost from 1s. to 4s. 6d. each. An important point to bear in mind with regard to these fuses is that they blow instantly the current exceeds the rated carrying capacity, and the action is, owing to the nature of the gold film, quicker than can be obtained with the ordinary wire type of fuse.

## Magnum double-sided Multi-contact Switch

THE ingenious and useful multi-contact switch which we have reviewed previously in these pages has now been improved and is obtainable with extra wide spacing and with the contacts arranged on each side. For short-wave work this switch has now much greater application, and it may consequently be employed in receivers designed for all-wave work, without risk of introducing losses through the switching. Obtainable with either nickel-silver or gold-silver contacts, the standard types are provided with five, six, seven, eight and nine pairs of contacts, and the prices range from 5s. to 8s. The switch may be obtained with up to thirty-two pairs of contacts and may be provided with two to six positions. The makers are Messrs. Burne-Jones and Co., Ltd.

# 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.*

### INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THIS organisation held a combined meeting at the "Arcaris Cafe," Clock Tower, Leicester, on Sunday afternoon, March 31st. This meeting was attended by the members of the Leicester, Manchester, and London Chapters, and also by the many members residing in the North and Midlands. The meeting was preceded by a description of short-wave equipment by Mr. Wood, of Stratton and Co., Ltd.; there was also an exhibition of various "Eddystone" short-wave receivers. Among the speakers were Mr. A. E. Bear, the European and Colonial representative, Mr. C. Cramp, Chairman of the Leicester Chapter, and Mr. H. Wild, Chairman of the Manchester Chapter. —Arthur E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

### SHORT-WAVE RADIO AND TELEVISION SOCIETY

THIS society held its weekly meeting at St. Paul's Hall, Norfolk Road, on Tuesday evening last. The lecturer was Mr. G. Menage, representing Messrs. R. A. Rothermel, Ltd., whose subject was the application of "Rochelle Salt Crystals" to high-fidelity sound reproduction. Mr. R. E. Dabbs (2BUS), the Society's Vice-Chairman, occupied the chair.

The lecturer firstly explained how the Rochelle salt crystal provided a bending movement of the whole unit. Such a combination is termed a "bimorph" and may operate either by a bending or twisting movement. When the plates are joined together in one way the whole unit is sensitive to pressure and insensitive to mechanical vibrations. In this form the crystals are used for use in microphones, this produces an excellent microphone because the insensitiveness to vibration makes delicate handling unnecessary and the unit is shock-proof. When the plates are used in the obverse form, *i.e.*, insensitive to pressure but sensitive to mechanical vibration, they are very suitable for use in gramophone pick-ups, loud-speakers, etc.

A vote of thanks was accorded to Mr. Menage for a most instructive evening. For full particulars of the society please apply to Mr. Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

### SLADE RADIO

LAST Thursday at the Shakespeare and Dickens Rooms, the new headquarters of the Slade Radio Society, the Secretary gave a lecture and demonstration of his own set. It was a 2 H.F. detector, L.F. and push-pull output of 5 watts, with an R.K. mains-energised speaker and a Burndept pick-up.

It had been built for A.C. mains operation, and this evening was energised by a rotary converter loaned by one of the members.

The output on both radio and gramophone was sufficient to be heard in all parts of the room.

Next week there is to be a lecture and demonstration by Mr. Cowley, of E. K. Cole, Ltd., upon "Super-quality Car Radio." It is expected that a number of cars will be available for demonstration.—Hon. Secretary, Chas. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham.

### THE CROYDON RADIO SOCIETY

"LATEST Valve Topics" was discussed before the Croydon Radio Society on Tuesday, March 26th, in St. Peter's Hall, S. Croydon, the lecturer being Mr. B. R. Bettridge, of the Marconiphone Company. Dealing with diodes first, he sketched their uses, and pointed out in what way they were apt to give trouble.

Turning to triodes, the meeting had explained to it the construction of a new range of midget valves, and Mr. Bettridge went on to explain carefully what caused valve noises. Here it was interesting to note that in one experiment, secondary emission from the glass itself was taking place.

The lecturer could not escape without a treatise on the H.F. pentode, and he stated its advantages over the tetrode. Incidentally, the former's extra grid increased its impedance, which meant a larger plate and greater inter-electrode capacity with tendency for instability. The chairman, Mr. W. J. Bird thanked Mr. Betteridge, saying that everyone present had learnt something.—Hon. Secretary: E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

### THE RADIO, PHYSICAL AND TELEVISION SOCIETY

THE first of the society's Speaker and Pick-up evenings was held at 72, North End Road, West Kensington, when a large straight line amplifier was used. Perhaps the speaker which evoked most interest was a large M.C. model designed to handle 30 watts. Of no less interest, however, was an ingeniously constructed double linen cone speaker made by Mr. N. G. Read. This instrument gave results equal to many moving-coil speakers.

In addition to frequency test records, several discs, particularly suitable for test purposes, were used.

The next meeting will be on Friday, April 12th, when a lantern lecture, "The Romance of the Post Office," will be given by Mr. E. G. Nurse. Readers of PRACTICAL AND AMATEUR WIRELESS are cordially invited to attend.—Mr. Arnold (Assistant Hon. Sec.) 12, Nassau Road, Barnes, S.W.13.

## REPLIES IN BRIEF

(*Continued from page* 129)

**H. E. B. (S.W.6).** We regret we have no blueprint of a superhet using the particular components you mention.

**A. W. (Glasgow).** Would suggest you try the set with batteries as your eliminator may be unsuitable.

**P. D. (Leix).** Fault may not arise from the use of the Pye battery, but some component may have broken down at the moment you connected the new battery. To locate it careful tests would be necessary.

**G. W. (Mile End).** Valve may be faulty, but you should examine the L.T. and G.B. connections, in case a mistake has been made in the wiring and the G.B. voltage is being added to the L.T. supply.

**E. G. R. (Waldron).** We would suggest that you communicate with the makers as the particular aerial-tuning system may be faulty.

**T. D. (Belfast).** Additional current may result in wrong H.T. voltages, thus causing erratic reaction. There would be no harm in using the 1 watt resistances in place of the ½ watt specified.

## THE PLUS-1 UNIT

(*Continued from page* 102)

H.T. is inserted in the battery as near the maximum positive tapping as possible. The G.B. negative plug should be inserted into the tapping recommended by the makers of the valve which is being used

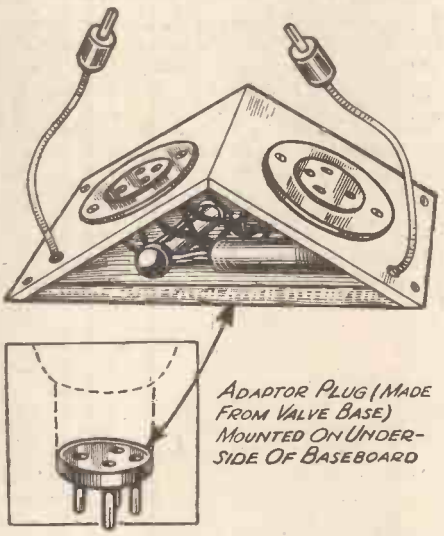



*Fig. 3.—Where space is very limited this construction will be found more useful. The slope of the side pieces should be chosen so that the valves will clear all other components.*

in the second stage. The receiver should be perfectly stable when the unit is added, and no troubles of any kind should be experienced. Now that the lighter evenings are coming, with the consequent drop in signal strength on distant stations, no doubt this handy little device will be very useful in order to obtain that little extra amplification demanded by the changed conditions.

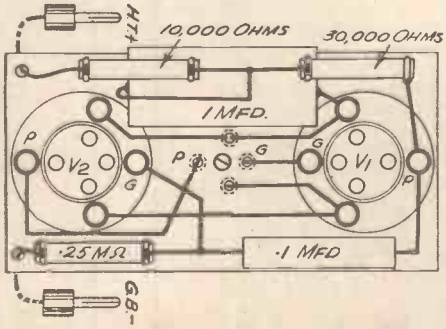
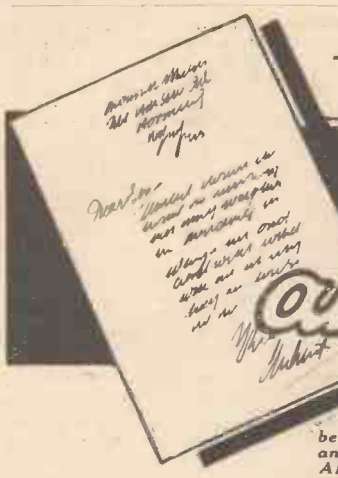
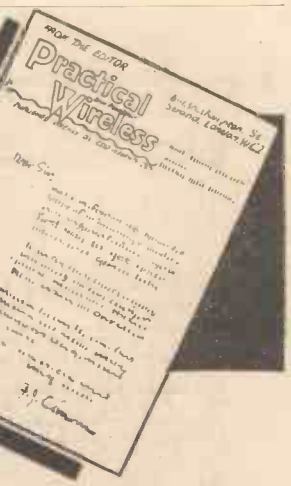



*Fig. 4.—Wiring plan using the flat construction. This may, of course, be modified to suit the particular construction which is adopted.*

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

# Queries and Enquiries






*If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.*

**SPECIAL NOTE**

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.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

(5) Grant interviews to querists.

## Transformer for A.C. Superhet

**"I am contemplating building your three-valve superhet, A.C. model, and desire to build the mains section as shown on page 359 of the issue dated November 24th. Will you please let me know the type number of a suitable Heayberd transformer for this purpose?"—G. E. B. (Barnsley).**

The Heayberd transformer type number W.31 will be suitable for your receiver. The 175-volt secondary tapping should be used, and the 4-volt, 5-amp. L.T. winding. The 4-volt, 1-amp. winding is for supplying a valve rectifier, and as the rectifier employed is of the metal type, this winding should be left disconnected.

## Speaker Details

**"I recently bought a speaker of the energised type. It is fitted with a 9in. cone, has a bright steel pot and has a depth of about 7ins. A piece of cardboard inside the box is marked Millgate, but there is no indication as to the voltage required, consumption in m/amps., or field impedance and speech-coil resistance. I wonder if you could supply me with the necessary particulars and also the best way of energising it?"—T. R. (Sheffield).**

We are sorry that it is impossible to give you the details you require from the meagre information which you supply. The only thing we can suggest is to communicate with the makers, who are Chorlton Metal Co., Ltd., Millgate House, 55, Blossom Street, Manchester. They will no doubt require some type number or other identification before they can give you all the assistance you need.

## A Soft Valve

**"Would you please advise on the following matter? Class B valve showing a filament glow and blue haze surrounding the plates which rises and falls with the volume of the broadcast. Is this as it should be? The receiver, a four-valver, has lately developed a pronounced microphonic noise which rather spoils reception. The supply is from the mains through an eliminator giving 150 volts 30 milliamps. The volume is good. Is there any way of stopping this noise?"—T. P. (Nr. Rotherham).**

The blue glow in the output valve denotes softness, which has been caused, no doubt, by over-running. This may be due to the eliminator which has been delivering more than 150 volts (due perhaps to bad regulation) and the consequent increased output has also overloaded and damaged the detector valve, thus giving rise to the microphonic noises. We would advise you to check the output from the eliminator very carefully and make certain that the valves are not being overworked.

## Microphone Connections

**"I have built the 5-watt amplifier from your issue for February 2nd. I am getting perfect results with the gramophone, but very poor with the microphone. Shall I be asking you too much as to how I can add an extra stage for the microphone?"—J. W. J. (Hythe).**

It should not be necessary to require another stage, and probably you are using the microphone in an incorrect manner. Remember that this instrument will require an input transformer, and this must suit the particular microphone you are using. Generally speaking the ratio of such a transformer will be between 50 and 100 to 1, and no doubt the makers of the mike will be able to supply you with an appropriate component. The volume would be poor if the microphone were connected direct in the grid circuit.

## Increasing the Power

**"I have a three-valve set and should like to know how to increase the power for foreign stations without altering the circuit."—W. G. P. (Brondesbury).**

A simple plug-in L.F. amplifier would no doubt suit your requirements, and such a unit is described in this issue. No doubt you will find this a simple way out of your difficulty.

## No Current

**"Having built the A.V.C. 4 I am sorry to say that I cannot get anything whatever through the last valve. I think the trouble is in the 5-pin valve—there seems to be no current whatever coming through the diode. Not having the valve you specified I was wondering if I ought to alter the resistance. Would you kindly let me know the best thing to do?"—A. B. (Brighton).**

We are sorry your query is not clear. Is the last stage faulty, or have you traced it to the double-diode-triode? You say nothing comes through the last valve, and this may mean you get no current. How have you tested the diode, to be able to state that no current "comes through it"?

## A.C. Mains Short Waver

**"I shall be glad if you will send me any information which you have dealing with a short-wave set for working on 200-volt A.C. mains, and also any information regarding a short-wave adapter suitable for use with a —— Model 272 receiver."—J. W. P. (Watford).**

We have not published a blueprint of an A.C. mains short-waver. Most well-designed battery short-wave receivers may be operated satisfactorily from the A.C. mains, but there are some difficulties in the way of designing a stable hum-free A.C. short-wave set, and no really satisfactory receiver of this nature has yet been found worth publication. With regard to your other query, some care is needed in using the combined apparatus in view of the fact that whistles may appear on every station due to interference with the I.F. circuits. Perhaps it would be worth while to communicate with the makers and obtain their opinion on the desirability of using the apparatus in this manner.

**The coupon on page 136 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 type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.**

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ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

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PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 ma. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each: 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes, Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6: 250, 112, 171, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59; send for catalogue of above types.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliamp-meters, 2½ inch outside diameter 18/6, 3½ inch outside diameter 22/6. Westinghouse Rectifiers for above 12/6 extra.

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BLUE SPOT P.M. Speaker, Multi-ratio transformer; Special offer, 16/-.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6; all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M. 7in. cone, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working 1/-; 15 mf. 100v. working, 1/3.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5, 3/-; Philips 6+4+2+1+1, 4/6.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v. 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps., 30 hys., 5/6; 150 milliamps., 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps., 20 hys., 2/9; 250 milliamps., 30 hys., 20/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt. 10/-.

PREMIER L.T. Charger Kits, consisting of Premier transformers and Westinghouse rectifier, input 200-250v. A.V., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Trusped Induction Type, A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

*(Continued at top of column three)*



*(Continued from foot of column one)*

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

POLAR STAR, manufacturers' model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

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KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

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SHORT-WAVE ENTHUSIASTS will welcome this "EDDYSTONE" high efficiency lead-in device. It makes sure that weak short-wave signals from thousands of miles away are carried safely to the set without loss at the point of weakest link in any aerial system.

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SOUTHERN RADIO'S WIRELESS BARGAINS:

SPEAKERS.—Blue Spot Permanent Magnet Speakers. Universal Transformers for Power, Super-Power, Pentode or Class B. All brand new 1935 series. Type 99 P.M., 30/-; 45 P.M., 24/-.

ELIMINATORS.—Regentone Eliminators, 1935 Series. Brand new and boxed. Type W.5a for A/C mains, 200/250v. With Trickle Charger for 2, 4 or 6 volt accumulators, 39/6. Type W1a (less Trickle Charger) to carry 30 milliamps, 33/-. Type W1C (less Trickle Charger), 30/-.

CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each, standard full size 0.0005 (not midget). Lotus 3-gang 0.0005, 11/-; 2-Gang 0.0005, 7/3. All Lotus Condensers Brand New. Fully screened with trimmers complete with Dials, escutcheons, etc.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 I.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5 with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New.

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MAGNAVOX speakers, complete with hum-bucking coil, output transformers, etc. DC152 (9in. cone), 22/6. DC154 (7in. cone), 16/-. All with 2,500 or 6,500 ohms fields.

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DUBILIER or TCC dry electrolytic condensers 8mfds. or 4mfds., 500v. working, 50mfds., 50v. 200mfds., 10v., 3/3. 50mfds., 15v., and 15mfds., 100v. 2/3. 50mfds., 12v., 2/-. TCC type "M" condensers, any value up to .001 mfds., 6d. Erie resistances. 1 watt type, 7d., 2 watt, 1/2, 3 watt, 1/9. Send for comprehensive list.

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MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

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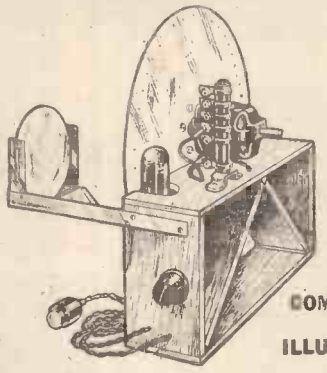

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***KITS DIRECT TO PUBLIC WE SAVE YOU POUNDS.***

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KIT C.—As Kit A, but with two Lucerne iron-cored canned coils, 14/6.

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RADIOMART. British Radiophone, 2-gang as above, but fitted Uniknob trimming; wavelength moving-scale dials, 8/3.

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RADIOMART. Radiophone Superhet Radiopaks boxed, circuits, 29/6; centre-tapped I.F.s with terminals, 3/6.

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RADIOMART. Telsen matched screened Dual-range coils 2/6, pair 4/6. Presets 9d.

RADIOMART. Differentials. Telsen .00015, .0003, 1/3. Astra .00015, 1/-. Polar .0003, 1/3.

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RADIOMART. Resin-cored solder, 9ft., 6d. Bulgin 1-amp. fuses, 2d. Bulgin twin fuseholders, 4d.

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RADIOMART. Western Electric microphones (cost £1/1/-), 2/9. Heavy mike transformer, 2/6.

RADIOMART. Supremus 27/6 battery economisers fitted Westinghouse Rectifiers; save half battery bill, 7/6.

RADIOMART. Igranic Class B Drivers, 1½-1, 2/11; Igranic, 8/6. Parvo Transformers, 1/11.

RADIOMART. NSF 8+8-mfd. electrolytics, 3/6. Dubilier 8-mfd., 2/11, both 500v. working.

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L. Ormond Sparks is in attendance between the hours of 9 a.m. and 6 p.m. weekdays and 7 p.m. and 9 p.m. on Monday, Wednesday and Friday evenings, at 9, PHOEBETH ROAD, BROCKLEY, S.E.4. Note new and only address.

VAUXHALL.—Station named scales for Radiopaks complete with Rivets. New wavelengths.

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VAUXHALL.—Magnavox energised types, 2,500 or 6,500: 10in. cone, 22/-; 7in. cone, 15/3. All brand new complete with humbucking coils, state power or pentode.

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VAUXHALL.—Benjamin. Class B transformers 1-1½ to 1. Terminals fixing, 6/6, boxed.

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VAUXHALL.—Dubilier or Radiophone tubular condensers non-inductive .1, 9d.; .05, 6d.; .002, .0002, and .0005, 4d. 1 mfd. Mainsbridge, 1/3; 2 mfd., 2/-; T.C.C. .002 mica, 2,000v. test, 10d.; .01, 1/-.

VAUXHALL.—Dubilier all values, 1 watt resistances, 7d.; Clix valveholders with terminals 5 pins, 7d.; 7 pin, 9d.; Continental 7 pin, 9d.; W.B., 4 5 pin, 4½d. Post paid, 2/6 or over or C.Q.D.

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**14/-** Only, usual price 45/-.—As above, but with 10in. cone, a very powerful quality speaker capable of handling large outputs.

**15/6** Only, usual price 35/-.—Permanent magnet model with cobalt steel magnet of high efficiency, 8in. cone, power, pentode, or universal transformer.

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**2/9** Only.—Brand new cabinets, suitable for any of above.

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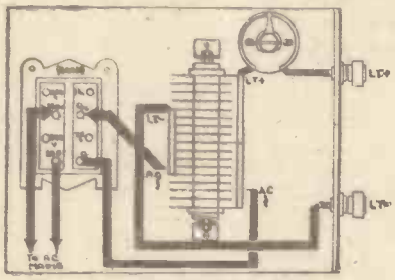


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RADIO CLEARANCE. Magnavox permanent magnet moving coil Speakers, 6in. cone, fitted pentode transformers; List price 27/6; our price 11/-.

RADIO CLEARANCE. Standard Telephones and Cables Mains Transformers, shrouded type, for H.T.8 rectifier, with 4v. 4amp. C.T., L.T. windings; exceptional value at 6/- each.

RADIO CLEARANCE. Utility 3 Gang Midget Type Superhet Condensers, 2 .0005 Sections and 110 kc/s Oscillator Section, fully Screened, with Trimmers, complete with Dial, 7/6.

RADIO CLEARANCE. Utility 3 Gang Midget Type Straight Condensers 3 .0005 Sections, fully Screened, with Trimmers, complete with Dial, 7/6.

RADIO CLEARANCE. Utility .0003 and .0005 Bakelite Dielectric Condensers, 9d. each.

RADIO CLEARANCE. British Radiophone 3 Gang Superhet Condensers, unscreened 2 .0005 sections and 110 kc/s Oscillator section. 3/11 each.

RADIO CLEARANCE. British Radiophone 110 kc/s, and 117 kc/s Intermediate frequency transformers: 2/6 each.

RADIO CLEARANCE. British Radiophone set of Superhet Coils, manufacturers' type, suitable for use with above advertised condensers: 5/6 per set of 3.

RADIO CLEARANCE. 8 mfd. and 4 mfd. dry electrolytics, 500 Volt working, well-known maker; 2/6 each.

RADIO CLEARANCE. Steel Chassis, cadmium plated, drilled ready for use, 4 and 5 Valve Type, 1/6; 7 Valve, 2/-.

RADIO CLEARANCE. 1 Gross ½ Watt Resistances colour coded, 12 each all good sizes (Plessey), 6/- per gross box.

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**COMPLETED SET.** Assembled, wired and aerial tested. Price **£8.8.0** or 15/- with order.

ACCESSORIES. W.B. Stentorian Senior Speaker, 42/-. Set specified valves, 33/-. L.T. Accumulator, double plates, 60 a.h., 7/10

Enclose also 3d. stamps to-day for our new fully illustrated Catalogue, containing many hundreds of amazing bargains. Fully illustrated. Send to-day.

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(*See also advt. on page 135, col. 1*)

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UTILITY SALES.—The "FAERITONE" Short Wave TWO with 3 sets of coils ready made 55/-, separate component list of prices with diagram, 6d. REGENTONE W.5.A 200/250 A.Vc. Eliminator with ½ Amp. charger 20 Milliamp 37/6. Ditto TELSEN 28 M/A 39/6.

**10,000** NEW DARIO Valves to clear. Detector H.F., L.F. 2/6, power 3/6, S.G., Pen. 5/6. TRIOTRON, all types 3/-, Power 4/-, S.G., Pen. 6/6.

DARIO 4 Volt Valves: Super H.F., Detector, R.C., L.F. 1/3.

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Television and Short-wave Handbook 9

# TUNING & OPERATING F. J. CAMM'S ALL-WAVE SILVER SOUVENIR


# Practical and Amateur Wireless

3d. EVERY WEDNESDAY

*Edited by* F. J. CAMM

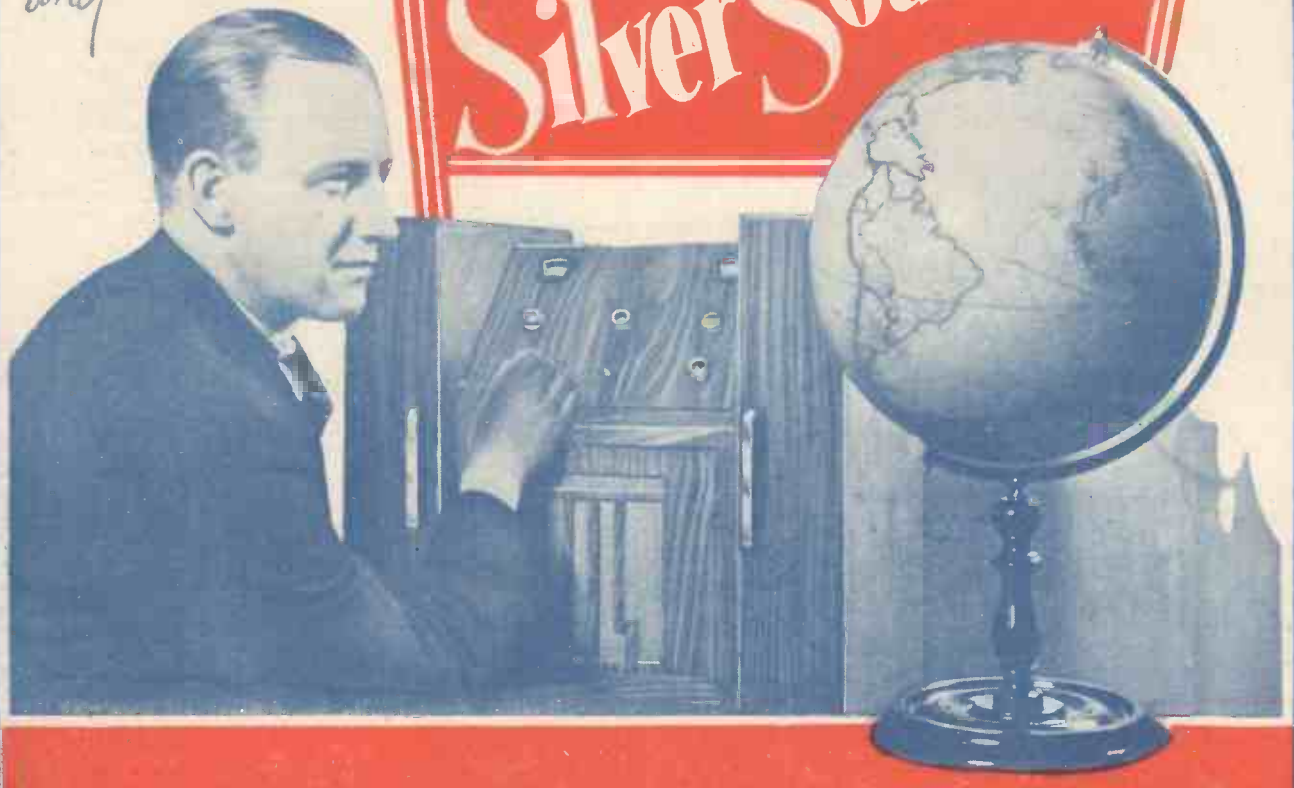
AND AMATEUR TELEVISION

A GEORGE NEWNES *Publication*

Vol. 6. No. 135. April 20th, 1935.


*Adjusting and Tuning*

## F. J. Camm's ALL-WAVE Silver Souvenir



# OPERATING F. J. CAMM'S SILVER SOUVENIR !

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. VI. No. 135. April 20th, 1935.

# ROUND *the* WORLD *of* WIRELESS

## Foreign Weather Reports

A LESSER-KNOWN station of which the daily broadcasts might be taken by listeners as part of a German radio programme is that of Norddeich which, on 1,571 metres (191 kc/s), gives out a weather forecast and navigational warnings on weekdays at G.M.T. 01.05 and 13.05, and on Sundays at 19.25. The call-sign is DAN.

In the same way OXY, Skamlebaek (Denmark), broadcasts a similar bulletin on 840 metres (357.14 kc/s) daily at G.M.T. 07.40, 09.40, 09.45, 13.40, 15.40, 18.40 and 20.40. For the benefit of British shipping, the warnings are frequently given out in the English language.

## Television in Turin

THE first Italian television transmitter has been installed at Turin, and is working on 5.05 and 8 metres. Receiving instruments which will shortly be placed on the Italian market will utilise the Zworykin cathode-ray tube.

## The Choice of a Word

IN Paris, where a television transmitter is being erected by the Paris PTT, an attempt is being made in radio circles to find a better word than television or radiovision. So far, the only alternatives put forward include such clumsy terms as: *teleorama, teleoptics, télethéâtre, radioptics,* and so on.

## Multi-lingual Broadcasts

WITH the exception of Moscow, which has made a speciality of international talks for some considerable time, Stuttgart is perhaps the European station which announces in most languages. If you listen to Stuttgart nightly (G.M.T. 23.00-01.00), you will hear the details of the programme given out in German, English, French, Spanish, Italian, Dutch and Polish.

## High-power Station for Afghanistan

TWO small transmitters are being installed at Kabul pending the building of a high-power transmitter. It is reported that the work has been undertaken by Soviet engineers, and that all the material will be supplied by U.S.S.R. radio works.

## The Austrian "Spring-cleaning"

IT is expected that the new Innsbruck station will be brought into operation towards the end of April, but will only work at full power in the autumn when the new aerial has been installed. Linz is to be given a 15-kilowatt station by the transfer of the Rosenhuegel plant from Vienna.

## Toning Down U.S.A. Programmes

IT is reported from New York that, at the request of a number of listeners, in future the North American stations will suspend the broadcast of gruesome relays which have been featured in the programmes. The general public, it is maintained, is not anxious to hear running commentaries on marine disasters or other equally heartrending catastrophes.



## An End to German Radio Publicity

IN the course of the daily programmes German studios for some time past have broadcast local commercial advertisements. In future, revenue from this source is to cease. From October 1st the German radio programmes will be shorn of all commercial publicity.

## Summer Time Changes

WITH the change-over of our clocks to British summer time on April 14th, some little thinking must still be done to ascertain the time in some European countries. France, Belgium, and Luxembourg put on their clocks one hour on March 31st, and to-day we are again level with them as with the Central European stations which carry out no alteration. Spain, Algeria, and Morocco retain Greenwich Mean Time throughout the year. Holland does not change until May 15th, when it is reported Russia will also adopt summer time.

## French Wavelength Changes

RADIO-NORMANDIE (Fécamp) owing to the removal of Eiffel Tower from the long-wave band, has been compelled to move up to 269.5 metres (1,113 kc/s). The Paris transmitter will, therefore, now be found on Fécamp's old channel of 206 metres (1,456 kc/s), a wavelength less subject to interference from shipping.

## Is This a European Record ?

THE Berlin station is now on the air daily from G.M.T. 05.30 to midnight, which spells a continuous broadcast of eighteen and a half hours. This daily radio programme will be maintained during the summer months.

## Publicity by Music

RADIO-AGEN, a small private French broadcasting station working on 345.6 metres, and which specialises in broadcasts advertising local wines, has now adopted as an interval signal a folk song praising the benefits of the vine.

## An S O S to Lost Friends

EVERY fortnight the Cologne studio stages a broadcast entitled *Wo bist du, Kamerad ?* (Where art thou, Comrade ?) It is destined to reunite war "pals" who, at some time or other, were serving in the same platoons. Letters are read detailing personal reminiscences, and, with the name of the writer, the call is sent out. The station has received though this means many replies, thus permitting the reunion of old comrades.

## Death of Well-known Inventor

MICHAEL IDVORSKY PUPIN, born in Idvor (pre-war Hungary) in 1858, recently died in New York, at the age of seventy-six years. He was the inventor of the pupinised cable which made the transmission of speech and music possible over long distances. When he first landed in the United States in 1874, he had five cents in his pocket, but soon took on successive jobs as ostler, muledriver, painter, and finally baker in a biscuit factory, where he saved money to secure tuition at the Columbia University.

# ROUND the WORLD of WIRELESS (Continued)

## Radio in French North African Colonies

WHILST devoting its main activities to an extension of broadcasting in France, the French State has not lost sight of possible improvements in the Algerian, Tunisian and Moroccan radio systems. To this end a scheme has been drawn up to supply high-power stations to these colonies. For Algiers something in the 75-kilowatt class is being considered, and for Rabat a station of at least 50 kilowatts.

AN H.M.V DE LUXE LOUD-SPEAKER

*One of the many specially-finished loud-speakers which "His Master's Voice" supplied for the replica of the King's house at Olympia. This one was situated in the study above a bookcase and concealed safe, and is finished in Canadian silkwood. It was operated from a "His Master's Voice" Model 800 Autoradiogram situated in the hall. In all there are seven H.M.V. loud-speakers in the house, and the actual instruments shown at Olympia will be installed in the finished house at Burgh Heath.*

Tunis, also, has been promised special plant to replace the present Kasbah transmitter working on 1,275 metres.

## "Workaday World"

THE eleventh talk in the series "Workaday World" will be entitled "The Academic View," and will be given by an ex-business man, Arnold Plant, Professor of Commerce to the London School of Economics, on April 26th, for Western listeners.

## Variety from Manchester

MUSIC-HALL variety has been a comparative rarity in Manchester during the past year; and the recent demolition of the Manchester Hippodrome in Oxford Street seemed to confirm its total extinction. But now a New Manchester Hippodrome is being started, under the same management, at Ardwick Green, in the building which was formerly the Ardwick Empire. An excerpt from the variety bill

**INTERESTING and TOPICAL PARAGRAPHS**

on the opening night will be broadcast to Northern listeners on Easter Monday.

## Bands Concert for Western Listeners

"OH, Listen to the Band" is the title of a programme for Western listeners in which three bands will be heard in succession. The first is the Cory Workmen's Silver Prize Band, conducted by J. G. Dobbins. This will be followed by the Bath Guitar Octette, arranged from The Tarrant Bailey Studios, and the Band of H.M. Royal Marines (Plymouth Division), conducted by Lieutenant F. J. Ricketts, relayed from the Sea Front Bandstand, Paignton. This programme will be given on Thursday, April 25th.

## Dunmow Flitch Broadcast

ON April 22nd listeners will again hear the Trial by Jury for the Dunmow Flitch. This trial, which has been broadcast four times previously, is held to discover the most deserving married couple, the prize being a flitch of bacon. As a rule, the judge, jury, and contestants are well-known humorists, and provide considerable amusement.

## "Yellow Sands"

THIS is the title of a Devonshire comedy by Eden and Adelaide Phillpotts, which has been adapted as a radio play and will be produced by Cyril Wood in the National programme on April 24th, and in the Regional programme on April 26th. This is the fourth play by Eden Phillpotts to be broadcast from the West.

## Motor-cycle Hill Climb Broadcast

ON Easter Monday the principal feature for Midland listeners will be a running commentary on Red Marley, the open hill climb organised by Birmingham Motorcycle Club. This will be given by Graham Walker, the old racing rider and former Captain of England's International team. One section of the hill, which is 550 yards long, has a gradient of one in one and a half.

## German Listeners

THE number of German listeners totalled 6,599,721 on March 1st, 1935. This is an increase of 160,489, or 2.5 per cent. The total for March 1st includes 477,312 free licences, of which 324,206 are issued to unemployed persons. The 40,000 listeners in the Saar territory are not included in these figures.

## "In Town To-night"

THIS popular feature will be heard for the last time this season on June 1st, but between now and that time it is proposed to introduce three or four Outside Broadcasts. Recently "In Town To-night" has been done from the studio, but to add variety the microphone will be taken out and will pick up features for "In Town To-night" in the highways and byways. This will give more local colour and possibly extra entertainment.

## Choral Concert from Plymouth

A CONCERT by the Plymouth Madrigal Society, conducted by Harold C. Lake, will be relayed from the Abbey Hall, Plymouth, on April 18th, for Western listeners. This society was formed in 1913, by Dr. Lake, at the suggestion of a few music lovers who were interested in unaccompanied choral music, especially that of the sixteenth century. The society has now a membership of about one hundred and occasionally combines with an orchestra to give works of special interest.

## "Music Hall" Broadcasts

THE B.B.C. announces that some variation is to be made in the broadcasting of "Music Hall" programmes which have hitherto been given on Saturdays. As from the beginning of May, "Music Hall" will be heard in alternate weeks only on Saturdays, while at other times it will be broadcast in mid-week. The first departure from the present arrangement takes place on Thursday, May 2nd. The change should enable many listeners to hear the "Music Hall" programme who have been unable to do so on Saturdays, as well as making for greater variety in Saturday evening entertainment.

# SOLVE THIS!

**PROBLEM NO. 135.**

Jackson had built a short-wave receiver, using some old components. To improve matters he soldered a short piece of wire to the moving spindle of the tuning condenser and connected the other end of the wire to a screw in the end plate. When trying out the set he found that at one position on the tuning dial a loud grating noise was heard through the 'phones and prevented reception. He naturally thought that the vanes of the tuning condenser were touching and accordingly examined the condenser. He found, however, that the vanes were equally spaced and were perfectly clean so that the noise was not caused by touching nor by dirt between the vanes. What was causing the noise? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 135 in the bottom left-hand corner and must be posted to reach this office not later than the first post Monday, April 22nd, 1935.

**Solution to Problem No. 134.**

Arthurs had overlooked the fact that the interference suppressor fitted to his mains plug was to prevent the passage of H.F. currents and consequently when he joined his aerial lead to it he received no wireless signals. The suppressor was efficiently stopping both the L.F. and the H.F. interference.

The following three readers successfully solved Problem No. 132 and books are accordingly being forwarded to them: J. A. Stanley Harris, 69, Firth Avenue, Kidsgrove, Stoke-on-Trent; F. Moore, 12, Salisbury Road, Washwood Heath, Saltley, Birmingham; E. Holtley, The Bungalow, Newton on Rawscliffe, Pickering, Yorks.

# COMPONENTS

## Their Action, Principle & Purpose

**This is the First of a New Series of Articles in which the Function of Every Component Used in Modern Receivers will be Explained in a Manner which will Interest the Beginner and More Advanced Experimenter**

ANYONE can easily make a successful receiver by following one of the many designs published in PRACTICAL AND AMATEUR WIRELESS, but there are comparatively few who have any real understanding as to how the receiver functions. It is all very well to have a knowledge of the general fundamentals and principles of reception, but it is impossible to gain a thorough knowledge without studying each component separately, learning what it does, how it does it, and why some particular value is most suitable.

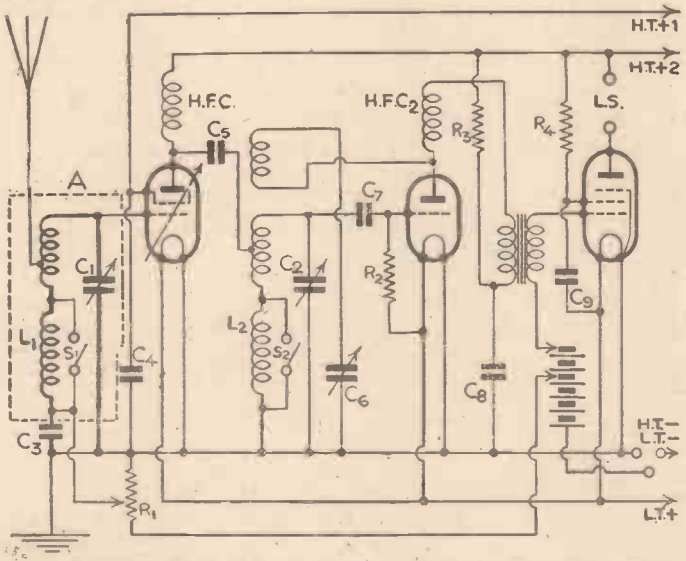



*Fig. 1.—The circuit taken as an example. Instead of assigning values to the components, these are indicated by letter references.*

In writing this article we are well aware that many previous articles of a rather similar nature have been published in the past, but in this instance we are tackling the matter in a somewhat different manner, so that the explanations given will benefit both the beginner to wireless construction and also the more experienced experimenter. We shall make our descriptions as simple as possible, but at the same time including technical details, simple calculations, and formulæ. Those who wish to ignore the simple mathematical portions of the articles may do so without losing the sense of the remainder, whilst those who are conversant with the fundamentals will frequently find something new in the method of treatment and in the simple analogies and methods of determining component values.

### A Typical Circuit

Rather than treat the complete assembly of component parts and circuits together, we shall deal with each separately, considering first the standard three-valve—variable-mu—det.—pen.—circuit shown in Fig. 1. The various parts have been annotated for reference purposes, but capacity, resistance, and inductance values have not been assigned. Beginning with the aerial-input circuit, we have the coil L1 (L is the letter used to denote inductance), and the variable condenser marked C1 (C denotes capacity). For the moment we can ignore the fixed condenser marked C3, which is joined between the lower end of the coil and earth, because this does not affect the present explanation.

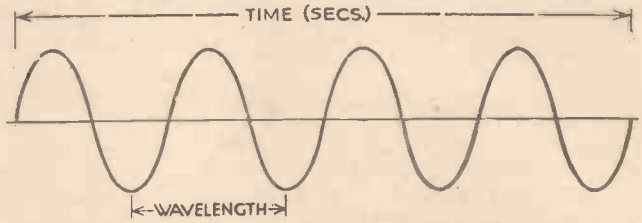



*Fig. 2.—A diagram which shows the relationship between wavelength and frequency. Frequency is the number of waves per second.*

### The Tuning Circuit

The coil and condenser together constitute what is known as an *oscillatory circuit*—for the simple reason that they respond to oscillating currents of a certain frequency, or of certain frequencies. Across a portion of the winding of the inductance coil there is connected a switch marked S1, which is for wave-changing, but this need not be considered at the moment. We need scarcely mention that the signals as sent out by a wireless transmitter actually consist of oscillating currents, or currents which are constantly varying from maximum to minimum, or, in other words, moving backward and forward at a given rate. It is the rate at which these currents change from maximum to minimum which determines the *frequency* (and also the wavelength) of any transmission. The relationship which exists between wavelength and frequency can be explained by saying that all wireless waves travel at approximately 186,000 miles (or about 300,000,000 metres) per second. Thus a wavelength of, say, 300 metres represents a frequency of 1,000,000 cycles per second. In other words, if the waves are 300 metres long the frequency of oscillation must be 300 millions divided by 300. On the contrary, a frequency of, say, 100,000 cycles, or

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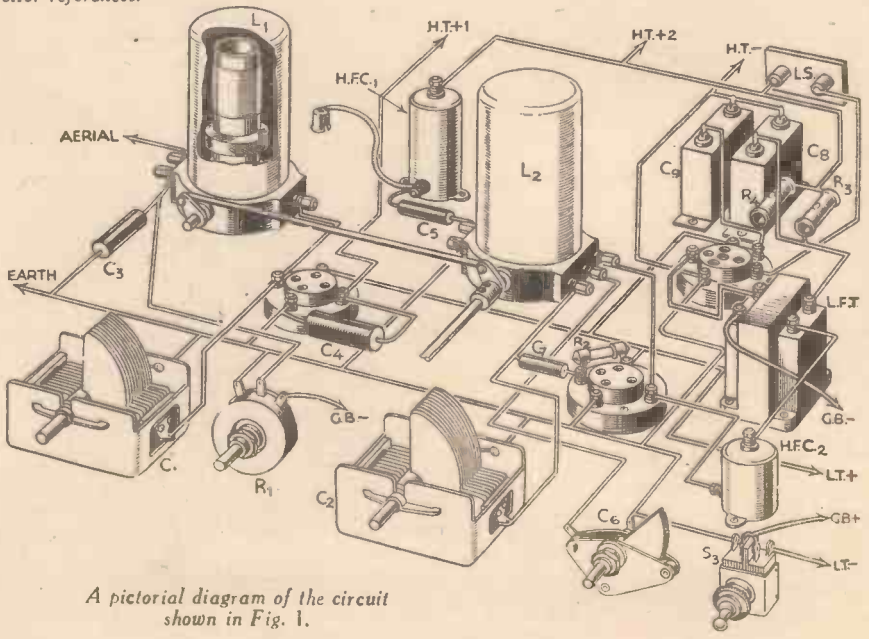



*A pictorial diagram of the circuit shown in Fig. 1.*

(Continued from previous page)

100 *kilocycles*, is equivalent to a wavelength of 300 millions divided by 100,000, or 3,000 metres. The relationship between the two terms in question will perhaps more readily be understood by examining the diagram shown in Fig. 2.

### Separating the Transmissions

Since there are hundreds of transmissions taking place at the same time, the receiver must be capable of accepting or rejecting all signals excepting those at a particular frequency, and it is the object of the oscillatory circuit—commonly referred to as the tuning circuit—to provide the discrimination necessary. This brings us to the precise function of the coil and condenser (L1 and C1 in Fig. 1), which are connected in parallel. It is known that when a current is passed through a coil of wire a certain magnetic influence is set up round the coil with the result that the coil becomes a form of magnet. This can readily be proved by winding 100 turns of 24-gauge insulated wire round a length of iron rod and connecting the ends of the wire to the terminals of an accumulator, as shown in Fig. 3. It will soon be noticed that the electro-magnet so formed will attract any ferrous material brought near it. It might be argued that this is not quite the same thing as a tuning coil which does not normally contain an iron core, but it should be made quite clear that the object of the iron is merely to concentrate the magnetic field set up.

### A Magnetic Effect

Just as the passage of a current through the wire causes a magnetic influence to be set up, so a current can be caused to flow through the wire by placing the coil in a magnetic field. It can now be seen that if the connection to the coil were rapidly "made" and "broken" two distinct effects would be produced; in the first place the *magnetic field* would be created, and then this would disappear and current would tend to flow from the coil through the battery. It is also worthy of note, in passing, that the current flowing from the coil would be in the reverse direction to that passing to it; in other words, that end of the coil which was made positive by the battery would become relatively negative, due to the effect of the magnetic field being re-converted into electricity.

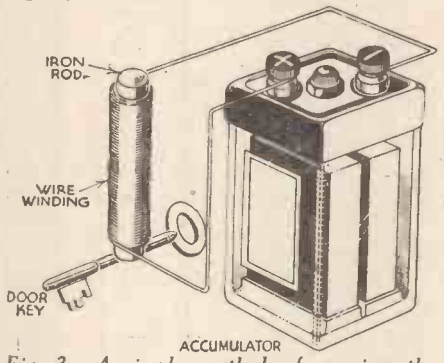



*Fig. 3.—A simple method of proving the creation of electro-magnetism.*

We must now consider the variable condenser for a moment. The effect of this is to store a certain amount of electricity, so that if a battery were connected to its terminals and then removed, it should be possible to connect a meter to its terminals, and so obtain a current or voltage reading. This, in fact, can be done, but the point with which we are more concerned in the circuit under discussion cannot be so readily proved. We therefore ask our readers to take it as a fact that a certain (though extremely small) amount of time elapses between the moment that the voltage source is connected to the condenser, and that at which the condenser is fully charged. The same rule also applied to the building-up and breaking-down of the magnetic field round the coil.

# How Old Are Your Valves?

Although the Useful Life of a Valve is Many Hundreds of Hours, it may be Considerably Shortened by Misuse or Accident. Some Interesting Points are Here Given by W. J. DELANEY

TWO queries recently received from readers very forcibly brought home the fact that many listeners fail to realise that the valve is not a permanent part of a radio receiver, and that, apart from the fact that it gradually deteriorates, accidents in connecting up or testing a receiver may very seriously impair the efficiency and shorten the life of a valve. The two queries in question were:

1. "My output pentode glows with a blue incandescence which varies with the music. . . ."

2. "I switched on but no signals or hum came from the loud-speaker. After a few minutes I raised the lid of the cabinet and was surprised to see that the pentode was all red-hot. . . ."

The first query was eventually traced to the fact that the receiver was being operated without H.T. for a considerable period of the testing time whilst the set was being installed, and the result was that the output valve had become "soft." In the second case it eventually transpired that no loud-speaker was connected to the set, and thus there was no load for the output valve (a mains pentode). Consequently, owing to the considerable wattage dissipation from the screen which resulted, the entire electrode assembly had become red-hot and the life of the valve was not only considerably reduced, but less than half the normal output was obtainable when the receiver was subsequently correctly connected up.

### A Story and a Moral

Most valve manufacturers give a guarantee of a definite life to a valve, and this means that when used under correct operating conditions it should provide for that period, the anode current, wattage dissipation, and other characteristics which the makers state for that particular valve. The care which is taken at the factory, not only in assembly but in testing, prevents all but a very few defective valves from finding their way into the hands of the listener. Now and again, unfortunately, a peculiar defect does enable a valve to pass its factory tests in spite of some fault, and after only a short period of use it breaks down. In such cases, however, the valve makers will exchange the valve and will examine the faulty one in order to take precautions against a similar defect again arising.

Therefore, the listener may be reasonably certain that when the valve is plugged into his receiver it will give good service for a definite period of time. Owing to the method by which a valve functions, however, there is a gradual deterioration, or falling off in performance. This is so slight that it is not noticeable, and after, say, six months' use the receiver appears to give exactly the same performance as when first installed. The same remarks apply at the end of a year's use, but by that time, if a set of brand-new valves of exactly similar characteristics is used in place of the old ones, a remarkable improvement in performance will be noticed. We do hear of cases where a constructor proudly boasts that he has had the same set of valves for three years "and they are still as good as when I first bought them." Unfortunately, this cannot be true, as the valve is what might be called a "perishable" article, that is to say, from the moment the filament or cathode is heated something is being used, and this is not put back in any way, so that in time they must become "worn out." The moral of this is to replace your valves after the period of life given by the makers, and you will be richly rewarded, not only in improved quality, but also in greater "reach" or in other words improved reception from all stations.

### Points to Guard Against

The useful period of life above referred to may be very considerably shortened if the valve has become damaged due to wrong connection, mechanical shock, etc. Some of the points which, although at first sight do not appear to have any effect on the life of a valve, but which may prove of great importance, are now given.

In a battery receiver, it is essential that the H.T. be applied whilst the filament is alight. When trying out a new circuit, therefore, make quite certain that the anode circuits are complete if the L.T. is switched on. Although running the filaments alone for a few minutes only may not make much difference, if allowed to glow for a long time the valve may become soft. This is because when the normal anode current is flowing there is a kind of "cleaning-up" effect which acts on the residual gases in the valve envelope, and without this useful effect the degree of vacuum is modified, with the result that softening takes place, and in the output valve in particular it is denoted by the blue glow referred to in the opening paragraphs.

In a mains receiver it is not usually possible to run one supply without the other, but in the event of a broken H.T. supply circuit the same remarks apply.

When first installing a mains receiver, or when carrying out experiments, take particular care to plug the valves into the correct holder. At first it may not appear to be a very serious matter if the wrong holder is employed, but a moment's thought will show that in some cases serious damage can be done. Take, for instance, the case of an A.C. receiver employing a directly-heated pentode. If an ordinary triode is plugged into this holder there will be a positive voltage of about 150 to 200 applied

(Continued on page 164)


## RADIO RECEPTION AND TELEVISION

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

THIS week our subject is to be changed somewhat, inasmuch that the intimate considerations of the cathode-ray tube and its auxiliary equipment are to give way to problems associated with the radio reception of the radiated television signals. Although primarily our intention is to deal with questions made important as a result of the proposed high-definition television service, it must not be overlooked that the cathode-ray tube is a very versatile piece of apparatus and adapts itself to the reception of the present low-definition signals with ease.

Whereas with the high-definition signals the scanning is horizontal, with a picture ratio which is likely to be settled upon as 6 horizontal to 5 vertical, with the existing B.B.C. transmissions scanning is vertical with a 7 to 3 ratio. Then, of course, line dissection and pictures per second are different. These separate items are easily accommodated, however, by altering the values of the discharge condenser in parallel with the gas-filled relay in both the L.F. and H.F. time bases, while the picture ratio is met by adjusting the "sweep" voltages by means of the bias potentiometer on the grid of the gas-filled relays. Scanning directions are altered by interchanging the time base connections to the deflector plates.

### A Debatable Point

This case of adaptation is always cited as one of the principal advantages of the cathode-ray tube for television picture presentation. It is generally conceded, however, that the low-definition images, as seen on the tube's fluorescent screen, are not up to the standard of a good Kerr cell mirror-drum combination. As a rule, however, they are much easier to synchronise, and a steady image, even if not "clean cut," is regarded by many as superior to a bright sharp picture which floats or hunts about a mean position. When it comes to high-definition images, however, at the present stage of development the cathode-ray tube undoubtedly gives infinitely better results than mechanical methods.

Whether this condition will continue to hold is, of course, still a debatable point, and the onus is now on the mechanical system protagonists to improve or modify their designs to meet the more stringent conditions imposed by the television pictures which have 180- or 240-line definition, and a picture repetition frequency twice that of the present B.B.C. service. At first sight it appears that the mirror-screw scanner stands the best chance of achieving this with an intensely bright strip light source capable of adequate modulation.

### Low-definition Pictures

Reverting now to the radio receivers suitable for linking to a cathode-ray tube when it is desired to look in at low-definition pictures, it may be stated straight away that, provided the set employed is a good quality one with even a moderate output power, then the results obtained will be quite satisfactory. It is a common practice to resistance-capacity feed the output valve to the cathode-ray tube, and although there may be several detailed schemes in this connection, the skeleton arrangement shown in Fig. 1 gives a general idea of how this is done.

The signal input from the set is fed *via* a 0.1 mfd. high-working-voltage condenser (1,000 to 1,500 volt) to one end of a potentiometer $R_1$ whose function is to control the depth of modulation applied to the tube shield. The other end of the potentiometer connects to the negative shield bias, while the moving arm connects direct to the shield. The television signal also includes the synchronising signal as well as the picture modulation and, in the case of the low-definition operation, Fig. 1 indicates how these synchronising pulses of 375 per second are fed to the grid of one of the gas-filled relays $V_1$ of the dual time base to ensure a correct triggering action.

### Time-base Locking

A potentiometer is connected across the signal input and the moving arm is joined through a resistance and 0.1 mfd. coupling condenser to $V_1$. This valve, therefore, receives a regularly-timed impulse (its value is controlled by $R_2$) from the television scanner, and the anode is joined to the "sweep" plate of one pair of the deflector plates. Now there is a definite ratio between the line dissection pulse of 375 and the picture repetition pulse of 12.5, so the two separate time bases are "locked" together ensuring that one frequency is exactly thirty times the other. If this is not done there is a tendency for the picture lines built up on the fluorescent screen to wander across the screen and so upset the viewing conditions.

The simplest method for this is to introduce some of $V_1$'s 375 pulse signal into the grid of $V_2$ which controls the picture repetition tuning. A .01 mfd. fixed condenser and one megohm resistance, therefore, links the anode of $V_1$ with the grid of $V_2$. Of course, the gas-filled relay discharge frequencies are really independently controlled by the constants of their circuits, but their separate actions must be steady for proper working, and the triggering effect imparted to both grids of $V_1$ and $V_2$ ensures that this steadiness, once set to the required values, is maintained.

### Ultra-short Waves

Coming now to the radiation and reception of the high-definition television picture signals, the problem is not quite so easy of solution. First of all, the extremely wide frequency range demanded by these pictures rules out the use of medium- or long-wave broadcasting stations. The only available channels for accommodating these rigid requirements are those provided by ultra-short waves, that is, wavelengths below the figure of 10 metres. To the majority of readers this introduces an entirely new radio technique, while even those who have worked with what are

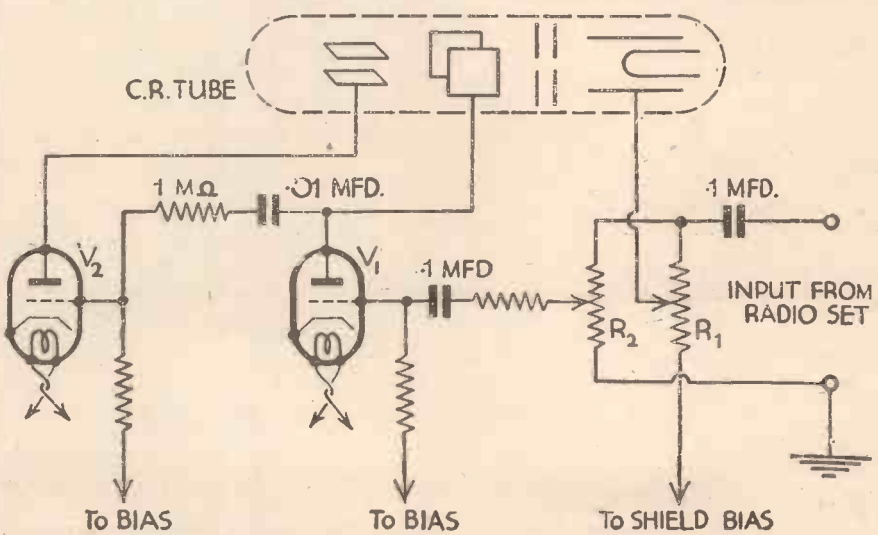



*Fig. 1.—One arrangement for linking the signals from the radio receiver to the C.-R. tube.*

commonly termed short waves will find that conditions differ when a migration is made to this lower region of the wavelength scale.

These waves of such short length (relatively speaking) and extremely high frequency (wavelength and frequency are linked by the standard formula of wavelength multiplied by frequency equals 300 millions) establish communication from point to point by means of the direct ray. That portion of the electro-magnetic disturbance which goes in a vertical or inclined direction, that is, above the line which is tangential to the earth's surface, is not reflected back by the Heaviside layer as is the case with other wavelengths.

## A Serious Problem

It is for this reason that they are said to possess quasi-optical properties resembling uniform directed beams from a light source which sheds its rays in all directions. From this reasoning it is easy to see that the higher the location of the transmitting aerial with reference to the surrounding country, the greater will be the range over which these signals will extend. This is one of the problems which is so seriously engaging the attention of the television technical advisory sub-committee. They are anxious to decide on a situation somewhere round London which has high ground, so that the aerial can be still further raised on a tower or mast, and thus ensure that the signal radiations will be receivable over the widest area at a strength adequate for operating the television apparatus above mush level.

The necessary aerials or radiating structures are not bulky or costly, and as an example of one form of construction which radiates the waves in all directions with equal intensity, mention may be made to the umbrella type aerial on the top of the South Tower of the Crystal Palace. On the other hand, these ultra-short-wave radiations can, when desired, be confined to a concentrated beam somewhat like that from a searchlight. An aerial structure for this purpose can take several forms, but usually a network similar to the radiating network is placed one quarter of a wavelength behind it. This then acts as a tuned reflector and quite effectively neutralises any signal radiation to the rear of the beam. This scheme is also in operation at the Crystal Palace, where the dipole aerial equipment, designed for experiments of this character, projects from the Tower balcony.

## Other Advantages

Since the carrier wave itself has an extremely high frequency (a 6-metre wave corresponds to 50 million cycles) it can be modulated quite readily with a very wide band of frequencies. As television progress is made and pictures with greater line definition become possible, the wavelengths which will be employed will become progressively lower, but at the present time from 5 to 7 metres form a very convenient medium for the work. Although, as has just been pointed out, in these ultra-high-frequency bands no ground waves exist owing to the high absorption while "sky waves" are lost, the direct ray which is used is free from fading, and this is an outstanding advantage. Furthermore, this advantage is supported by the fact that there are practically no atmospheric disturbances to mar or mutilate the picture in the form of light striations.

Of course, every advantage is accompanied by a corresponding disadvantage, and with ultra-short waves it has been found more difficult to build valves which will furnish very high powers, owing to the limitations imposed by the high-frequency effects in the valve construction. This is being overcome, however, and stations with rated powers of between 10 and 20 kilowatts have been built and tested with quite remarkable results.

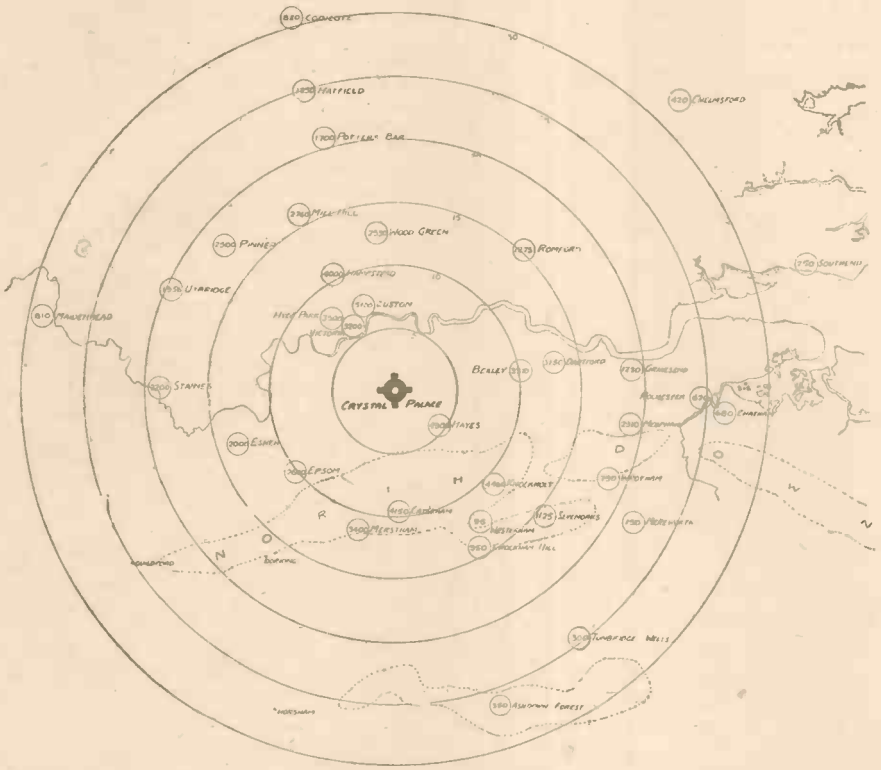



*Fig. 2.—Chart indicating field strength data in microvolts from the Baird transmitter at the Crystal Palace.*

## Field Strength

Then, again, these waves are liable to be easily reflected from high buildings or objects in the path of transmission. This causes complicated interference patterns and standing waves, the latter being conspicuous as shadows when hilly districts are present. Tests have shown that a receiver will pass from a region of high signal strength on a hill crest to one of almost negligible pick-up in a valley, and then emerge into strong signals again when out of the "shadow" cast by the hill from the transmitting aerial site. This is shown quite clearly by referring to Fig. 2, which furnishes field strength data in microvolts from the Baird transmitter at the Crystal Palace, working on a wavelength of 7 metres and a power of 10 kilowatts.

Under any condition of environment a cathode-ray-tube receiver will portray a good television picture where the field strength is above 1,000 microvolts, while for those locations giving measurements of between 250 and 1,000 microvolts, a good picture is possible provided the receiving aerial is not within fifty yards of an arterial or main road. From 100 to 250 microvolts, results worth looking at will only be secured in quiet locations.

These latter considerations arise partly from the fact that "man made" electrical disturbances, particularly those derived from the ignition systems of motor-cars or aeroplanes, as well as those induced from transmission lines, telephone lines, high-frequency or X-ray machines, and so on, cause trouble. In view of the very intensive campaign of attack against electrical interference of any man-made form which is now being conducted, it is reasonable to expect that the troubles from this direction will soon disappear. In any case, proper precautionary measures applied in the radio receiver itself can do much to neutralise the observable effects.

On the question of the radio receiver itself, there are three forms open to choice on these ultra-short waves—straight, super-het, and super-regenerative. Naturally there are protagonists of each class, and each have their own advantages and disadvantages, but as yet there is not much available data to work on owing to the comparatively short length of time which has elapsed since experiments in this class of work were undertaken. Those features which can be examined, however, will be dealt with in the next article.

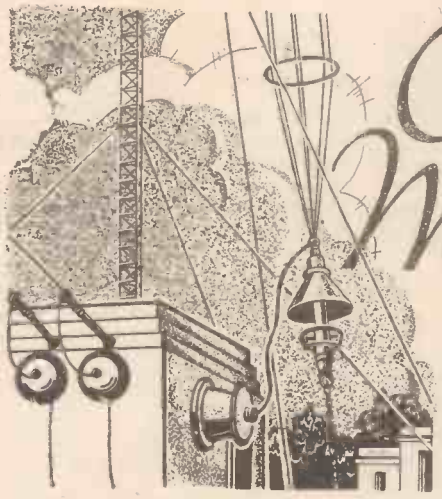
# TELEVISION NEWS

## Transatlantic Television

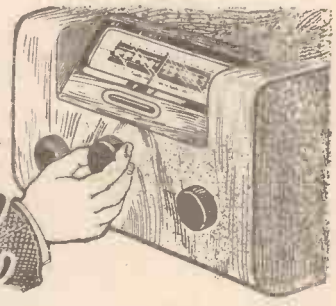
RUMOUR still persists in linking up the summer months of this year (some go so far as to say it will coincide with certain of the Jubilee conferences) with a very ambitious transatlantic television test. London and New York have been cited as the terminal points for this experiment, and it is intriguing to contemplate the enormous fillip which would be given to television if an event of this ambitious nature did materialise.

## Boxing Match and Television

SEVERAL newspapers reported that it was intended to televise part of the heavy-weight boxing contest in Hamburg between Hamas and Schmeling, as a result of requests from New York, London, Rome and Paris. While the suggestion was an excellent one, and would have furnished data of quite a practical character to those sponsoring television in Germany, it appears that nothing was done in this connection.



# On Your Wavelength



By Thermion

## An Interesting Effect

WE all know the peculiar problems which receivers are prone to set us, and I ran up against one the other day. I had just constructed a four-valve A.C. superhet and, in my haste, tried it out in my workshop before fitting it into the cabinet. I used a mains aerial, since the receiver was later to be used as a transportable. Contrary to my expectations, results were not particularly good at first, and no more than ten stations could be received at really good volume. But as the set was wanted to replace another which I intended to modify, I fitted it into the cabinet, thinking that I could do the final tuning-up later.

The set was then carried into the drawing-room and stood on a small coffee-table which happened to be handy. On switching on, however, I was astounded to find that reception was considerably better than before, despite the fact that no alterations had been made and that the "power" plug used was in the same circuit as that in my workshop. It took quite a long time to discover that the improvement was due to the brass top of the table on which the set had been placed. I then fitted an earth lead, the result being that the metal no longer had any effect, and that reception was just the same regardless of the room in which the set was used. Anyhow, I discovered that the metal table formed a good capacity earth of some kind, although it was not connected to the receiver in any way.

## Maps

MAPS to the short-wave listener are a very useful adjunct, as greater interest is added to the capture of a distant broadcast if you know exactly from which spot in the world it was originated.

WOR, a new 50 kilowatter which has been recently opened at Carteret (New Jersey) and which is one of the high-power U.S.A. stations on the medium-wave band, is also installing a short-wave station for relaying its programmes overseas. Tests may be expected soon, and although the channels at time of writing have not been definitely fixed, we may expect to find them in the 31.25, 19, and 16-metre bands, as is usual for this class of transmitter.

## Federated Malay States

ABOVE the 50-metre wave-band there is a worth-while logging to be made; it is ZGE, Kuala Lumpur (Federated Malay States) which is now broadcasting every Sunday, Tuesday, and Friday from G.M.T. 11.40–13.40 on 75 metres (4,000 kc/s), with a power of 1.2 kilowatts. Local time is seven hours ahead of G.M.T., so you will be listening to an evening concert. As a rule, in addition to gramophone records, a relay is carried out of a musical entertainment from the Selangor Club; at other times Chinese music is transmitted. There is an English news bulletin at every broadcast, and the station closes down with the playing of God Save the King. It is the Kuala Lumpur (F.M.S.) Amateur Radio Society which organises the programmes.

## Pernambuco

PRA8, Pernambuco (Brazil), which advertises its wavelength as 49.67 metres (6,040 kc/s), would appear to be using a slightly lower channel, so you may come across this station below HJ1ABG and GSA.

Finally, a correspondent writes me that he has logged a new Colombian broadcast—namely, HJ3ABH, Medellin, on 50.17 metres (5,980 kc/s), of which the interval signal is three notes somewhat similar to those heard in the N.B.C. transmissions. I had received advice that a 25-kilowatt short-waver was to be opened in Colombia in January this year, and this may be the transmitter, as it was then stated that special broadcasts would be regularly made from North America and Europe.

## In a Minnicher Kwondairy

HEREWITH a letter I have received from R. L. (London):—

Dear Thermion,

Time and again we have been told that it is possible to please all the people some of the time and some of the people all the time, but never can the B.B.C., in its wildest flights of fancy, hope to please all the people all the time.

Their Committee, of which Mr. Bernard Shaw is chairman, and Professor Lloyd James secretary, has now produced a third list of 779 words, and gives the exact pronunciation which must be used by all announcers from B.B.C. stations.

The task which was set the Committee was, in Sir John Reith's own words, "the problem of evolving a common denominator of educated speech."

Many of the rulings of the Committee will be invaluable in ordinary life, yet so many more of its selected pronunciations are in direct opposition to the generally accepted pronunciation of certain words.

Among the points on which the Committee has to be praised are its rulings that "amateur" is to be pronounced "ammater"; "Celtic" is "Seltic," except when it is used in connection with Wales, when the initial "C" is a hard one; while "conduit" (another word which has been the source of considerable argument) must now definitely be "cundit." All these, and many more, are valuable recommendations.

But where did the Committee learn that "culinary" should be "kewlinary," that "avoirdupois" should be "avverdepoys," "combat"—"cumbat," or "miniature"—"minnicher"?

The Committee seems uncertain, although they give definite rulings for individual words, about Oriental titles. They approve of "Shaik" for "Sheik," but "Sultan" must not be given its Arabian pronunciation, but be used with short vowels. Nor must "harem" be pronounced otherwise than "hairem."

Another point on which the Committee has strayed is the pronunciation of the word "margarine," which they order should be "marjareen." As the secretary of the Margarine Association has pointed out to Professor Lloyd James in a letter of protest, there is no justification either etymologically or by custom and usage for any pronunciation other than with a hard "G." The word comes from the Greek word "margaron," meaning a pearl, just as does the Christian name Margaret.

The letter "G," in particular, seems to have caused the Committee a lot of trouble. Announcers must harden the "G" in "gibberish," but soften it in "sarcophagi," otherwise these poor announcers will be in as awkward a "kwondairy" as I am myself as I peruse this report.

[*General usage is the deciding factor of pronunciation. Almost everyone pronounces margarine with a soft g.*—ED.]

## Midget Components

NOW that midget valves are available from two different manufacturers, I hope there will be a revival of interest in the really midget receiver. Other manufacturers must now fall into line and produce some really midget transformers, tuning coils, tuning condensers, H.T. batteries, and particularly some midget valveholders of a size proportionate to the valves for which they are intended. After all, midget valves alone do not make the midget receiver and it is absurd to use normal size components with midget valves. Such receivers will be made up for really portable use, and I do not anticipate that constructors will expect extreme quality or long range from them. If I am correct in this assumption, we can afford to set aside some of our ideas regarding efficiency and consider size as the question of first importance. Midget accumulators are already available, no larger in size than a four-volt flash lamp dry cell.

Personally, I favour using a number of these midget valves, say at least six, and low stage gain. This is a practice much favoured in America for portable use; a single ear phone must be used, since it is not possible to make a really midget speaker which is satisfactory. The limit in size, I think, has been reached and these are by no means small enough for the receiver I have in mind. I know how popular these bijou sets are from past experience.

(*Continued overleaf.*

(*Continued from previous page*)

Many years ago the Wecovalve, the Xtraudion and Dextraudion valves, which were three of the earliest low-consumption dull emitters, made possible the production of what was considered then to be really small receivers. Those were the days of soft valves, which blue glowed at anything over 40 volts plate current, the days when technical writers spilt a lot of ink by spreading false theses, the days when they told you that wood was hopeless for panels, and that only the best class of ebonite need be used, and when they had comic notions about the size of tuning coils. Thanks to papers such as PRACTICAL AND AMATEUR WIRELESS, these false notions, propagated by those who professed to be teachers and should really have been amongst the taught, have been well and truly laid. We can now place components more compactly. We can follow the direct-wiring system instead of making the receiver a passable imitation of a bird cage by using square wire with all the wires at right angles and parallel to one another.

## Regrets

ONE or two readers who are keen cyclists have called me to task for my recent paragraph in which I drew a parallel between letters written by cyclists and by certain wireless correspondents. I am sorry, but would urge them that if they would like their letters to see the light of print they should be couched in reasoned terms and free from vituperation. Attack my opinions as fiercely as you like; we are bound to disagree on some things. But don't use offensive language. I received one such letter the other day from a reverend gentleman, of all people, who apparently believes in the principle that you should do as he tells you and not what he does.

## Test Instruments

THE newcomer to wireless often reads that a certain circuit should be operated so that such and such a current flows, and then finds that a definite resistance value should be inserted in another part of the circuit, and thus begins to assume that it is necessary, in order to take an intelligent interest in wireless as a hobby, to have a most elaborate set of testing instruments on hand. Actually, of course, only one good instrument is necessary, and I had to explain all this to a nephew of mine the other day on the occasion of a birthday. He wanted something useful, and is a keen wireless fan, so I offered to get him a really good milliammeter reading up to 1 mA. He suggested that there would not be much use for a low-reading instrument of this nature and suggested one reading up to 50 mA. This is, of course, a common fallacy. Given a really good quality meter reading to 1 mA. you can construct a meter reading practically any voltage, any current, and quite a useful range of ohms for resistance tests. And the total consumption will not be so high that the instrument is useless on eliminators, etc. To simplify calculations the resistance of the meter should be ascertained (the makers will generally tell you this) and a small wire-wound resistance should be inserted in series with it to bring the total resistance up to 100 ohms. Then our old friend Ohms Law will enable you to work out very simply the required shunts to convert the meter into one giving higher current readings, and the value of the necessary series resistances to enable all values of voltage to be taken. The entire assembly may be enclosed in a box with plugs and sockets for the necessary selection or a rotating switch of the arm and stud type.

# Notes from the Test Bench

## Volume Potentiometers

A READER who had constructed the Hall-Mark 4 wrote to us recently stating that he was particularly pleased with the quality of reproduction on both radio and gramophone, but he complained that the volume potentiometer did not control the volume. When the receiver was submitted for test, however, it was discovered that terminal 3 of the coil unit was in contact with the metallised baseboard owing to the bared end of the lead attached to this terminal being too long, thereby making contact with the coil chassis. Constructors of this receiver should, therefore, ascertain that this lead is cleared from the chassis.

## Droitwich Interference

OUR correspondence indicates that listeners in the Midlands are experiencing great difficulty in cutting out the Droitwich transmitter. On some older types of receivers, this station spreads over practically half of the tuning dial and renders the reception of the adjacent transmissions almost impossible. It has been found that the connection of a pre-set condenser in the aerial lead does not sufficiently improve selectivity, and, therefore, some other method has to be adopted. The modern type of superheterodyne and band-pass receiver is capable of separating the long-wave stations, of course, but listeners owning receivers which give a satisfactory degree of selectivity on the medium wave-band do not wish to go to the expense of a complete receiver. Fortunately, there is a moderately simple method of cutting out the offending signal when distant station reception is desired. This is done by connecting a tuned circuit between the aerial lead and the aerial terminal of the set. The coil used in this tuned circuit should be of the plug-in type having approximately 150 turns, and the tuning condenser should have a capacity of .0005 mfd. When reception of Droitwich is not desired, the condenser should be rotated until the circuit is tuned to the Droitwich wavelength. This type of suppressor is not confined to long-wave interference suppression, of course; by substituting a coil having a lower inductance, suppression of medium-wave transmissions may be effected.

## Calculating Filament-dropping Resistances

THERE seem to be many readers who find great difficulty in calculating the value of the necessary dropping resistance for use in the heater circuit of universal and D.C. receivers. We have had cases where constructors have built our universal receivers for use on D.C. mains and have rightly decided that the rectifying valve can be dispensed with, but have forgotten that when this is done it is necessary to adjust the value of the heater resistance. Unlike A.C. valves having a low-heater resistance, D.C. and Universal valves are wired in series and, therefore, when one valve is omitted the total valve-heater resistance is reduced, and excessive current will pass through the valves unless the value of the dropping resistance is correspondingly increased.

## Wavelengths, Frequency and Megacycles

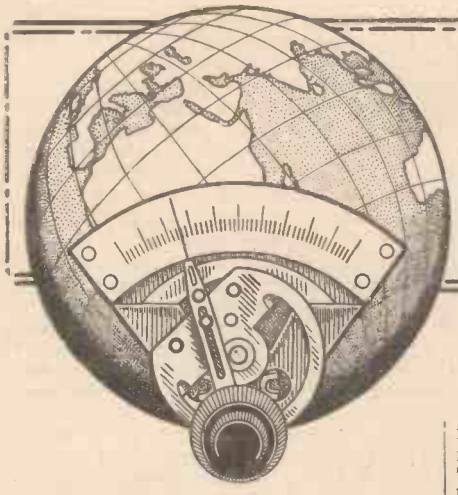
THE amateurs who transmit on the short-waves will now be heard (if you are lucky enough to get down to the short waves) talking about megacycles. We have heard of kilocycles, and this term is now apparently coming along into more general use to confuse the amateur. Actually it is not a difficult point when we remember that mega means a million. A kilocycle is a 1,000 cycles, and the frequency rises as the wavelength decreases. Thus, 300 metres equals 1,000 kilocycles, and 100 metres equals 3,000 kilocycles. Ten metres, therefore, equals 30,000 kilocycles which is 30 million cycles. A megacycle is a million cycles and, therefore, 10 metres equals 30 megacycles.

## Tuning Indicators

WHAT will the tuning dial of the future look like? We have seen any number of ingenious ideas to improve this part of the standard broadcast receiver, ranging from the small escutcheon window showing the degrees of a simple scale to the full-vision device of the Ferranti receivers, where, in addition to the actual wavelengths and station names, the dial also includes indicators showing the accuracy of tuning, the tone control setting, the A.V.C. control and other adjustments. No doubt it is a very good plan to endeavour to get all the available indicators into one space, and if only all the controls could be similarly brought together the general appearance of the receiver would be improved. But, as the modern wireless receiver is essentially a musical instrument, why have any controls and dials? Surely the ideal arrangement would be a very small opening disclosing a simple number (somewhat after the fashion of a musical-box) where the number indicated the station, and a short list of stations which are obtainable at good volume could be included in the lid or in some other out-of-the-way place. The receiver itself should be so designed that nothing below a certain aerial input affected the remaining circuits, and thus only those stations which provided really good quality would be heard. The output should be controlled by the circuit to keep at a certain level—somewhat after the fashion of A.V.C.—although perhaps a simple control to vary this might take its place inconspicuously on the cabinet.

## On Short Waves

WHILST trying out a new short-waver the other evening, I had a rather peculiar experience which may probably have befallen others. After tuning in a few stations, I eventually found one which I took to be a very distant one; it faded badly and signals were very distorted at times. After trying for some time to bring it up to full strength, the signals suddenly stopped, and could not be brought back. Later, however, the same station was again tuned in as before. This time, I managed to "hold" it for more than ten minutes before an announcement was made. But when the announcer did speak, it was to tell me that I was listening to—Droitwich. I found out later that other members of the household were using a portable set in another room, and that I was actually receiving signals which were being re-radiated by it. My short-wave signals stopped immediately the portable was switched off. So that is that!



# SHORT WAVE SECTION

## At the Short-waver's Bench

An Article Describing a Number of Useful Ideas for the Experimenter

### Interchangeable Grid Leaks and Condensers

IT is often very useful to be able to change the grid leak of a short-wave detector, especially when trying out a new set, but the modern form of wire-ended leak does not lend itself to this so well as the old-fashioned type. To meet the case, however, the following arrangement was devised. The screws were removed from two crocodile clips which were then screwed on to the detector valve-holder, one under the grid terminal, and the other under the L.T.+ terminal, as shown in Fig. 1. The wire ends of any grid leak can be gripped easily in the clips, making valves quickly interchangeable. Similarly, the idea may be used for the modern wire-ended type condensers and, in the case of the grid condenser, the same clip at the grid terminal can be used to hold both leak and condenser.

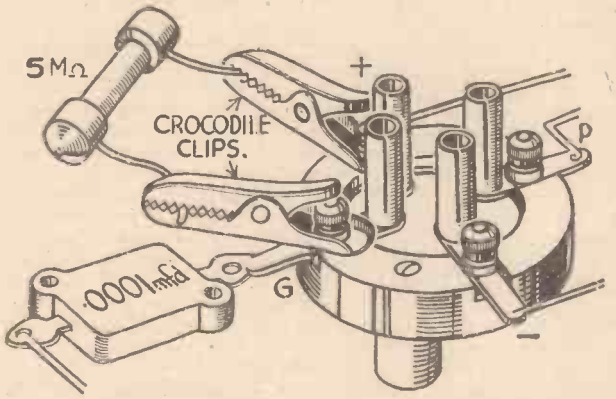



*Fig. 1.—A simple scheme for adjusting the detector circuit.*

### Plug-in Coils

The newer class of home constructors will probably not remember the "pre-wavechange-switching" days when plug-in coils of every variety were always used for broadcasting. To-day we are in a similar era on the short waves, and the leading coil arrangements are plug-in ones. On broadcast bands in the old days often a strange fault would arise owing to the coil pins not making contact, or else making poor contact, with the sockets of the coil-holder. It may, therefore, be as well to remind readers that coil pins, as well as valve pins, should be opened out gently in order that they may make good contact with the sockets. Occasional cleaning with a small piece of fine sandpaper is also useful.

### Short-wave H.F. Chokes

Mention of plug-in coils calls to mind the fact that old two-pin plug-in broadcast coils make excellent short-wave H.F. chokes. The main snag is that they have a rather large field, and must either be well away from other components or else screened to prevent interaction. Those readers who are using an all-mains short waver, such as the one recently described, may be having trouble due to H.F. on the mains. A couple of plug-in coils (the best sizes may be found by trying them out), and two condensers, arranged as in Fig. 2, will effectively block out frying noises, crackles, and crashes due to this cause.

Another plug-in coil idea is useful where the local station is found to intrude on short-wave signals. Connect a coil-holder in the lead from the aerial to the aerial terminal. Plug in a coil which is found to be about the right size for the "local," and connect a small pre-set condenser of about .0003 across it. Tuning this condenser will get rid of the interfering station, and will in no way impair short-wave signals.

### Loud-speakers

Many experimenters know that short-wave reception can be made or marred by the loud-speaker that is used. The writer's moving-coil speaker is practically useless for short-wave work, firstly because it is not highly sensitive, and secondly because of its good reproduction of the bass. This latter is not too desirable, as the top notes are so drastically cut by reaction that reproduction becomes "woolly." At present a very large horn speaker is used, which was "all the rage" in 1927, and which is now a great success. It is sensitive, and gives hardly any bass reproduction but plenty of "top" notes. This is excellent as far as readability goes, but the quality is not quite good enough for "listening," as distinct from "searching." For the former, therefore, I am going to adapt my balanced armature speaker unit and fit it with a thinnish brown paper cone. This should prove definitely an advantage, and is passed on as a useful tip to those who are troubled with "heavy" moving coil reproduction on the shorter bands.

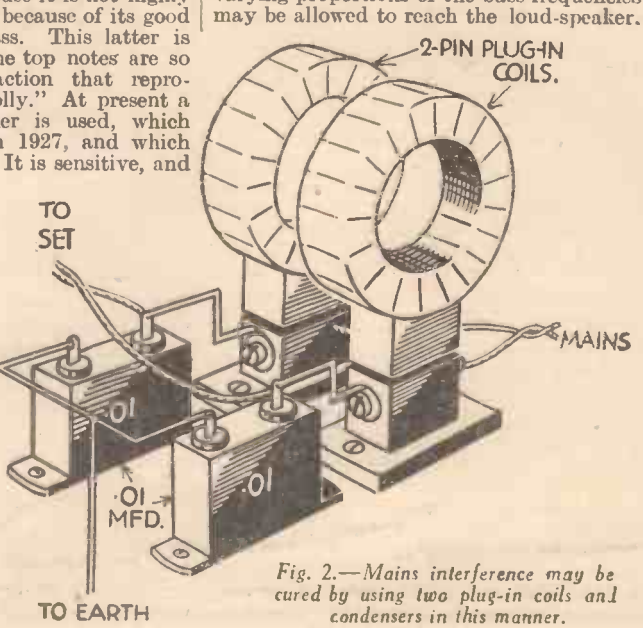



*Fig. 2.—Mains interference may be cured by using two plug-in coils and condensers in this manner.*

### Tuning on the Lower Wavelengths

It is not often realised that, whilst tuning must be done slowly and gently on the 50-metre band, as we tune lower it must be done even more slowly. Owing to the greater frequency-band which one metre equals, on the lower wavebands stations will seem closer together on the dial. Therefore, if below 20 metres you cannot find anything, I would advise still more careful searching, or the use of a higher ratio tuning dial.

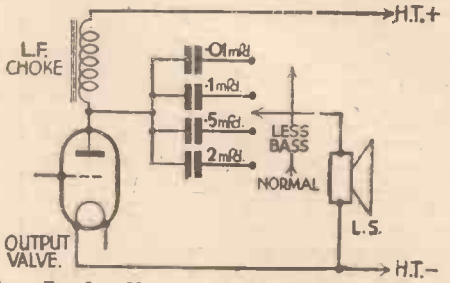



*Fig. 3.—Varying the tone by means of a condenser circuit.*

Mention has already been made of high-note cutting due to reaction. Many readers may not know that there are special L.F. transformers on the market with rising characteristics for the higher frequencies to counteract this loss. Even with one of these, however, bass is often too prominent, and Fig. 3 shows a method by which varying proportions of the bass frequencies may be allowed to reach the loud-speaker.

# Short-Wave Meters

Details of Construction and Methods of Calibration of Two Slightly Different Instruments are Given in This Article. By G. W. DAVEY

THERE is no doubt that a very useful addition to the equipment of a short-wave "fan" is a wavemeter. Short-wave work mainly consists of station logging and, as many of the distant stations received are often difficult to identify, an accurately calibrated wavemeter is an absolute boon. Before giving details of the instrument, it will be as well to mention one or two general hints regarding construction.

Unlike the short-waver, the meter is not designed to be a set with which to experiment, but is a standard instrument, calibrated and made for a specific purpose—the whole secret of its usefulness, therefore, lies in its reliability. Use only the best components for it, and as it is to be a permanent job all connections should be soldered. The condenser in particular must be of a very rigid type as any variation or alteration in its setting, due to looseness or bending of the vanes, would upset the whole of the calibration. Similarly, in order to avoid its being upset by slight variations in contact between the coil pins and sockets, it is advisable to use a wave-change coil arrangement. There are several on the market, and a wavemeter is not likely to lose any efficiency due to the use of one.

## The Autodyne Circuit

The circuits given are of two entirely different arrangements, that shown in Fig. 1 being a screen-grid valve used in an "autodyne" circuit—an extremely simple arrangement. Under certain conditions, when the screening grid voltage is higher than that on the plate, a screen-grid valve will oscillate of its own accord. This is made use of in certain circumstances, notably in this one, the anode circuit being provided with a tuned circuit in order to tune the oscillations to the wavelength required. One single coil only is required, and this may be a plug-in coil or, better still, a home-made one with tappings at various positions, leads being taken out to push-pull switches enabling sections to be cut out, one at a time, for different wave-ranges. The screening-grid may be taken to a 120-volts tapping, whilst any tapping that proves most satisfactory around 80 volts will do for the plate.

The circuit shown in Fig. 2 will be found slightly more complicated, though quite as easy to make up. Again, it is the anode circuit that is tuned, but a reaction winding is also necessary. With regard to valves, almost any spare one can be used; the best, however, is likely to be a small power valve. This will oscillate more easily, but

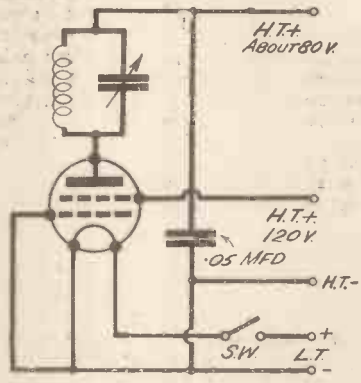



*Fig. 1.—The "Autodyne" circuit.*

will take more H.T. and L.T. current. The voltage required, however, will not be more than 40 to 45 volts, and this circuit is more likely to obtain favour in this respect.

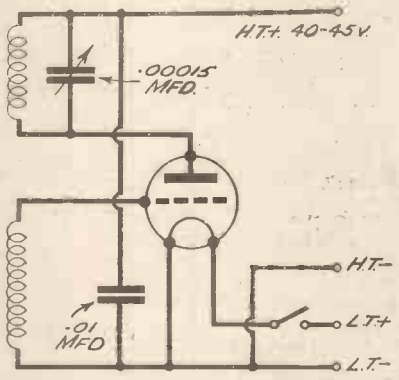



*Fig. 2.—An alternative tuned-anode circuit.*

## Calibrating the Meters

Either wavemeter is of little use until it is calibrated, and with this in view those readers who happen to know an amateur transmitter are fortunate, as practically every amateur transmitter will possess a frequency monitor, and with its aid the meter may be quickly calibrated. This, by the way, is done by drawing up a graph, setting dial readings along one side, and frequencies along the bottom of a piece of squared paper. Fig. 3 gives a general idea as to how the "curve" (usually a straight line) is drawn by means of plotting dial readings against frequencies.

## Alternative Method of Calibration

The other method of calibration is to use either a calibrated short-waver, or one on which you are sure of the dial readings for several known stations on each band. One band, of course, is calibrated at a time, the meter being stood about three or four feet from the set, and a known station tuned in. The meter must now be tuned until its whistle is superimposed dead on top of the station you have tuned in. Make a note of the meter-dial reading, plotting it against the station's frequency on the graph, which should have been prepared beforehand. The process must be repeated for several stations on each band until a curve can be drawn linking up all the dots on the squared paper.

## Using the Meter

The use of the meter is now obvious. When an unknown station is tuned in the wavemeter "whistle" is "placed" right on top of it, and the wavemeter dial reading taken. From this the graph will give us the frequency which, by reference to a short-wave station list, will show what the station is. In a similar manner to identifying a station by the method just described we can search for one by tuning the meter to the frequency of the station required and tuning in the whistle on the set, which will then be tuned to exactly the wavelength required.

There is not the slightest objection to

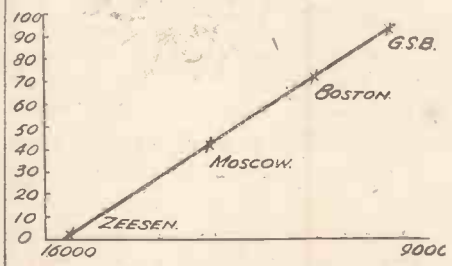



*Fig. 3.—How to mark out the graph for calibrating the meter.*

the wavemeter being run off the mains, and no great care in smoothing is required. In fact, if the valve used is a directly-heated one, as shown in the diagram, run off raw A.C., the hum will modulate the oscillator's output, and will be received instead of a whistle. Some readers may prefer it as being simpler and more pleasant to work with.

## Talk on Market Gardening

SUCCESSFUL market gardening is the subject for discussion in the feature "For Western Farmers in Particular," on April 25th. A. W. Ling will discuss the situation with L. Ogilvie. Mr. Ogilvie is the Adviser in Mycology for the Bristol Province, and with his colleagues at the Research Station at Long Ashton, Bristol, he has made a special study of the diseases which may affect market gardening crops. This talk should be of value not only to market gardeners who are operating on a fairly large scale, but to everyone who grows vegetables, even in small patches in back gardens.

# ITEMS OF INTEREST

## "Railway Rhythm"

IN co-operation with the railways of Great Britain an interesting programme will be broadcast on the Regional wavelength on May 1st. This is in effect a May Day link and is intended to furnish a record of rhythm in work. The programme will be called "Railway Rhythm," and is under the direction of John Watt and Max Kester. At present the cast recruited consists of three comedians, Claude Hulbert, Claude Dampier, and Stainless Stephen. The B.B.C.'s new mobile van will be used considerably in the preparation of this programme, so that listeners will be hearing for the first time *viâ* the loud-speaker many of the everyday railway noises which, fitted into a programme of this type, will give considerable amusement.

# A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

## A Handy Plug-in Fuse

THE plug-in fuse, shown in sketch, was devised with the idea of protecting my accumulator from the harmful results of exceeding the specified discharge rate. The actual fuse is of tinfoil, as described in recent issues of PRACTICAL AND AMATEUR WIRELESS. To determine the actual breadth of the narrow portion, the hook-up, shown in circuit diagram, was used. The variable resistance is initially set at maximum, the value being gradually decreased until the fuse, under test, blows. The reading obtained on the ammeter, at this instant, denotes the fusing current in amperes.—STEENSON RAINCY (Wishaw).

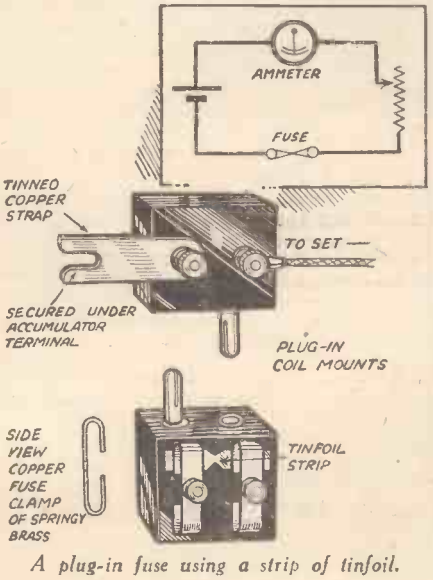
## Simple Resistance Holder

IN PRACTICAL AND AMATEUR WIRELESS there have been published very useful hints for makeshift resistances, consisting of a piece of paper smeared over with black-lead or lead pencil. I have used them many times, but the difficulty is in connecting them up. The illustration shows how I have overcome this difficulty by making a very cheap and efficient holder. The base is a piece of ebonite 2in. long, §in. wide, and $^3/_{16}$in. thick. Two terminals are provided under the bases of which two wire paper clips are firmly clamped. It is then an easy matter to slip a resistance in place between the wire clips, as shown in the sketch.—R. SAUNDERS (Stamford Hill).

## A Handy Time Switch

THE accompanying sketch shows a simple, reliable, and cheap time switch which has been very successful for use with both battery and mains receivers. It is quite safe, and all live parts are insulated.

A piece of ebonite is fixed to a wooden baseboard, and on it is mounted a snap switch of battery or mains type as required.

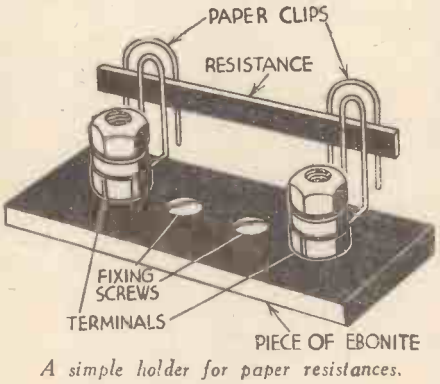



*A plug-in fuse using a strip of tinfoil.*

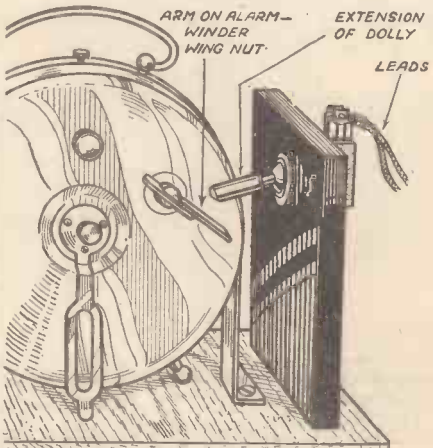
### THAT DODGE OF YOURS!

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., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

The switch must have a metal operating dolly. A piece of tube of suitable length is soldered to the dolly to form an extension, and the switch is mounted so that it is *on*



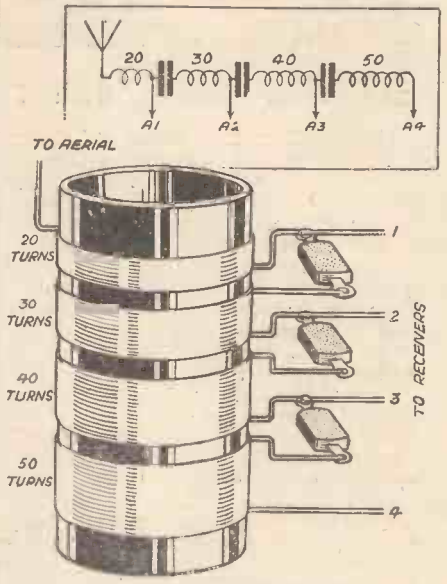

*A simple holder for paper resistances.*




*A simple but reliable time switch for use with either a battery or mains receiver.*

when the dolly is in the down position. An ordinary alarm clock is used, a short piece of thick wire being soldered to the alarm-winder wing-nut so as to form an arm. The clock is then secured to the baseboard by a suitable fixing strap.

In use, the clock is set in the normal manner so that the alarm operates at the time the current is to be switched off. With the extended switch-dolly in the *up* position, so as to be clear of the arm on the winder wing-nut, the alarm action is wound up. The dolly is then brought to the *down* position so that the switch is *on*.




*A multiple aerial-coil unit.*

At the required time the alarm operates, and as the winder wing-nut revolves, the arm engages with the extended dolly and moves it upwards until the spring in the switch causes the latter to snap over to *off*. This movement also lifts the extended dolly clear of the arm so that the alarm action is able to run down without any of the parts being strained.

It will be noticed that if the switch is initially located so that it is *off* with the dolly down, the device may be made to switch the receiver on, and not off, at any required time.—C. MUSTILL (Leeds).

## Multiple Aerial System

WHERE it is desired to work two or more receivers from the same aerial without mutual interference, the following system will give good results. Wind 140 turns of No. 28 gauge enamelled wire on a 2in. diameter former. The coil can be wound in sections of twenty, thirty, forty, and fifty turns, depending on the number of receivers. Connect each group with a .0001 mfd. condenser, as shown in the accompanying sketch. The complete unit may be screened with a suitable can.—M. LECKIE (Glasgow).

# OPERATING AND ADJUSTING F. J. CAMM'S ALL-WAVE Silver

## Loud-speaker Results from Five Continents at Every Hour of the Day and Night!

LAST week we gave sufficient information regarding the construction and operation of this receiver to enable constructors to put the complete apparatus into commission. There are, however, one or two small points which warrant mention at greater length in order that every possible adjustment may be made so as to obtain the last ounce in performance on every wave-band which is covered.

First of all, there is the small coupling condenser used at the top of the broadcast band-pass coils. If you examine the circuit diagram on page 152 of this week's issue, and refer to the list of components on page 152 it will be seen that there is no specification for condenser C11. This is on account of the fact that the condenser is made up (as briefly mentioned last week) from two pieces of wire twisted together. Unfortunately, it is impossible to state exactly the amount of wire and the method of twisting which is to be adopted, in view of the fact that individual receivers will vary. To commence with, take two pieces of connecting wire just over two inches in length, and attach these to the terminals marked VC on the two coils nearest the controls—that is, the front of the chassis. The wire must, of course, be covered with its normal insulation material.

### Adjusting the Band-pass Coupling

Do not be tempted to improve insulation by slipping systoflex or similar material over the wire, as by so doing you will considerably modify the capacity between the two twisted wires, and one case of poor performance on our £5 Superhet was found eventually to be due to this fact. Use the normal type of connecting wire, and this has sufficient insulation for the purpose. Now twist these wires together about half an inch from the terminals and proceed to twist them throughout their length, so that the appearance of the wire is the same as normal flexible. Allow about two inches for preliminary tests, and when finally ganged and in working order the wires should be untwisted and the ends separated until the best position has been found. The point to aim at is maximum selectivity where quality is retained. When band-pass couplings are made so that a very small peak is obtained the side-band cut-off is sufficient to spoil the quality of reception, and on the other hand, if the peak is too wide, there will be insufficient separation between stations which are at present working with a separation of only 9 k/cs. Therefore, it is necessary in each individual case to tune in various stations on the dial and set this coupling to provide the requisite result, those listeners who suffer from serious interference having to obtain higher selectivity than those more fortunately placed.

### TUNING RANGE

| | |
|---|---|
| Short Wave - | 13—96 metres |
| Medium Wave | 200—550 metres |
| Long Wave - | 900—2,000 metres |

### Ganging the Condenser

We have many times referred to the trimming or ganging of a three-circuit tuner, and little difficulty should be experienced here, provided the constructor remembers to tune in a station as low as possible on the medium-wave band and keep the station as quiet as possible by means of the volume control whilst trimming is carried out. When a very faint signal is employed for trimming, slight differences in volume are made much more noticeable, and thus more accurate adjustments are possible. When the best results have been obtained at this point on the dial, a station at the opposite end should be located, and a slight adjustment of the trimmers made in order to ascertain whether the best setting has been found. Any serious alteration of the trimmers at this point will throw out the previous setting, and thus, should it be found that considerable movements are required a return to the lower end should be made, and the inter-circuit connecting wires should be modified slightly. The coils themselves are matched by the manufacturers, and the three-gang

*Note the attractive cabinet design, with inclined panel and locker space.*

### SPECIAL

**Short waves in addition to normal broadcasting wavelengths without the use of special components.**

**Special short-wave circuit employed—the change being carried out by means of a simple switch.**

Some of the Smaller Adjusting Points are Here Described, Together with Complete Operating Details which will Enable You to Obtain the Maximum Performance from This Interesting All-Wave Receiver

# Souvenir

**Roam the Entire World of Ether with This Remarkably Effective All-Waver**

condenser is also matched in each section. The three circuits should therefore match throughout their range, but inter-circuit wiring introduces sufficient stray capacities to upset these adjustments. Therefore, if you find that you cannot obtain a setting on the trimmers, where at each end of the tuning scale the slightest movement upsets the balance, the inter-circuit wiring is responsible, and the wires should be modified. Sometimes it is only necessary to move one or two wires, but in other cases it may be necessary to shorten or lengthen them in order to obtain a balance. Remember, that when once this adjustment has been made it holds for all time, and there is no need to go through the trimming process again unless some of the components are changed.

## What to Listen For

On the normal broadcast band there is no need to tell you what to listen for. All the really worth-while European stations should be heard, and the adjustment of the right-hand tuning condenser, together with the lower left-hand control (reaction) will enable the required volume to be obtained. As is the case with all receivers, however, do not attempt to push reaction too far and spoil not only the quality of your reception, but also render tuning difficult. The application of reaction slightly affects the tuned circuit to which the reaction coil is coupled, and thus the balance between the three circuits will be upset. Therefore use reaction sparingly, and take it as a rule that if it is necessary to apply so much reaction that the matching of the circuits is upset, then the station is not worth listening to, and confine your reception to those stations which provide a more powerful signal. There should be sufficient of these, in most parts of the country, to provide ample entertainment at all times, although with this particular receiver, should it be found that the normal broadcast band does not provide any item of interest at any particular period, there are the short waves to be explored. You will probably find, when once installed, that you will spend the greater part of your listening time on the short waves owing to the interest which is to be obtained in locating the stations.

## Short-wave Listening

Unlike the medium and long waves, there is no knowing from one hour to another just what stations you may tune in on the 24 to 52 metre band which is covered by the coil specified for the Silver Souvenir. Switch the receiver to the short waves, and carefully turn the reaction condenser until a *slight* rushing noise is heard. If you turn it too far, you will pass many stations, and probably only hear powerful C.W. transmissions. Tuning is best, therefore, carried out with two hands, the left hand controlling the reaction condenser, and the right the tuning condenser immediately above it. Keep the two in step, so that when a carrier wave is tuned a chirp is heard, and then slacken off the reaction until the speech or music is resolved. If it is found that any "dead spots" occur, that is, where the reaction condenser may be turned to its maximum position without obtaining reaction, it will be necessary to include a small condenser in the aerial lead. This should preferably be of the pre-set or air-spaced small variable type, in order that the most suitable adjustment may be found. It should be possible to obtain reaction before the reaction condenser is at its maximum position, throughout the entire range of the tuning condenser. With regard to the actual stations which you might hear, you will probably find that the Empire Broadcasting transmissions provide very good calibration points, provided you can hear the call letters.

### FEATURES OF OUR NEW CABINET

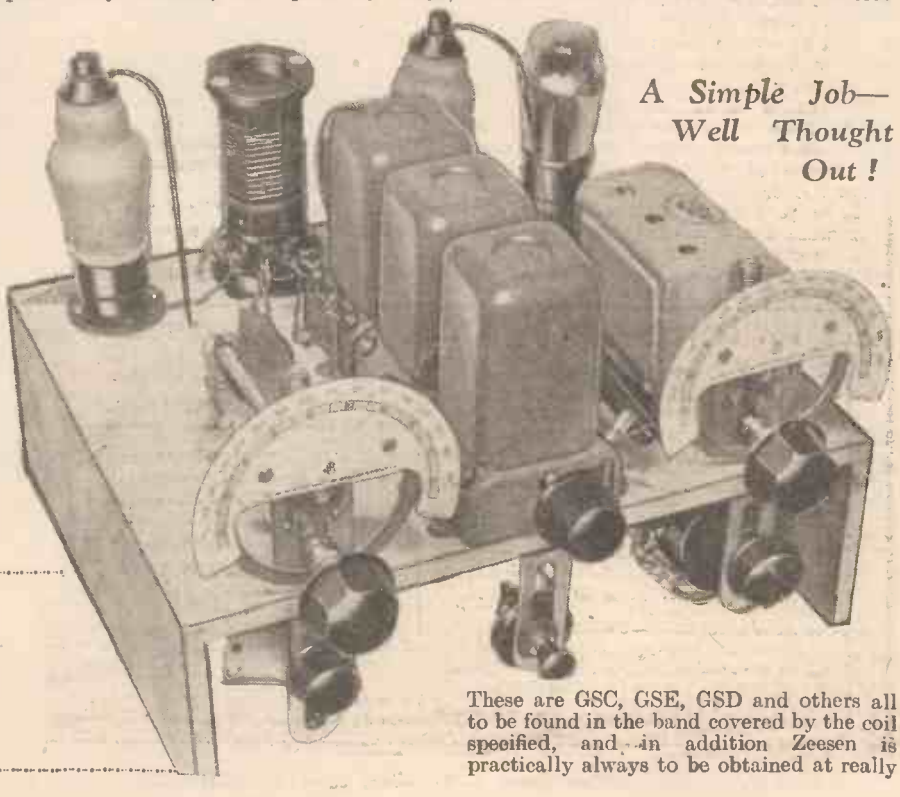
**Inclined Panel — Locker Space for instruments, phones, books, batteries and accumulators.**

### FEATURES

**Simplicity of control—only one tuning knob for each waveband.**

**Three pentode valves—providing maximum efficiency in each of the three stages.**

**Undistorted output of 1 watt.**



*A Simple Job—Well Thought Out!*

These are GSC, GSE, GSD and others all to be found in the band covered by the coil specified, and in addition Zeesen is practically always to be obtained at really

*Here is F. J. CAMM'S Silver Souvenir in its new and original cabinet. The panel is inclined for ease of operation. Chromium-plated knobs are used. The two lockers provide accommodation for phones, testing equipment, batteries, books, etc.*

*The Silver Souvenir with the lid off! Releasing the chromium-plated knobs reveals the internals.*

wonderful volume. Although there are numerous American, Canadian and Australian stations on this band, it must not be expected that these will be picked up every night just when you want them. Much of the thrill of short-wave work comes from the uncertainty with which certain stations are heard. You may, for instance, tune through a certain part of the dial and hear nothing. A moment or so later, you may pass through the same part of the dial and hear several stations, which were transmitting when you last passed but which had perhaps faded at the moment you passed the tuning point.

Many Morse stations will be heard, some from remote parts of the world, and some from amateur transmitters in this country, and at certain times amateur transmitters may be picked up and will state their actual wavelength, which will enable you to make a calibration chart for this band so as to be able more easily to locate certain desired stations. There is no need to confine your short-wave listening to the 24 to 52 metre band, however, as it is possible to obtain further coils to replace the short-wave coil specified and thus cover a much more extensive range. A total wave-band of 12 to 80 metres should be ample for obtaining most interesting programmes.

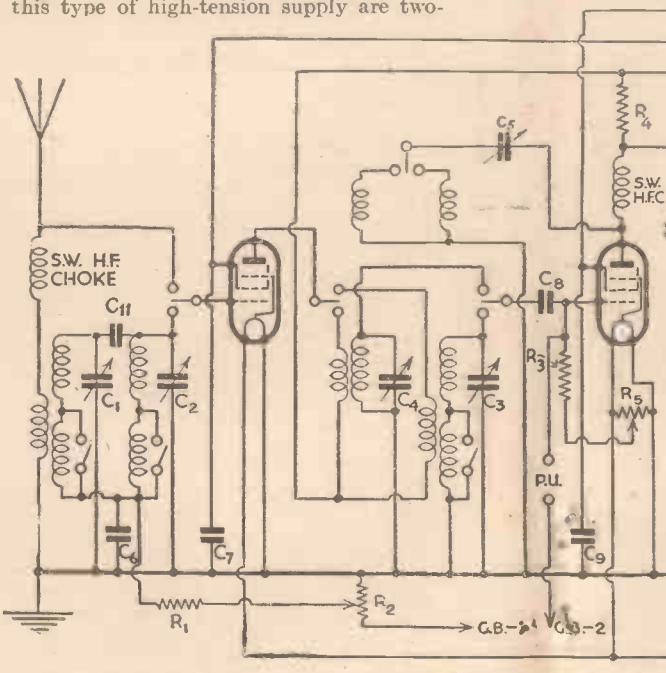
## Calibrating the Short Waves

Unfortunately, on the short waves there will be found a number of stations which are duplicated. For instance, the Empire Transmissions are sent out on various wavelengths simultaneously, and some of the high-powered European stations also use different wavelengths simultaneously. Zeesen, for instance, may be heard at a number of different dial settings, and, although on some parts of the tuning dial the programme will differ, it may be found that at others a similar transmission is in progress. This renders calibration rather difficult, as it is not possible for the announcer to give the exact transmission to which you are tuned, and can only state that stations DJA and DJC, for instance, are radiating the programme. This brings home the need for a really good wavemeter, and in this issue will be found some notes regarding the construction of such an instrument.

All doubts regarding the exact tuning point will thus be removed and a more interesting use may be made of the short-wave transmissions.

## Using an Eliminator

Generally speaking, this receiver will function quite satisfactorily from a good eliminator, and it is only necessary to connect this to the receiver in the usual way. Difficulties which might arise with this type of high-tension supply are two-




*Theoretical circuit diagram of Mr. F. J. Camm's All-Wave "S*

### LIST OF COMPONENTS FOR F. J. CAMM'S ALL-WAVE SILVER SOUVENIR.

**COILS.**
One set 3-gang W.L. type QRT (Wearite).
One short-wave coil, type S.P.C., with type S.P.B base (B.T.S.).

**CONDENSERS (Variable).**
One 3-gang .0005 mfd. Baby condenser with slow-motion drive—C1, C2 and C3 (J.B.).
One single condenser, .00016 mfd., type E, with slow-motion drive, C4 (Polar).
One reaction condenser, .00025 mfd., type No. 4, C5 (Polar).

**CONDENSERS (Fixed).**
One .5 mfd. tubular—C10
Two .1 mfd. tubular—C7 and C9
One .01 mfd. tubular—C6
One .0001 mfd. tubular—C8
} (T.M.C.).

**RESISTANCES.**
One 50,000-ohm 1 watt—R4
One 20,000-ohm 1 watt—R1
} (Amplion).
One 2-megohm 1 watt—R3
One detector-bias resistor, type No. BR—R5 (B.T.S.)

**CHOKES.**
Two short-wave, type HF.3 (Bulgin).

**VOLUME CONTROL.**
One 50,000-ohm potentiometer—R2 (Varley).

**TRANSFORMER.**
One Niclet, type DP21 (Varley).

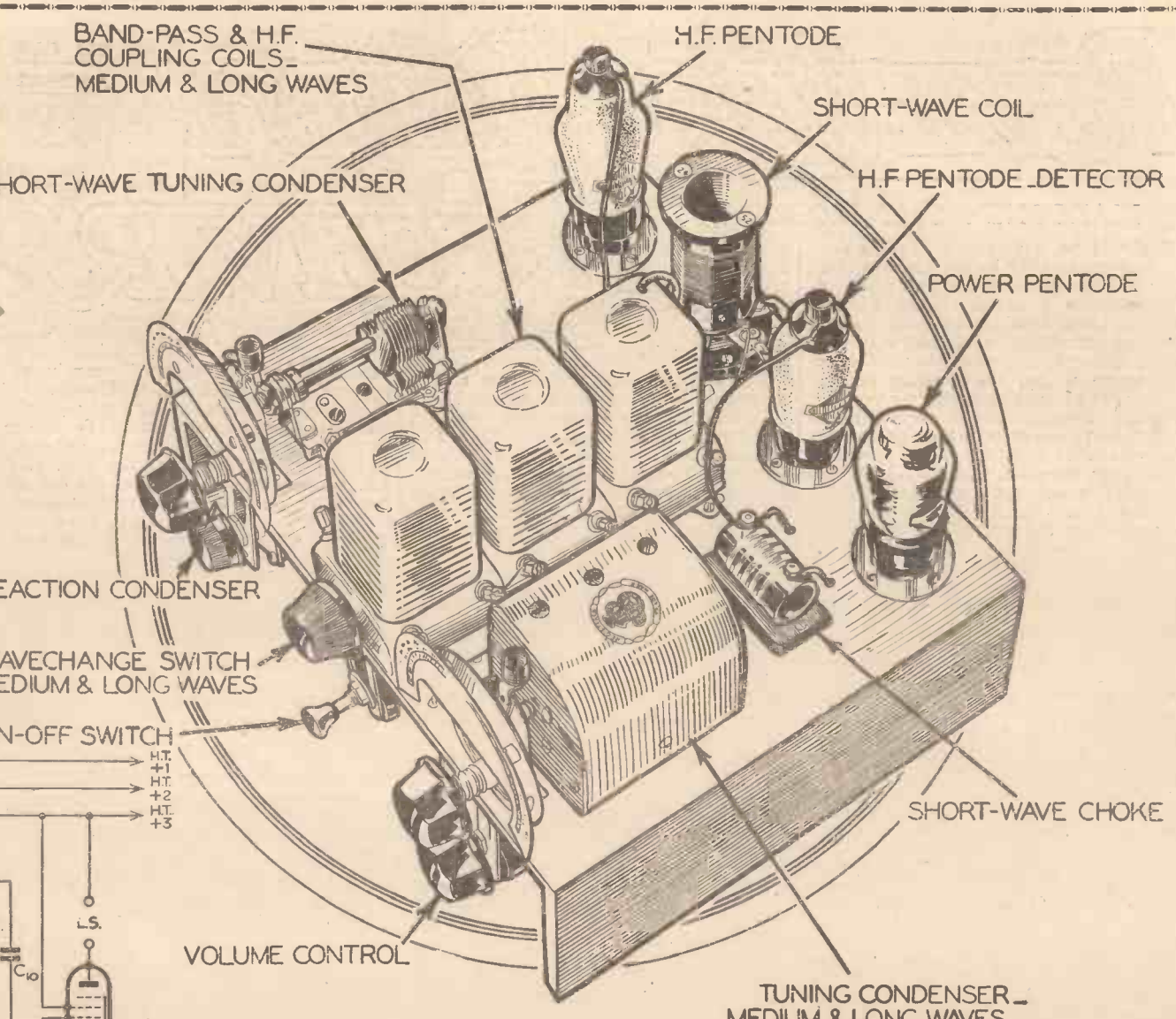
**SWITCHES.**
One 3-point on-off switch (B.T.S.).
One 4-way change-over switch (Wearite).

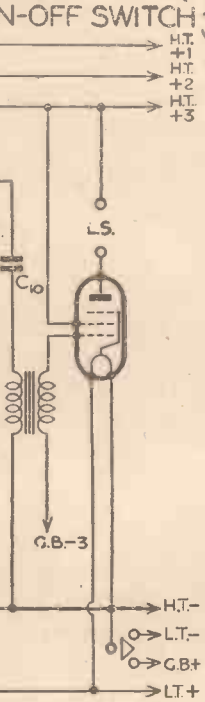
**CHASSIS.**
Metaplex, 12in. by 10in., with 3½in. runners (Peto-Scott).

**VALVES.**
One 210 VPT, one 210 SPT, and one 220 PT. (Cossor).

**VALVE-HOLDERS.**
Two 4-pin chassis type airsprung (Clix).
One 5-pin chassis type airsprung (Clix).

**ACCESSORIES.**
Four component brackets (Peto-Scott).
Eight wander plugs, H.T.—, H.T.+1, H.T.+2 H.T.+3, G.B.+, G.B.—1, G.B.—2, G.B.—3, (Belling Lee).
Two spade terminals, L.T.— and L.T+ (Belling Lee)
Two terminal strips, L.S. A.E. (Belling Lee).
One permanent magnet moving coil Stentorian Junior loud-speaker (W.B.).
One 120-volt H.T. battery (Siemens).
One 16-volt G.B. battery (Siemens).
One 2-volt L.T. accumulator (Siemens).
One Silver Souvenir cabinet (Peto-Scott).
One pair high-resistance headphones.



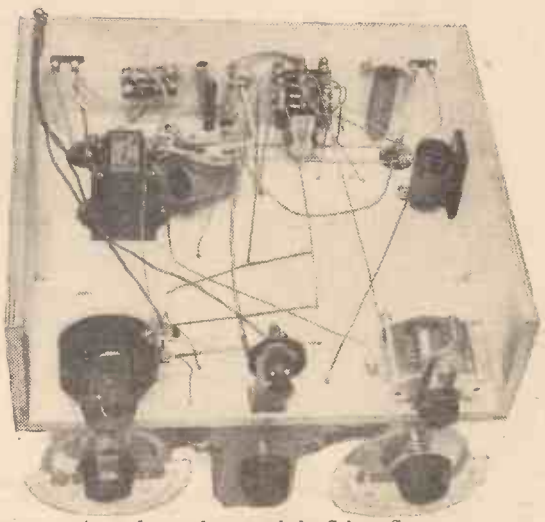




*Silver Souvenir."*

fold. Firstly, instability might arise due to the necessity for decoupling the anode circuits, and secondly, hum might be experienced when the receiver is tuned to the short waves. The first-mentioned trouble is overcome in the usual way by the use of decoupling resistances and condensers, and in general it should y be necessary to include these in the H.F. uit. When, however, the mains unit is such a nature that serious instability caused, then the detector circuit also have to be so modified. In view of the allel-fed L.F. transformer circuit, how-r, this should not be necessary unless the ns unit is a very poor one. Where the has a tapping specially designed for the ening grid of an H.F. valve this may employed, and if a variable tapping is vided, this should be employed in ference to a fixed tapping, and will enable the maximum to be obtained from the H.F. stage.

## Curing Hum

If hum is experienced on the short-waves, it may be necessary to include further smoothing circuits, and a good L.F. choke with an 8 mfd. by-pass condenser should be joined to the maximum H.T. tapping on the mains unit, and the choke should then be joined to the positive end of resistance R4, in preference to adopting the common H.T. supply for the detector stage. If a metal case is employed for the unit, this should be joined to earth, and it should also be placed as far as possible from the receiver. Only in very rare cases will it be found necessary to turn the unit about to cure hum induced into the L.F. transformer in the receiver. This is a possibility which must not be overlooked, however, and when the receiver and unit are enclosed in the cabinet, it may be found desirable to carry out a few experiments to decide upon the position which provides the lowest amount of interference. With most good units, there should be no troubles of any sort, and they may simply be joined to the receiver in the same manner as the normal H.T. battery.



*An underneath view of the Silver Souvenir.*

# REVIEW OF LATEST RECEIVERS

TESTS OF STANDARD RECEIVERS ON OUR AERIAL

## MARCONIPHONE MODEL 264

IT should be unnecessary in these days to have to refer to the high standard which is adopted in the finish of Marconiphone products. Model 264, in addition to the usual style of table cabinet, has been embellished with small chromium strips, giving to the complete receiver an appearance which, whilst being entirely modern, is not gaudy or too severe, and, although hackneyed, the term "handsome" does definitely apply to this receiver. The circuit is described as a five-valve seven-stage superhet, with Q./A.V.C., and the price is only twelve guineas. These features alone command attention, and an analysis of the complete circuit details shows that the makers have managed to combine a really high-class chassis into a really low-priced receiver, for 12½ guineas cannot be held to be a high figure for such an imposing receiver. The valve combination is MX.40, VMS4, MHD4, MPT4, and MU12, which, for the benefit of those who are not acquainted with Marconi or Osram valve types, are respectively a heptode, a variable-mu S.G., a double-diode-triode, and a pentode output valve, with the last valve (MU12) an indirectly-heated rectifier. The latter delivers an output of 350 volts, and thus it becomes possible to utilise an energised loud-speaker for smoothing purposes, delivering at the same time the extra sensitivity of this type of speaker and providing perfect smoothing for the H.T. supply. The loud-speaker is fitted with a hum-bucking coil, and the input transformer is provided with connecting points which, in addition to the energising leads, etc., provide two additional points for the connection of an external speaker.

*Note the interesting cabinet design of the Marconiphone Model 264*

### Circuit Details

The coils for the receiver are of the unscreened type, but are so arranged that no difficulties are encountered by hum pick-up or other interference. The I.F. transformers are, however, effectively screened. The first valve is of the electron-coupled frequency-changer type, and is fed from a band-pass tuner, the variable condensers for this part of the circuit being combined with the oscillator tuning condenser to form a three-gang condenser. The aerial input may be of the normal type or a mains aerial connection may be employed, a plug at the rear providing a simple change from one method to the other. In addition a further adjusting control near this connection enables the sensitivity to be slightly reduced in order to decrease static. This control operates in conjunction with the volume-control knob on the front of the panel, and this is provided with two positions, somewhat after the fashion of a simple push-pull switch. In its normal condition, the control lies against the panel, but if it is pulled out between-station noises are reduced to a very low level, and if the static control at the rear is set to its maximum position (anti-clockwise), when the volume-control knob is pulled out there is silence between stations. This is a valuable device, and can best be appreciated by those who live in a neighbourhood where intense static and other noises are heard between the various stations. Tuning under such conditions is very difficult, as the volume control has to be turned to a very low level to avoid the distraction of the noises, and thus it becomes difficult to locate the desired station.

### A.V.C.

The automatic volume control in this receiver does really function well and keeps all the more powerful stations at approximately the same level. Thus, when tested in our laboratories it was found possible to turn the volume control on the London Regional to its maximum position, and no overloading of the output valve took place. When turned to Radio-Paris exactly the same volume was obtained, and two or three other stations provided exactly the same output. Features of the construction which will appeal to the keen listener are as follow: Firstly, the adjustment for varying mains voltages is carried out by inserting a small screw in the appropriately marked socket. No wires to disconnect or leads to change round—simply the insertion of a screw. Screening of the valves is carried out by ordinary metallising in the case of the H.F. and I.F. valves, and connection to the cap of the valves is carried out through screened leads and a small metal cap, thus preventing troubles due to interaction with the lead or its point of junction.

### Controls

Four controls are provided, although, as previously mentioned, one of these has two separate functions. This is the volume control combining silent tuning switch, and the remaining controls are for tone, tuning, and wave-change/on-off/gramo switch. The tuning scale is calibrated in metres and is of the full vision type. Several tests were carried out with the receiver, using a large outside aerial, a small indoor aerial, and the mains aerial device. Whilst the outdoor aerial was productive of the greatest number of stations, no greater volume was obtainable, owing to the efficiency of the A.V.C. device. This really worked in this particular receiver, and was not simply a name given to a circuit as has been found in some commercial sets. Stations appeared at practically every point on the dial on the medium waves, and on the long waves there was ample to provide full entertainment throughout the evening.

On the indoor aerial most of the good Continental stations could be comfortably heard, and no difficulty was experienced in choosing a programme at really comfortable strength. The mains aerial device did not appear inferior to the indoor aerial, and was quite good enough for the majority of listeners, who will, of course, find it an advantage to be able to dispense with the external aerial. All the refinements fitted to the receiver, such, for example, as hum control, pick-up circuit, etc., functioned admirably, and on gramophone records the reproduction was up to the same high standard as was obtainable on radio signals. The receiver represents splendid value for money.

The Three "S's" of Radio Receiving Circuits

# BEGINNER'S SUPPLEMENT

**One of the Most Useful Classifications for Present-day Radio Receivers Deals With the Circuit Arrangements. This Article Deals With "Straight"—"Superhet" and "Super-regenerative" Receivers.**

ONE of the first things noticed by the new-comer to radio is the very large number of different types of receiver from which he has to make his choice. This is particularly the case with home-constructed sets, because commercially built receivers tend to become standardised or stereotyped to a certain degree, although here, also, there is a fairly wide range of choice.

Receivers can be classified in a number of different ways, but the most useful and interesting classification takes into account the circuit arrangements employed. During the comparatively short period in which radio technique has been built up, a large number of different methods of reception have been developed, each having as its object either the general improvement of listening, or the solution of some specific difficulty. Many of these arrangements and circuits have been discarded as soon as better ones have been evolved, but a number of basic circuits and principles have survived and form the foundation of all modern sets. Broadly speaking, all receivers fall into one or another of three main classes, namely "straight" circuits, "superhets," or sets of the "super-regenerative" type.

## Elements of the "Straight" Set

Dealing with "straight" circuits, listeners should be reminded that the received signal which is picked up by the aerial consists of a high-frequency wave, combined with a wave of speech frequency which constitutes the programme. The one essential of a receiver, therefore, is a means for separating the two frequencies, and for reproducing the speech frequency portion in an audible form. The simplest form of receiver, therefore, consists of a tuner, a detector (which may be a crystal or a valve), and a pair of headphones.

The cycle of operations in this elementary set is that in the aerial and the tuner circuit are developed modulated high-frequency currents corresponding to large numbers of radio stations. As the result of tuning, the high-frequency current corresponding to the wanted station develops a considerable voltage across the tuning circuit, this being applied to the detector, where the rectifying action (ability to pass current in one direction only) filters out the high-frequency portion of the signal, making only the programme component available in the output circuit.

In Fig. 1 is shown the common circuit for a single valve set for the purpose of noting certain features. In the first place, a tapped coil is used for tuning, to give a better degree of selectivity or freedom from interference by other stations. Then, by means of the reaction coil L and the condenser C, energy is fed back from the anode circuit of the valve to the grid circuit to be re-amplified. Few people are content at the present time to listen with headphones, and so in Fig. 2 is shown a further extension of the "straight" circuit. This represented the average domestic set of, say, four or five years ago, and is still used where reception conditions do not call for a very sensitive or highly selective set, and listeners are content with their two local programmes and a small number of foreign alternatives.

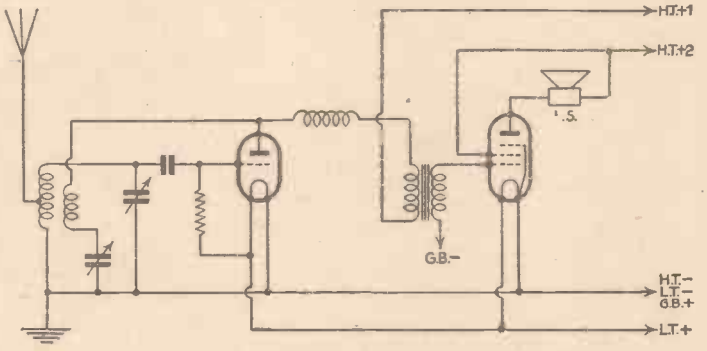



*Fig. 2.—Adding a stage of L.F. amplification to the circuit shown in Fig. 1 to increase signal output.*

## One Frequency Change

A modern straight set may be constructed by adding a third valve between the aerial and the detector to amplify the H.F. signals before they are rectified, thus greatly increasing the range. A tuned circuit following the H.F. amplifier also improves overall selectivity.

It is, of course, impossible to illustrate and describe all the variants of the "straight" circuit, but it may be mentioned that up to two H.F. amplifying valves may be employed; either of the screen-grid or screened pentode types, and they may be of the normal type or the variable-mu class, in which case gain control may be exercised manually or partly manually and partly automatically.

From the foregoing it will be gathered that a "straight" set is one in which *only one change of frequency* is employed, namely, from radio frequency to speech frequency. This change takes place in the detector stage, but one or more H.F. amplifying stages may be employed prior to detection. These sets are used on all wavebands—long, medium, and short—providing the tuning circuits are suitably designed, and it can be stated quite fairly that the best straight sets are equal to anything which can be reasonably demanded of them for medium- and long-wave reception. On the short waves their efficiency is not quite so high, but even here they will usually give a good account of themselves.

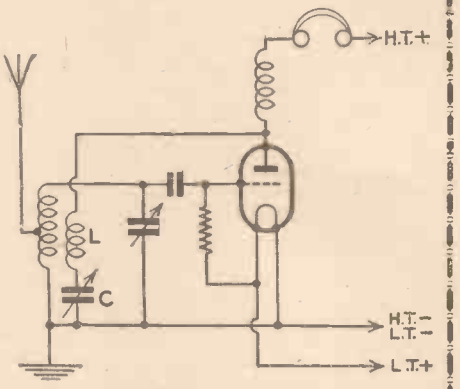



*Fig. 1.—A simple one-valve detector circuit with reaction to illustrate the principles.*

## The Next Class

In the second class of receivers, namely "superhets," the frequency is changed twice. The first change is from a radio frequency to a lower frequency which is not so great as the signal frequency, but considerably above audio frequency. This is known as the supersonic or intermediate frequency, and it is here that the greater part of the amplification occurs. Following the I.F. amplifiers comes the second detector, or speech detector, which fulfils the same function as the detector of a straight set, and provides a speech frequency voltage to be dealt with in the ordinary way by the low-frequency amplifier and loud-speaker.

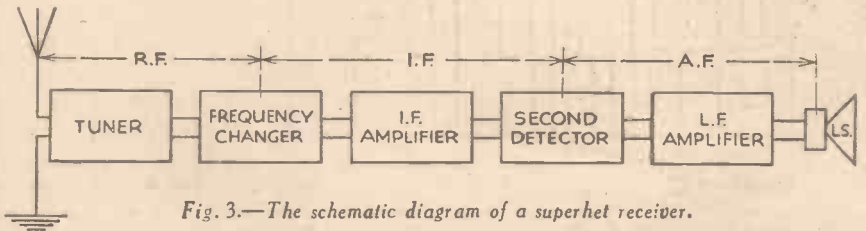



*Fig. 3.—The schematic diagram of a superhet receiver.*

Fig. 4 shows a theoretical circuit of a superhet receiver and indicates the stages through which the signals pass. The reason for the double change of frequency is twofold. In the first place the lower intermediate frequency can be amplified much more efficiently than the radio frequency, and this provides, for a given number of valves, a very much higher sensitivity than is usually possible with a straight set. Secondly, the couplings between the intermediate frequency stages and the second detector consist of transformers having both primary and secondary windings accurately tuned to the intermediate frequency, thus greatly enhancing the selectivity of the circuit.

## A Distinctive Feature

It should be remembered that these I.F. transformers operate at a fixed frequency, no matter what is the frequency of the incoming signal, and their tuning is adjusted once and for all when the set is built. The tuning system of a superhet, therefore, is no more complicated than that of a straight receiver, although the circuit arrangement itself is somewhat more complex.

The most interesting and distinctive feature of a superhet is the manner in which the first change of frequency, namely from R.F. to I.F., is achieved. Briefly, the receiver itself is made to generate a local unmodulated radio frequency oscillation which, by means of a tuning system ganged with the signal tuning system, is maintained at a frequency which differs from the frequency of the incoming signal by a definite amount, equal to the desired intermediate frequency. This frequency is usually of the order of 110 kc/s. The local oscillation is combined with the incoming signal, and the result is the production of a new modulated signal of intermediate frequency. There are several different forms of frequency changer, the principal ones being (1) a separate triode oscillator with a screened grid or H.F. pentode mixer valve; (2) a screen-grid or H.F. pentode operated as a combined detector-oscillator, and (3) an "electron-coupled" frequency changer of either the heptode or octode type.

## Advantages

The last mentioned represents the most recent practice, the frequency changer valve comprising a cathode, anode, and either five or six grids. The cathode and first two grids form a triode oscillator and provide the heterodyne frequency. The next grid forms a screen between the oscillator section and the remainder of the valve, which functions as a screen-grid or pentode mixer, of which the fourth grid is the control grid, and the next the auxiliary grid. Electrons, oscillating at heterodyne frequency, are drawn from the oscillator portion, and are modulated at signal frequency in the mixer section without the use of any form of external coupling. The circuit shown in Fig. 4 shows the theoretical circuit of a conventional superhet of this type.

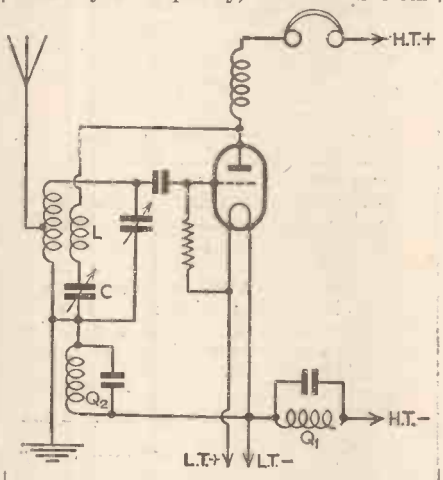



*Fig. 5.—The basic circuit of a super-regenerative receiver.*

To sum up, therefore, a superhet receiver is, valve for valve, much more sensitive and more selective than the average straight set, and is frequently preferred for distant reception. Owing to its great selectivity, the quality of reproduction is apt to suffer by an attenuation of the upper register, but various devices for correcting the tone can be employed, when the reproduction can be made very pleasing. It is suitable for all wavebands, and on the short waves gives a far better overall gain than is possible in straight sets which endeavour to amplify the very high frequencies.

## Super-regeneration

In the last category is the super-regenerative receiver, and to understand its principle it is necessary to revert for a moment to Fig. 1, in which the device known as reaction (or regeneration) is shown. If reaction is increased beyond a certain point the valve will oscillate, that is to say, generate oscillations at signal frequency. Reception under these conditions is, of course, impossible, and maximum sensitivity actually occurs just before oscillation sets in. It is, however, not possible to use a valve even in this condition, because the circuit is then quite unstable, and the valve may suddenly break into full oscillation without warning. It is possible, however, to adjust the circuit in such a way that the valve is made to fall into and out of oscillation many times in every second. When it is in the act of oscillating it is extremely sensitive, and amplifies the signal very considerably, and uncontrollable oscillation is prevented by the arrangements made to break up the oscillation into very small time periods. This principle is called super-regeneration.

What happens is that the valve oscillates and the oscillation is "quenched" very rapidly, this cycle being repeated at intervals corresponding to a frequency either high in the audible scale or in the supersonic region. If an audible frequency is chosen there will be, in addition to the signal, a certain amount of background noise at the quenching frequency, and some form of filter must be employed to eliminate it. There are many variants of the super-regenerative circuit, and practical diagrams have appeared in PRACTICAL WIRELESS from time to time, so it will suffice to give, in Fig. 5, a basic diagram of a single-valve circuit of this type. This consists essentially of a detector arrangement with reaction, similar to that shown in Fig. 1, but it must be remembered that for super-regeneration reaction is pushed to the limit to obtain oscillation.

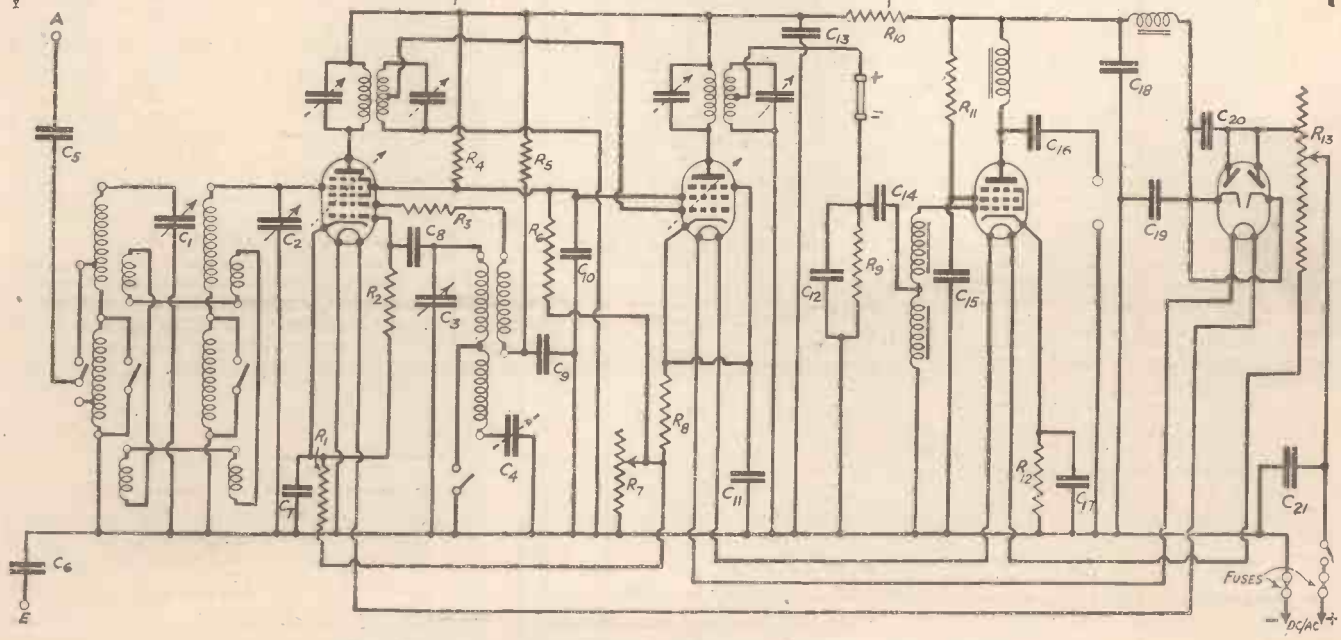



*Fig. 4.—Theoretical circuit of the Universal Three-valve Superhet.*

# IMPRESSIONS ON THE WAX

*By* T. ONEARM

A MOST interesting record just issued is "Ambrose's Jubilee Cavalcade" on a 12in. Decca Record No. *K*750. This record deals with the song "hits" of each successive year of His Majesty's reign, announced and grouped into series. It brings back memories of each of those twenty-five years with amazing clarity, and it is extraordinary how one's mind automatically links each together—the song and the year. The "arranger" (Ronnie Munro) took over four days to arrange this medley, and Ambrose has, in turn, done real justice to this musical panorama of the last twenty-five years.

Alfred Campoli features prominently in the Decca list this month with two very fine records. The first, "Destiny" and "Nights of Gladness," played by Campoli and his old-fashioned Waltz Orchestra, on *Decca F*5434, is typical of the playing of the period in which these waltzes were written. I hear, incidentally, that "Destiny" is to be the theme tune of one of the Jubilee films. The number of his other record is *Decca F*5482. The titles "Romanesca" and "Vienna in Springtime," featured on this record, are admirably played by his Marimba Tango Orchestra and are of general appeal, because they are not merely tangos for the dancer, but are really interesting pieces of music as well.

## A Record with a Story

There is an interesting story behind the recording of the two songs "Malola" and "Home Again" on *Decca F*5481. Mabel Wayne, the composer of "Ramona," "Little Man You've Had a Busy Day," and so many of the biggest song hits of recent years, had just composed the two numbers mentioned above. Collie Knox, the Radio editor of the *Daily Mail*, happened to hear her playing them and began to hum them as she played. Finally, he sang them through.

Mabel Wayne immediately suggested that they made a record together, which Knox agreed to do. Just then, Ambrose happened to call and said he would, for fun, join in the making of this record and play a violin obbligato, which offer they readily accepted. I do not remember hearing three artists of such varying talents on a single record before. You should certainly hear it!

## Decca-Polydor Records

There is an important addition to the already formidable repertory of the works of Ravel, the "F" Major String Quartet now available on *Decca-Polydor Records LY*6105-6107. The composer directs the performance, and the players are the Galimir String Quartet, which consists of three sisters and one brother. The players are well known in Vienna.

Karl Linder playing the Bach "E" Flat Organ Fugue, on *Decca-Polydor PO*5117, is an organ record to which I am going to apply a double superlative by calling it super-magnificent. This record of the Triple Fugue for organ is based upon the hymn tune to which we in England sing the words "O God, our help in ages past." Although a fugue is a highly technical piece of musical composition, it can be described simply as a fantasia built upon a main tune which forms the subject of the fugue. I urge you to hear this record.

In response to a vast number of requests, the Decca Company have this month published another record by Felicie Huni-Mihacsek, the well-known soprano, who, with the assistance of Willie Domgraf-Fassbaender (baritone) and Gerhard Witting (tenor), sings excerpts from two of Mozart's most popular operas. The songs are "How long in Torment Sighing" ("The Marriage of Figaro") and "Such Charming Melodies" ("The Magic Flute"). The record—*Decca-Polydor CA*8198—is a superb one in which everything is right, and there is no flaw or blemish anywhere.

A long time has elapsed since a record by Guiseppe Lugo, the Italian-born tenor who is now a celebrated member of the Paris Opéra-Comique, has appeared in the Decca-Polydor list. This month, however, he sings two well-known songs—"O Sole Mio" and "Mattinata"—on *Decca-Polydor PO*5116. Make a point of getting this record.

## Brunswick Records

Among the *Brunswick* records for this month appears a record of Emil Coleman and his orchestra playing "Clouds" and "Be Careful, Young Lady" on *RL*222.

Although this band may be unfamiliar to many, it is a most popular band in the States, specialising in strings and melody. I think that the two tunes mentioned above will soon be widely known, as three of them are from Carl Brisson's new picture "All the King's Horses," generally to be presented shortly.

Bing Crosby boo boo boo records are popular, and this month he gives us "It's Easy to Remember" and "Swanee River" on *Brunswick O*1993. The former song comes from Crosby's latest picture "Mississippi," which should, for that reason alone, put this song into the "hit" class. But without a film to publicise this song, I prophesy that it would be an outstanding "hit" all the same.

## REWINDING LOUD-SPEAKER FIELD COILS

WE have received a number of inquiries recently asking for details of gauge and turns of wire necessary to rewind the field coils of moving-coil loud-speakers. Some of these loud-speakers are of the six- and twelve-volt type, others of high-resistance types, it being required that they be rewound for use direct on D.C. mains or *via* a rectifier on A.C. mains, or require a different resistance value so that they can be used in place of the usual smoothing choke in an eliminator.

We give the method by which the turns and the gauge of wire can be found for all these changes, but it should be noted that in some of the earlier types of loud-speakers where the "pot" is very much larger than the present-day constructions, the original watts can be increased by two or three times, due to the fact that ample iron was invariably employed, but for reasons of economy, especially on those driven from accumulators, the current was kept low. As the class of iron varied considerably as well as the size, and as it is not possible for the amateur to determine which class of iron was actually used, it is not intended to give details for working out the watts necessary for saturation, although some remarks made at the end of this article will be useful in this direction.

There are three figures which must be known before an attempt is made to rewind the coil. They are the resistance of the new coil, the window area or "window," and the length of an average turn of wire. The first is found by working out the watts of the original coil, which will be the product of the volts and current. Having found this figure it is then necessary to reconvert the watts into current using the new volts, and then finding the resistance. The whole of the foregoing can be worked out from the formula: $R=\frac{V^2}{v \times I}$

where V is the new working voltage, v the original working voltage, and I the original current. If it is desired to increase the watts the resistance must be divided in ratio with the watts increase desired.

It should be noted that the present-day field coil usually has a dissipation of 7 to 10 watts, and this should not be increased, these field systems being designed to the maximum economical limits. If any doubt is felt, the manufacturer's advice should be sought. The second can be found by actual measurement of the length of the bobbin, and the depth of the winding taken from the rim of the end cheek to the core, and multiplying these two together, the answer being in square inches. The third, the length of an average turn is found from the formula D1—D2× 3.14, where D1 is the outside diameter of the end cheek and D2 is the diameter of the core. Some allowance should be made when measuring D1 and D2, to allow for insulation and for covering the outside of the coil.

It is not possible in a simple formula to work out both wire size and turns, even knowing the above data, and it is best to "try" a gauge of wire and to make alterations if things do not work out quite right. This can be done in two ways. The first is to work on the wanted resistance and find out how much space a certain gauge of wire will occupy, and the other is to find out the nearest resistance that a certain wire will give by filling the available space. Both are just as good as one another, but the

(*Continued on next page*)

# Welding and Wireless Equipment

How a New Process is Aiding Production. By C. W. Brett, M.I.W.E., Managing Director of Barimar, Ltd.

AN interesting phase of wireless development, often overlooked by the actual user, is the variety of intricate plant involved in the production of various components. The problems of manufacture are no more vital to a satisfactory result than an even flow in output, and it is the latter which is the more frequent scource of anxiety.

A short time ago a firm manufacturing wireless components experienced three major breakages on key machines within as many weeks, and had it not been for the scientific methods of welding which have only been introduced for a relatively short time, the consequences would have been extremely serious. As it was delay was reduced to a minimum, and in every instance production was restored almost within a period of hours.

## Low-temperature Welding

This engineering achievement is due to the new British low-temperature welding process for repairing cast iron and malleable parts. Hitherto it has been necessary to dismantle the machine before such work could be commenced. The pre-heating of the casting, together with the subsequent cooling, involves not only a considerable loss of time, but a risk of distortion, unless the part is handled by operators having extensive experience backed with the specialised knowledge of a metallurgical expert in heat treatment.

The low-temperature welding process frequently enables fractured components to be repaired in position, without the risk of faces losing their truth, bearings getting out of line, and cracks during the operation or subsequent to it.

## Economical Repair Work

Almost equally important, in these days when production costs must be carefully scrutinised, is the fact that repairs to light castings which are welded by this new process rarely cost more than one-sixth of the price of a replacement part.

Although one could give an extensive list of the types of machine tools and other equipment repaired or reconditioned in the manner described, probably the most serious breakages which occur are in power presses or stamping machines used in the production of articles made of plastic material as well as metal.

These accidents often happen during pressure of work; two thicknesses of the material to be moulded may be inserted instead of one, whilst it is not uncommon for a tool to be left on the press table, and for the main frame to be broken in two as a result.

Fractures of this kind usually occur across the bearing housings which carry the shaft in the eccentric type of press, or in the angle where the upright portion meets the table.

Irrespective of position, however, these machines can not only be repaired by welding, but built up at those points where the margin of strength may be increased with advantage.

Quite apart from the fact of uniting a broken casting, it is equally important that the nature of the parent metal repairing the weld remains unchanged and that the relative position of the various parts will be perfectly true.

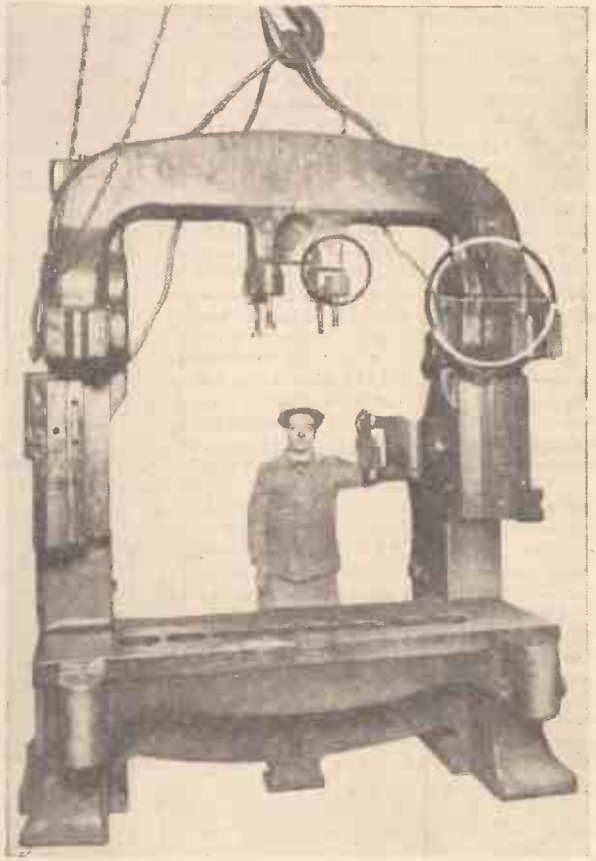
It is work of this kind which allows uninterrupted and economical production, and whilst scientific research is unremitting in its effort to produce still better wireless equipment, welding engineers are contributing their quota to the cause of this development.

## Repairing a Fractured Press

The subject of the accompanying illustration is an extremely powerful press capable of stamping eight parts in one movement. This machine has an enormous daily output, and is the key press of the factory in which it is installed, mainly because it produces the basic items for the various manufacturing processes which follow.

When the main casting was fractured the work in the factory was affected immediately and would quickly have come to a standstill. The breakage occurred right through two of the shaft bearing housings, necessitating particularly careful work to prevent even the slightest distortion. A welding squad with special equipment repaired the press, and it was working at full capacity again in three days!

Numerous instances of this kind could be repeated, but sufficient has been said to emphasise the connection between the scientific welding engineer and the producer of wireless sets.



*This illustration shows the cracks in a powerful press which were repaired by the low-temperature welding process described in this article.*

## REWINDING LOUD-SPEAKER FIELD COILS

*(Continued from previous page)*

latter will be used in the following example, which explains how the best gauge of wire is found.

## Simple Calculations

Taking a loud-speaker whose "window" has an area of 3.5 square inches, with an average-turn-length of 7.5 inches and a required resistance of 4,500 ohms. For the first calculation a wire is chosen which it is anticipated will be near the mark, so No. 30 S.W.G. enamelled wire is taken. Looking at the accompanying table it is seen that the minimum number of turns of this wire which will go into one square inch is roughly 5,500. As 3.5 square inches are available for winding it should be possible to get 19,250 turns on the coil. It should be noted that the turns per square inch column in the table is for carefully wound coils, not necessarily "turn by turn," but in a reasonable orderly manner. This figure is then multiplied by the average turn length and then reduced to yards, which in this case gives 4,010 yards. Referring to the table again for the resistance per yard, it is found that the total resistance would only be 477 ohms, which is very wide of the mark. Some considerable increase is required, so No. 36 S.W.G. is now tried. In this case the total turns would be 43,400, the total length of the wire 9,040 yards, and the resistance 4,682 ohms, which is quite near enough for practical purposes.

*Use this table for working out your loud-speaker windings.*

| Wire S.W.G. En. | Turns per sq. in. | Resistance per yard | Current |
|---|---|---|---|
| 30 | 5,476 | .119 | .12 |
| 31 | 6,241 | .227 | .106 |
| 32 | 7,225 | .262 | .092 |
| 33 | 8,281 | .305 | .078 |
| 34 | 10,000 | .361 | .066 |
| 35 | 12,000 | .433 | .055 |
| 36 | 14,400 | .520 | .045 |
| 37 | 18,225 | .661 | .036 |
| 38 | 22,800 | .849 | .028 |
| 39 | 30,500 | 1.130 | .021 |
| 40 | 34,000 | 1.327 | .018 |

A column is also given in the table showing the rating for each particular gauge of wire, and this should be referred to finally to make sure that the wire chosen can be safely used without overheating. In the example above, the current according to Ohm's Law would be .055 amp. The rating is, however, conservative (1,000 amps per square inch), and, provided that there was ample room round the loud-speaker and a free flow of air, this gauge of wire could be safely used.

It would be possible by using the current rating column to arrive at the watts for an unknown "pot," but not for saturation current.—W. H. F. (Middx.).

## LEAVES FROM A SHORT-WAVE LOG

By J. G. ABRAHAMS

THERE are a number of alterations to be noted this week in the schedule of the official broadcasters.

Zeesen (Germany), as an example, has brought into regular operation two more high-power short-wave transmitters, and consequently their grouping for the S.B. transmissions is now altered. DJB (19.74 metres) and DJQ (19.63 metres) are already on the air with a broadcast for Eastern Asia at B.S.T. 06.30-08.00 and DJN on 31.45 metres follows at B.S.T. 09.45-13.15 for Southern Asia. The transmission the Germans put out between B.S.T. 14.00-17.30 is destined to Eastern and Southern Asia and South America, and for this broadcast three channels are used, namely, DJA (31.38 metres), DJN (31.45 metres) and DJE (16.89 metres). Announcements are made in German, English and Spanish. For Africa, DJD (25.49 metres) and DJC (49.83 metres) work from B.S.T. 18.00-22.30; later DJA (31.38 metres) offers a programme to South America from B.S.T. 23.15-03.15, and to conclude DJC (49.83 metres) is brought into action at B.S.T. 23.30 with a radio entertainment and news bulletin destined to Canada and the United States. The arrival on the scene of DJN temporarily upset the Norwegian arrangements, and consequently, LKJ1, Jelöy, which relays the Oslo programme in the morning hours, has now reduced its wavelength to 31.34 metres (9,572 kc/s), and thus avoids interference.

ORK, Ruysselede, which can be heard every evening taking the Brussels programmes for the benefit of Congo listeners, has slightly changed its times; it is now on the ether between B.S.T. 18.30-20.00.

Of the Portuguese stations the only alterations to be noted are those made by CT1AA, Lisbon. On 31.25 metres Lisbon Colonial continues to work on Tuesdays, Thursdays and Saturdays, but will be found testing occasionally on 25.02 metres between B.S.T. 14.00-15.00. On Mondays, Wednesdays and Fridays between B.S.T. 22.00-24.00 tests are also being carried out on 50.1 metres.

### Rome Transmissions

Although Rome (I2RO) has been heard trying out various channels at odd times, both with the Far East and South America, the two wavelengths most regularly used are 30.67 metres and 49.2 metres. On the former the broadcasts are made daily between B.S.T. 20.30-23.00, and on Tuesdays, Thursdays, Saturdays and Sundays from B.S.T. 01.45-03.15; on 49.2 metres there are regular transmissions every Monday, Wednesday and Friday between midnight and 01.30.

PRA8, Pernambuco (Brazil) has slightly lowered its wavelength and on most nights will now be found on 49.5 metres (6,060 kc/s) or slightly below Daventry GSA. Remember that its interval signal is a long-drawn-out wail reminiscent of a siren. GSA is sandwiched between this station and HJ1ABG, Barranquilla, on 49.65 metres (6,042 kc/s), from which you hear chimes every fifteen minutes.

### Panama City

Whilst in this region, may I suggest a search for HP5B, Panama City, on 49.75 metres (6,030 kc/s)? If, as a jumping-off point, you set your condenser scale to the readings of DJC, Zeesen (49.83 metres) and work down slowly, you should succeed in logging this newcomer. The station was recently picked up on a two-valve receiver between G.M.T. 01.30 and 02.00. Announcements are given out by a man in both Spanish and English. In Spanish, the call is given as the *Estacion Radiodifusora Miramar de la Radio Panama*, and the announcer when signing off towards G.M.T. 03.30 wishes everybody "a happy good-night."

### Colombian Short-wavers

Notwithstanding the number of Colombian short-wavers already in existence, a new one has appeared on the horizon. It is HJ4ABL, Manizales, on 49.18 metres (6,100 kc/s). A special broadcast for distant listeners is made every Sunday morning between B.S.T. 04.00-04.30, and details of the programme are given out in Spanish, English, German and Dutch. The call, frequently repeated and preceded by blasts on a motor horn, is (in Spanish): *Ecos del Occidente* (Echoes of the West).

HJ4ABE, Medellin, another Colombian, must now be the most powerful of the South American stations as it is rated at 4 kilowatts. The wavelength has been altered from 50.59 metres (5,930 kc/s) to 50.85 metres (5,900 kc/s).

As a runner-up for energy, we also find HJ3ABH, Bogota, which has now installed a new plant (1.6 kilowatts) working on 49.9 metres (6,012 kc/s). It should be found immediately above DJC, Zeesen.

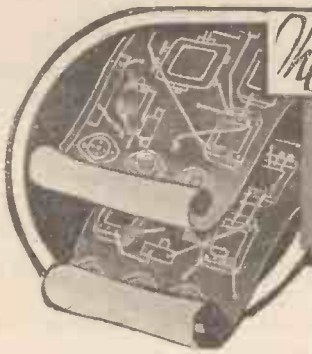
### Moscow

The two channels of a very powerful European station, which will be found of considerable assistance to the listener who wishes to calibrate a receiver, are Moscow RW59, on 25 metres (12,000 kc/s), and the same transmitter on 50 metres (6,000 kc/s). Although the latter is working nightly, to simplify identification tune in to one of the English broadcasts; they are given on Sundays, Mondays, Wednesdays and Fridays at B.S.T. 22.00. On the 25-metre channel transmissions in English are only given on Sundays at midday and 16.00 B.S.T., and on Wednesdays at midday B.S.T.

Finally, HVJ, Vatican (Rome) on 19.84 metres (15,120 kc/s) and 50.26 metres (5,970 kc/s) has entirely altered its schedule. Daily, on the lower wavelength, the station will be found working from B.S.T. 16.30-16.45, and on the higher channel daily at B.S.T. 20.00 (English on Tuesdays only). On Sundays and holidays this wavelength is also used at B.S.T. 11.00. The broadcasts are now usually opened with the pealing of bells from St. Peter's, Rome, and the ticking of the studio clock is still retained.

## SPECIAL COURSE OF LECTURES ON TELEVISION

THE Regent Street Polytechnic have arranged a course of four lectures on Television, which will be given by Mr. H. J. Barton Chapple, Wh. Sch., B.Sc., A.M.I.E.E., etc. The dates of the lectures are May 20th, May 27th, June 3rd, and June 17th, and they will deal with image structure, image distortion, side-band limitations, use of ultra-short waves, reasons for scanning, and methods employed, television receivers, light modulation, importance of synchronising, photo-electric cells, cathode-ray tubes, time base and exciter units, methods of modulation, high-definition services, the electron camera, multiplier tubes, amplifier characteristics, correcting devices, and latest developments. The fee for the course is only 6s., and, conducted by such a well-known authority as Mr. Barton Chapple, the lectures are bound to be well attended.



# The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

**These blueprints are full-size. Copies of appropriate issues of "Practical Wireless," "Amateur Wireless" and of "Wireless Magazine" containing descriptions of these sets can in most cases be obtained at 4d. and 1s. 3d. each, respectively, post paid. Index letters "P.W." refer to "Practical Wireless" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send, preferably, a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.**

## PRACTICAL WIRELESS.

**Blueprints, 1s. each.**

| | | |
|---|---|---|
| Long-Range Express Three | 24.9.32 | PW2 |
| Mains Express Three | 8.10.32 | PW3 |
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| Bijou Three | 29.10.32 | PW5 |
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| Argus Three Mains Unit | 26.11.32 | PW6A |
| Empire Short-Wave Three | 3.12.32 | PW7 |
| Solo Knob Three | 10.12.32 | PW8 |
| Midget Two | 17.12.32 | PW9 |
| Autokoil Pentode Two | 31.12.32 | PW9A |
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| A.C. Fury Four | 25.2.33 | PW20 |
| Radiopax Class B Four | 27.5.33 | PW21 |
| Three-Valve Push-Pull Detector Set | 4.3.33 | PW22 |
| Double-Diode Triode Three | 10.6.33 | PW23 |
| Three-Star Nicore | 24.6.33 | PW24 |
| Class B Detector Two-Valve | 17.6.33 | PW24A |
| D.C. Ace | 15.7.33 | PW25 |
| Superset | 19.8.33 | PW26 |
| Auto-B Three | 19.8.33 | PW27 |
| All-Wave Two | 19.8.33 | PW28 |
| A.C. Three | 16.9.33 | PW29 |
| Premier Super | 23.9.33 | PW30 |
| Experimenter's Short-Wave Three | 23.9.33 | PW30A |
| A.C.-D.C. Two | 7.10.33 | PW31 |
| All-Wave Unipen | 14.10.33 | PW31A |
| F.J.C. 3-valve A.V.C. (Transfer Print) | 4.11.33 | PW32 |
| Luxus A.C. Superhet | 14.10.33 | PW33 |
| A.C. Quadpak | 2.12.33 | PW34 |
| Sixty-Shilling Three | 2.12.33 | PW34A |
| Nucleon Class B. Four | 6.1.34 | PW34B |
| Fury Four Super | 27.1.34 | PW34C |
| A.C. Fury Four Super | 10.2.34 | PW34D |
| Leader Three | 10.3.34 | PW35 |
| D.C. Premier | 31.3.34 | PW35B |
| A.C. Leader | 7.4.34 | PW35C |
| Prima Mains Three | 5.4.34 | PW35D |
| Master Midget Two | 12.5.34 | PW35E |
| Atom Lightweight Portable | 2.6.34 | PW36 |
| Ubique | 28.7.34 | PW36A |
| Four-Range Super-Mag. Two | 11.8.34 | PW36B |
| Summit Three | 18.8.34 | PW37 |
| Armada Mains Three | 18.8.34 | PW38 |
| Midget Short-Wave Two | 15.9.34 | PW38A |
| All-Pentode Three | 22.9.34 | PW39 |
| £5 Superhet Three | 27.10.34 | PW40 |
| A.C. £5 Superhet Three | 24.11.34 | PW43 |
| D.C. £5 Superhet Three | 1.12.34 | PW42 |
| Hall-Mark Three | 8.12.34 | PW41 |
| F. J. Camm's Universal £5 Superhet | 15.12.34 | PW44 |
| A.C. Hall-Mark | 26.1.35 | PW45 |
| Battery Hall-Mark 4 | 2.2.35 | PW46 |
| Universal Hall-Mark | 9.2.35 | PW47 |
| Hall-Mark Cadet | 23.3.35 | PW48 |
| F. J. Camm's Silver Souvenir (All-Wave Three) | 13.4.35 | PW49 |

## AMATEUR WIRELESS AND WIRELESS MAGAZINE. CRYSTAL SETS.

**Blueprints, 6d. each.**

| | | |
|---|---|---|
| Four-station Crystal Set | 31.3.34 | AW427 |
| 1934 Crystal Set | 4.8.34 | AW444 |
| 150-mile Crystal Set | Out of print | AW450 |

## STRAIGHT SETS. Battery Operated.

**One-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| B.B.C. One-valver | Out of print | AW344 |
| B.B.C. Special One-valver | Out of print | AW387 |
| Twenty-station Loud-speaker One-valver (Class B) | Out of print | AW449 |

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Melody Ranger Two (D, Trans) | Out of print | AW388 |
| Full-volume Two (SG.-Det, Pen) | 17.6.33 | AW392 |
| Iron-core Two (D. Trans) | Out of print | AW395 |
| Iron-core Two (D, QPP) | 12.8.33 | AW396 |
| B.B.C. National Two with Lucerne Coil (D, Trans) | Out of print | AW377A |
| Big-power Melody Two with Lucerne Coil (SG, Trans) | Out of print | AW338A |
| Lucerne Minor (D, Pen) | Out of print | AW426 |
| Family Two (D, Trans) | *Apr.* '32 | WM278 |

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

| | | |
|---|---|---|
| £8 Radiogram (D. RC, Trans) | Out of print | AW343 |
| New Regional Three (D, RC, Trans) | 25.6.32 | AW349 |
| Class-B Three (D, Trans, Class B) | 22.4.33 | AW386 |
| New Britain's Favourite Three (D. Trans, Class B) | 15.7.33 | AW394 |
| Home-built Coil Three (SG, D, Trans) | 14.10.33 | AW404 |
| Fan and Family Three (D, Trans, Class B) | 25.11.33 | AW410 |
| £5 5s. S.G.3 (SG, D, Trans) | 2.12.33 | AW412 |
| 1934 Ether Searcher: Baseboard Model (SG, D, Pen) | 20.1.34 | AW417 |
| 1934 Ether Searcher, Chassis Model (SG, D, Pen) | 3.2.34 | AW419 |
| Lucerne Ranger (SG, D, Trans) | Out of print | AW422 |
| Cossor Melody Maker with Lucerne Coils | Out of print | AW423 |
| P.W.H. Mascot with Lucerne Coils (Det. R.C. Trans) | 17.3.34 | AW337A |
| Mullard Master Three with Lucerne Coils | Out of print | AW424 |
| Pentaquester (HF, Pen, D, Pen) | 14.4.34 | AW431 |
| £5 5s. Three: De-luxe Version (SG, D, Trans) | 19.5.34 | AW435 |
| Lucerne Straight Three (D, RC, Trans) | 9.6.34 | AW437 |
| All-Britain Three (HF Pen, D, Pen) | Out of print | AW448 |
| "Wireless League" Three (HF Pen, D, Pen) | 3.1.34 | AW451 |
| Transportable Three (SG, D, Pen) | *Feb.* '32 | WM271 |
| Multi-Mag Three (D, 2 Trans) | *June* '32 | WM288 |
| Percy Harris Radiogram (HF, D, Trans) | *Aug.* '32 | WM294 |
| £6 6s. Radiogram (D, RC, Trans) | *Apr.* '33 | WM318 |
| Simple-tune Three (SG, D, Pen) | *June* '33 | WM327 |
| Tyers Iron-core Three (SG, D, Pen) | *July* '33 | WM330 |
| C.-B. Three (D, LF, Class B) | Out of print | WM333 |
| Economy-pentode Three (SG, D, Pen) | *Oct.* '33 | WM337 |
| All-wave Three (D, 2LF) | *Jan.* '34 | WM348 |
| "W.M." 1934 Standard Three (SG, D, Pen) | *Feb.* '34 | WM351 |
| £3 3s. Three (SG, D, Trans) | *Mar.* '34 | WM354 |
| Iron-core Band-pass Three (SG, D, QP21) | *June* '34 | WM362 |
| 1935 £6 6s. Battery Three (SG, D, Pen) | *Oct.* '34 | WM371 |
| Graduating to a Low-frequency Stage (D, 2LF) | *Jan.* '35 | WM378 |

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

| | | |
|---|---|---|
| 65/- Four (SG, D, RC, Trans) | Out of print | AW370 |
| "A.W." Ideal Four (2SG, D, Pen) | 16.9.33 | AW402 |
| 2 H.F. Four (2SG, D, Pen) | Out of print | AW421 |
| Crusaders' A.V.C. 4 (2 H.F., D, QP21) | 18.8.34 | AW445 |
| (Pentode and Class-B outputs for above: blueprints 6d. each) | 25.8.34 | AW445A |
| Quadradyne (2SG, D, Pen) | *Feb.* '32 | WM273 |
| Calibrator (SG, D, RC, Trans) | *Oct.* '32 | WM300 |
| Table Quad (SG, D, RC, Trans) | *Nov.* '32 | WM303 |
| Calibrator de Luxe (SG, D, RC, Trans) | *Apr.* '33 | WM316 |
| Self-contained Four (SG, D, LF, Class-B) | *Aug.* '33 | WM331 |
| Lucerne-Straight Four (SG, D, LF, Trans) | *Feb.* '34 | WM350 |
| £5 5s. Battery Four (H.F., D, 2LF) | *Feb.* '35 | WM381 |

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

| | | |
|---|---|---|
| Super-quality Five (2 HF, D, RC, Trans) | *May* '33 | WM320 |
| New Class-B Five (SG, D, LF, Class-B) | *Nov.* '33 | WM340 |
| Class-B Quadradyne (2 SG, D, LF, Class-B) | *Dec.* '33 | WM344 |
| 1935 Super Five (Battery Superhet) | *Jan.* '35 | WM379 |

**Mains Operated.**

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Consoelectric Two (D. Pen) A.C. | 23.9.33 | AW403 |
| Economy A.C. Two (D. Trans) A.C. | *June* '32 | WM286 |

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

| | | |
|---|---|---|
| Home-lover's New All-electric Three (SG, D, Trans) A.C. | 25.3.33 | AW383 |
| S.G. Three (SG, D, Pen) A.C. | 3.6.33 | AW390 |
| A.C. Triodyne (SG, D, Pen) A.C. | 19.8.33 | AW399 |
| A.C. Pentaquester (HF Pen, D, Pen) A.C. | 23.6.34 | AW439 |
| D.C. Calibrator (SG, D, Push-pull, Pen) D.C. | *July* '33 | WM328 |
| Simplicity A.C. Radiogram (SG, D, Pen) A.C. | *Oct.* '33 | WM338 |
| Six-guinea AC/DC Three (HF Pen, D, Trans) A.C./D.C. | *July* '34 | WM364 |
| Mantovani A.C. Three (HF, Pen, D, Pen) A.C. | *Nov.* '34 | WM374 |

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

| | | |
|---|---|---|
| A.C. Melody Ranger (SG, DC, RC Trans) A.C. | Out of print | AW380 |
| AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C. | 8.9.34 | AW446 |
| A.C. Quadradyne (2SG, D, Trans) A.C. | *Apr.* '32 | WM279 |
| All Metal Four (2SG, D, Pen) A.C. | *July* '33 | WM329 |
| "W.M." A.C./D.C. Super Four | *Feb.* '35 | WM382 |

## SUPERHETS.

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

| | | |
|---|---|---|
| 1934 Century Super | 9.12.33 | AW413 |
| Super Senior | *Oct.* '31 | WM256 |
| 1932 Super 60 | *Jan.* '32 | WM260 |
| Q.P.P. Super 60 | *Apr.* '33 | WM319 |
| "W.M." Stenode | *Oct.* '34 | WM373 |
| Modern Super Senior | *Nov.* '34 | WM375 |

**Mains Sets: Blueprints, 1s. 6d. each.**

| | | |
|---|---|---|
| 1934 A.C. Century Super, A.C. | 10.3.34 | AW425 |
| 1932 A.C. Super 60, A.C. | *Feb.* '32 | WM272 |
| Seventy-seven Super A.C. | *Dec.* '32 | WM305 |
| "W.M." D.C. Super D.C. | *July* '33 | WM321 |
| Merrymaker Super A.C. | *Dec.* '33 | WM345 |
| Heptode Super Three, A.C. | *May* '34 | WM350 |
| "W.M." Radiogram Super, A.C. | *July* '34 | WM360 |
| "W.M." Stenode, A.C. | *Sep.* '34 | WM370 |

## PORTABLES.

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

| | | |
|---|---|---|
| General-purpose Portable (SG, D, R.C., Trans) | Out of print | AW351 |
| Midget Class-B Portable (SG, D, LF, Class-B) | 20.5.33 | AW389 |
| Holiday Portable (SG, D, LF, Class B) | 1.7.33 | AW393 |
| Family Portable (HF, D, RC, Trans) | 22.9.34 | AW447 |
| Town and Country Four (SG, D, RC, Trans) | *May* '32 | WM287 |
| Two H.F. Portable (2 SG, D, QP21) | *June* '34 | WM362 |
| Tyers Portable (SG, D, 2 Trans) | *Aug.* '34 | WM363 |

## SHORT-WAVERS. Battery Operated.

**One-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| S.W. One-valve | Out of print | AW329 |
| S.W. One-valve for America | Out of print | AW429 |
| Roma Short-waver | 10.11.34 | AW452 |

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Home-made Coil Two (D, Pen) | 14.7.34 | AW440 |

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

| | | |
|---|---|---|
| World-ranger Short-wave 3 (D, RC, Trans) | Out of print | AW355 |
| Experimenter's 5-metre Set (D, Trans, Super-regen) | 30.6.34 | AW438 |
| Experimenter's Short-waver | *Jan.* 19, 35 | AW463 |
| Short-wave Adapter | *Dec.* 1, '34 | AW456 |
| Superhet. Converter | *Dec.* 1, '34 | AW457 |

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

| | | |
|---|---|---|
| "A.W." Short-wave World Beater (HF Pen, D. RC, Trans) | 2.6.34 | AW436 |
| Empire Short-waver (SG, D, RC, Trans) | *Mar.* '33 | WM318 |

**Superhets: Blueprints, 1s. 6d. each.**

| | | |
|---|---|---|
| Quartz-crystal Super | *Oct.* '34 | WM372 |

**Mains Operated.**

**Two-valvers: Blueprints, 1s, each.**

| | | |
|---|---|---|
| Two-valve Mains Short-waver (D, Pen) A.C. | 10.11.34 | AW453 |
| "W.M." Band-spread Short-waver (D, Pen) A.C./D.C. | *Aug.* '34 | WM368 |

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

| | | |
|---|---|---|
| Emigrator (SG, D, Pen), A.C. | *Feb.* '34 | WM352 |

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

| | | |
|---|---|---|
| Gold Coaster (SG, D, RC, Trans) A.C. | *Aug.* '32 | WM292 |
| Trickle Charger | *Jan.* 5, '35 | AW462 |

# Facts & Figures

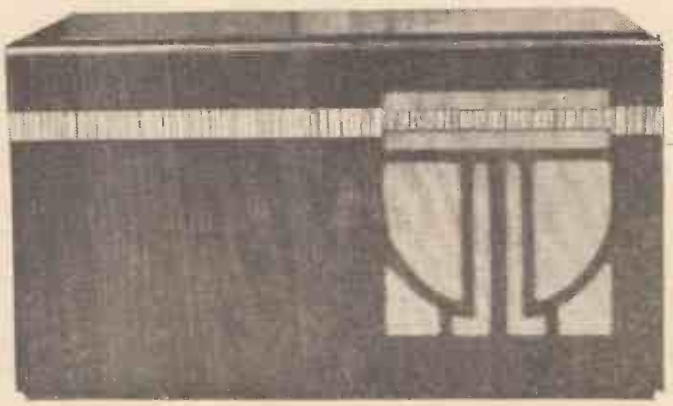
## COMPONENTS TESTED IN OUR LABORATORY

### Mervyn Short-wave Coil Assembly

NO matter how efficient a short-wave coil is made, losses may be introduced by the subsequent connection and inclusion of wave-change switches. For this reason it is usual to use a separate coil for each wave-band, and this leads to inconvenience when it is desired to pass from one band to another. The Mervyn coil illustrated below is assembled with its own switch, and the entire construction is of the very low-loss type. It will be seen that an air-spaced winding is provided for the coil, a ribbed ebonite former being used, and the switch is also of the low-loss type. The overall length is only 6ins., thus keeping down the field and permitting of the construction of a compact receiver. The range covered is from 6 to 59 metres, divided into three bands—6 to 18.5 metres, 14.5 to 32 metres and 26 to 59 metres. Common connections are already made in the unit and substantial leads are provided for these points in order to avoid risks of breakdown, due to vibration, etc. As provided there are only three connections to be made to use the unit in a receiver, namely grid, earth, and reaction. The theoretical circuit shows the coil unit built into a short-wave converter, the coil being used as an intervalve coupling and the coils are indicated by small asterisks and the figures 1 and 2. The unit will be found of extreme value to those who are anxious to convert an existing receiver for short-wave work or who wish to make up a new receiver for that purpose. The price is 15s. 6d.

### A Useful Cabinet

MANY constructors are content to roughly put together a cabinet from odd pieces of wood, and contend that so long as the receiver works efficiently the cabinet does not matter. Against this point of view, however, there is the argument that a good receiver housed in a really well-finished cabinet has a more useful field, and may be placed in any room in the house without presenting an undignified appearance and without having to be excused when friends call. Messrs. Graham Farish, Ltd., have now decided to market, through the normal trade channels, one or two designs of cabinet for the home constructor, and a sample is illustrated herewith. The cabinet-maker's craft has now reached such a high degree of excellence that in all respects these cabinets may be admired. Methods of incorporating inlay bands, cutting frets, and in developing that high gloss hitherto only associated with pianos, renders the modern cabinet a really first-class piece of work, and readers who are interested should write to Messrs. Graham Farish for details of the various models and prices.



*One of the new cabinets now being made by Messrs. Graham Farish.*

### Magnum Yacht Radio Apparatus

AN interesting list is now available to readers, and describes the yacht apparatus being manufactured by Messrs. Burne Jones & Co., Ltd. This is not an ordinary broadcast receiver with slight modifications rendering it suitable for use afloat, but is a specially-designed piece of apparatus covering the 150 to 2,000 metre wave-band and is suitable for the reception of weather reports and forecasts; position finding by directional apparatus; reception of radio-telegrams and gramophone record reproduction. The apparatus is designed to resist damp and salt air, and is intended for use with battery supplies. The list may be obtained on application to Messrs. Burne Jones & Co., Ltd., Magnum House, 296, Borough High Street, S.E.1.

### C.A.V. Batteries

IN view of the recent general re-grouping of prices and types in the battery trade the following C.A.V. prices should be noted:

C.A.V. "STANDARD" RANGE.

| Type. | Voltage. | Price. |
|---|---|---|
| HTD1 | 60 .. .. .. .. | 3/9 |
| HTD3 | 99 .. .. .. .. | 6/3 |
| HTD4 | 120 (square) .. .. .. | 7/6 |
| HTD35 | 108 .. .. .. .. | 6/9 |
| HTD4L | 120 (long) .. .. .. | 7/6 |
| HTD105 | 120 (square with grid-bias) | 8/- |

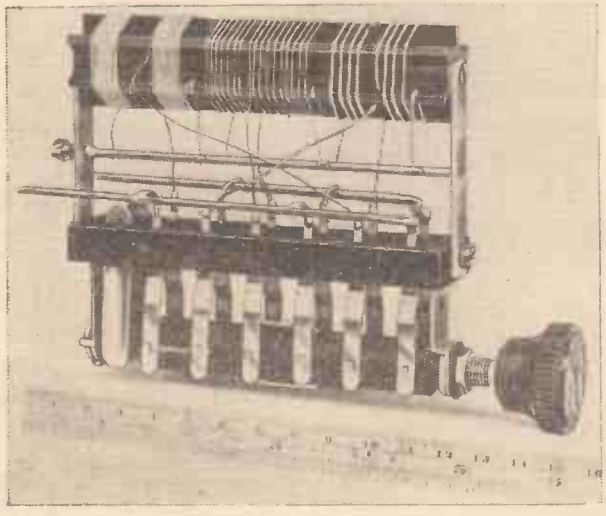
C.A.V. "CAVAC" RANGE.

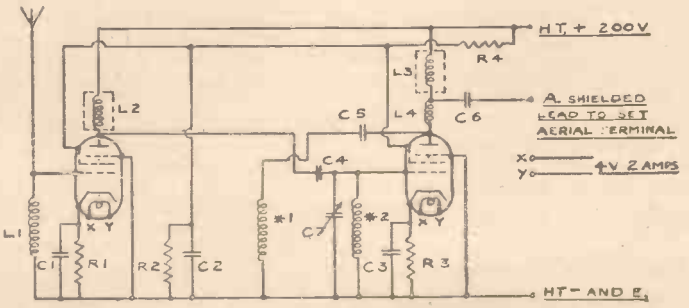
| Type. | Voltage. | Price. |
|---|---|---|
| C.C. 60 | 60 .. .. .. .. | 3/- |
| C.C. 100 | 100 .. .. .. .. | 5/- |
| C.C. 120 | 120 .. .. .. .. | 6/- |

### Wearite Universal Type A Coils

THE popular Wearite Universal coil has had a very successful run for the past twelve months, and is now to be superseded by the Type A coil. This is very similar in electrical characteristics to the original coil, although certain slight alterations have been made. An additional tapping point, for instance, on the primary is to be found in the new coils, and together with the other modifications the coil will be found to be a definite improvement on the original Universal coil. The price of this new model is 5s.








*The new Mervyn 3-range short-wave coil unit, and a theoretical circuit of a short-wave converter incorporating the unit.*

# 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.*

**ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY**

THIS society will be pleased to receive reports of reception of the dedication concerts broadcast by Radio Normandie on March 31st. These should be sent to Mr. Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

Miss Carol Bush, organizer of the Ladies' Section A.-A.R. and T.S. has appointed Miss Eileen G. Harris, of "Frampton," Victoria Avenue, Porthcawl, Glam., British rep. of the Ladies' Section.

This section of the society is growing rapidly, and has already representatives in New Zealand (Mrs. S. Robson, 100, Islington Street, Invercargill, N.Z.) and Australia (Miss Joyce Hinton, 27, Albert St., Wickham, New South Wales, Australia).

Lady enthusiasts should forward their names to their nearest representatives—enclosing a stamp-addressed envelope if they desire a reply. Attractive membership cards are now presented to members freely.

**SLADE RADIO**

AT a recent meeting of this society, held at the Shakespeare and Dickens Rooms, Edmund Street, a lecture and demonstration was given by Mr. R. I. Cowley, Chief Engineer of the Car Radio Factory of E. K. Cole, Ltd.

The lecture fully described the circuit and manufacture of the set, and gave a thorough explanation as to the points that governed the design. Many lantern slides were shown which had been specially prepared, some of which showed the band-pass coil's sensitivity, and output for given signals, while other slides showed different ways of installing sets in cars, the last slide showing a number of cars being fitted in the Ekco factory. At the conclusion of the address, a demonstration upon a set in the room was given. There were also sets in chassis form and various component parts which the members were able to examine, and two cars fitted with Ekco Radio took members for demonstration runs.

**SHORT-WAVE RADIO AND TELEVISION SOCIETY (THORNTON HEATH)**

THE weekly meeting of this society was held at St. Paul's Hall, Norfolk Road, on Tuesday, 2nd inst., under the chairmanship of Mr. J. T. Webber.

Mr. R. E. Dabbs, 2BUS, gave an exhibition and talk on his short-wave transmitter. He first dealt with the simple self-controlled oscillating circuits which have been largely superseded by the crystal-controlled oscillator. Mr. Dabbs used in his transmitter one valve combining the functions of crystal oscillator and frequency-doubler. The valve used here was a PT4. It had two tuned circuits in the anode circuit, the first being tuned to the frequency of the crystal and the latter to the first harmonic. The output from the second circuit was fed into a buffer amplifier which employed a O15/400 type valve. The buffer stage was connected to the final power amplifier by means of link coupling. This method consisted of coupling a coil of two or three turns to anode coil of the O15/400, the coil being connected to a length of twin flex. The other end of the flex was connected to a similar coil which was coupled to tuned grid circuit of the P.A. In this way it was possible to have the two stages some distance from one another, and yet to transfer the energy from one to the other in an efficient manner. The power amplifier which employed a PX25 was modulated by a PT16. When the transmitter was used for CW this latter valve was made to act as a keying valve, thus preventing any interference by key clicks.

Finally, Mr. Dabbs' two-valve detector and pentode receiver was then demonstrated.

## HOW OLD ARE YOUR VALVES?

(*Continued from page* 140).

to the *cathode* (the centre pin) with disastrous results.

Another little-known point relates to overloading a modern high-slope valve. In the case of an output pentode of this type the application of a very large signal will cause considerable transient anode-voltage surges, and if an inductive anode load is being employed these may rise to as much as five times the steady anode feed voltage. This may cause what is known as a "flash-over" inside the actual valve, breaking down insulation, impairing the vacuum, and in an extreme case actually causing the glass envelope to fracture.

Other points, such as incorrect voltages caused by wrong connection or broken-down resistances and condensers will, of course, occur to the average constructor, and it should be unnecessary to point out that short-circuits, either accidental or intentional, can result in irreparable damage, both to valves and other components.

# LETTERS FROM READERS

**The Editor does not necessarily agree with opinions expressed by his correspondents.**

**All letters must be accompanied by the name and address of the sender (not necessarily for publication.)**

## "Site and Set Design"

SIR,—I have been a reader of your publication from the first number, and I think it is absolutely the best wireless paper published.

I generally agree with most of the contents, but there is one statement in your issue of March 2nd in the Beginners' Supplement which I do object to, as being totally misleading to a beginner. Your contributor, H. Beat Heavychurch, seems to be totally unacquainted with the capabilities of sets designed by his own colleagues. He states that the simplest set which he mentions is incapable of a greater range than seventy-five miles from a B.B.C. station, except in certain exceptional circumstances. Now I have one of the simplest of sets, designed by S. J. Garratt and published in the March 4th, 1933, issue of PRACTICAL WIRELESS—the Three-valve Push-pull Detector set. What are its capabilities? Budapest, which is over 500 miles, on the loud-speaker; also Vienna, Rome, Beromünster, Stuttgart, Florence, Prague 1, Munich, Leipzig, Toulouse, Berlin, Poste Parisienne, Madrid, Turin, Trieste, Hamburg, Bari (Italy), Athlone, Juan les Pins and Radio Normandie (Fécamp), to name only a few, and all at loud-speaker strength. There could be no simpler set than this one, employing three valves with grid-leak and condenser, variable condenser, coil, variometer for reaction, and transformer. Now, Mr. Heavychurch, how does this tally with your seventy-five miles or even one hundred and fifty miles which you mention.—THOMAS GREVILLE (Letchworth).

[*It should be pointed out that the article in question dealt with the subject quite generally, and while it is known that in some situations quite a simple set will give amazing results, this cannot be used as a reason for suggesting that this will occur with consistency in every situation within the proposed service area. It is the case here of the exception proving the rule.*—ED.]

## From a S. African Reader

SIR,—I have to acknowledge, with thanks, the receipt of the three Gift Books, which undoubtedly form a fine reference library.

I have been a regular reader of PRACTICAL WIRELESS for over a year, and with each issue I have looked forward to finding the description of a good short-wave circuit. Judging from your correspondence columns I have not been alone in this, and I note that such a circuit has now been promised.

Might I suggest that if a battery model is chosen, you should describe also an A.C. mains version for the benefit of many readers like myself who would prefer the A.C. model.

I would also like to suggest that you give details for the construction and operation of a good short-wave converter using one of the new A.C. type heptode valves. I have in mind a converter for use with an all-electric broadcast set. The H.T. supply could be derived from the latter, so that only a small mains transformer would be required for the heater circuit of the converter valve.

In conclusion, may I congratulate you on the enlarged short-wave section which makes your esteemed paper more valuable than ever.—J. WILSON (Pretoria, S. Africa).

## An Unparalleled Gift

SIR,—I have pleasure in acknowledging receipt of your excellent gift volume, "Television and Short-wave Handbook." It exceeds all my expectations, and the least I can say is that it is a very fit companion for the "Wireless Constructor's Encyclopædia." Thanking you for such an unparalleled gift.—JAMES A. PEARCE (Liverpool).

## The A.C. Hall-Mark

SIR,—I have just completed the A.C. Hall-Mark 4 receiver, and am astounded at the results—they have far surpassed my expectations.

I would mention that this is the first wireless set I have ever tackled, and the diagram and illustrations were so easily followed that results were obtained without any hitch, except for the fact that trouble was experienced with the twin coils. The base of one of the bakelite coil formers was very dirty, and consequently caused considerable tracking from the contacts across to the metal frame.

On one point, however, I shall be glad to receive your advice. I obtain a high-pitch whistle which is constant all the way round the dial. Having little or no knowledge of the technicalities of the set I am unable to locate this trouble. Trusting you will be able to assist me.—E. C. SALTER (West Wimbledon).

[*The trouble is due to self-oscillation of the output stage, and was referred to in the articles on construction. On the blue print will be seen two condensers in broken lines across the secondary, and a note to see the constructional article. If these two condensers are included the whistle will be cured.*—ED.]

## An Appreciation from Overseas

SIR,—It may be of interest to hear from an overseas listener, and to know that your "Short-wave Section" is greatly appreciated.

Out here we depend on wavelengths between 16 to 50 m. for our "radio fare," and within these wavebands we can usually rely on getting consistent and excellent reception accompanied with good quality. We hear well the B.B.C. Empire Stations, European short-wave stations, and the near-by Americans.

The majority of receivers in use are of American manufacture, being generally of the large "console" type, employing several "tubes," from six to sixteen, tuning from about 14 to 500 m., and running direct from the electric supply (230-240v. D.C.). These receivers are comparatively cheap and give remarkable good results, though it is to be regretted that no English manufacturer has yet put on the market a really tempting receiver designed for the Colonial listener, and a receiver that would really compete with those of American origin.—D. H. SEMPER (St. Kitts, British West Indies).

## REPLIES IN BRIEF

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

**A.C.T. (Wood Green).** Regret we have no diagram of blueprint of a four-valve superhet using the valves you name.

**J. W. (Liverpool).** Selectivity will probably not be good enough for modern conditions. Would recommend a more selective type of circuit in your case, preferably of the superhet type.

**E. J. L. (Manchester).** Tone control should be unnecessary. Probably the mike is defective, and we would recommend that you have it tested before going further with your experiments.

**M. J. (S.W.).** Output stage is oscillating. Fit a resistance in the grid lead to the last valve—the value varying according to the particular valve; 5,000 ohms will probably prove suitable; 10 m.a. should be ample for a set of the type you describe, although you do not give the output valve.

**G. A. P. (N.W.10).** As yours is a new commercial receiver we would not advise any alteration. Send it to the makers or write for a service engineer to come and hear it whilst it is working on your aerial.

**G. B. (Liverpool).** Set would probably work, but great care would have to be exercised to prevent hum due to the mains supply.

**A. W. F. (Huddersfield).** H.F. leakage into the eliminator causes the trouble, which may be cured by joining two .01 condensers across the two halves of the H.T. secondary winding. The junction of the two condensers is earthed.

**W. M. (Fife).** We have not used the coils you mention, and, therefore, cannot supply working details or circuit diagram.

**R. McB. (Glasgow).** All of your circuit arrangements are in order, and, therefore, the trouble must be due to the speaker or some other circuit fault. Is there ample H.T. for the Class B stage? We presume you have guarded against overloading in the driver stage?

**P. G. J. (Exeter).** We cannot give you all the information you ask for. Articles on the various subjects appear from time to time, and a list of blueprints is included in every issue. We cannot check your sketch as the details are not at all clear.

**A. B. (Sunderland).** You do not state the type of circuit. We have published various constructional articles on the making of coils, including those of the "all-wave" type. Are any of the articles we have already published of any use to you?

**C. G. (Billericay).** The zincs could be used for a wet H.T. battery, but as the battery was used they would not be of much use. The sacs in your battery would also be worn out and unsuitable for the purpose. Parts for a wet H.T. may be obtained from advertisers in our pages.

**R. T. W. (Sheffield).** You have been wrongly informed. An eliminator may be used, but if the regulation is poor a neon stabiliser may be connected across it to regulate the output.

**C. G. B. (Harborne).** Although the modification should not be difficult to carry out, it might mean that all resistances values, etc., in the receiver would have to be modified in order to balance the circuit. In view of this we would not advise the alteration. Probably a modern output valve, taking a similar current to that now in use, but delivering a greater output, would prove useful to you.

**H. G. (S.E.14).** Regret we cannot understand your query. How are you running a crystal set from a 100-volt H.T. battery?

**G. B. (Alloa).** We can only suggest that you carefully check each stage with a milliammeter, and all components for continuity, etc. It is impossible to state from the details you give where the trouble arises.

**J. W. (Cardiff).** You can do nothing, and if they refuse to adjust the set without the whistle you should complain to the Post Office, who will point out the offence. It is contrary to the terms of the licence to permit the receiver to oscillate in this manner.

**H. J. (Didsbury).** Your old eliminator will doubtless be of little use in this receiver, and we would advise you to build the receiver exactly to specification.

**J. H. (Harehills).** You should carefully examine the eliminator as it would appear that a fault has developed in that. Probably the mains transformer primary has broken down or become partially disconnected.

**E. S. (S.W.20).** Pick-up is joined between grid and earth—the necessary biasing resistance already being included in the cathode lead of the first valve. Hum may be due to a faulty component, or bad wiring, and careful examination will probably locate the faulty part.

**W. H. (Cheshire).** The 201-A is a triode with five-volt filament, and there is no equivalent on the English market, although the American valve may be obtained here. However, any good English triode would be efficient in the circuit, which would require modification in the filament circuits—cutting out the resistors, etc. The circuit should be quite good, and we can offer no adverse criticism. The combination of valve types we would recommend are: S.G. (with suitable modification to the H.T. supply); detector, L.F. and small power.

**J. B. (Port Glasgow).** We would recommend pentodes if you wish to obtain the proper type of Q.P.P. A high-ratio transformer would also be required for the correct circuit. Are you confusing the circuit with Class B?

**K. O. F. (Southwick).** Regret we cannot understand your query.

**G. B. M. (Maidstone).** Obviously something seriously is wrong if you can obtain no signals. In view of your tests would suggest that you try dry batteries as your eliminator may be causing the trouble.

**A. C. (Birmingham).** Cannot help you from the details you give. Some component may be disconnected internally or completely broken down and, therefore, stage by stage test with meters will be necessary to locate the trouble.

**W. W. P. (Lowestoft).** Your idea is feasible, but it would be preferable to purchase a properly made potential divider of similar total resistance and use that. A condenser should be joined from each tapping point to H.T. negative.

**J. L. C. (Reydon).** Your valve has been damaged, and although apparently functioning normally will give a short life. Read the article in this issue on valves.

**L. W. C. (Pontyclun).** Examine all by-pass condensers, and you will no doubt find that one has broken down and is short-circuiting the H.T. supply.

**R. T. (Eastbourne).** We would certainly not advise the use of the two speakers in the manner you suggest. The results from the good speaker would be very poor indeed.

**W. J. (Bromley).** Obviously the wave-change switch is at fault. Connect the tapping points direct to earth and this will give medium-wave reception if the coils are in order.

**H. T. (Clapham).** No, do not tamper with D.C. mains. Wait until you move into the new place and then ascertain the voltage at the plug point. Sometimes this is double the rated-mains voltage, and is termed by the company a "power point." You must guard against this.

**B. F. R. (York).** No, we cannot give a recommendation for a commercial receiver. Get your local dealer to supply on appro. and hear in your own house.

**Y. W. (Kingsbury).** The total consumption is 40 watts. This is comparatively low for a receiver of the nature you describe.

**P. S. (Southsea).** A 1-watt resistance is hopeless for automatic bias with that valve. The rating should be 5 watts.

**Q. L. K. E. (Harrogate).** Any of the chemical earths you name will prove satisfactory. No harm should result to the flowers, although we have heard that phenomenal growths have been observed when this type of earth is used beneath a flower bed.

**Y. O. T. (Llandudno).** So far as we have been able to trace this component has not been placed on the English market. Messrs. Claude Lyons may be able to obtain one for you.

**B. D. S. (Exeter).** The maximum D.C. current recommended by the makers of this particular transformer is 6 m.a. At this figure the inductance of the primary is approximately 50 henries. The D.C. resistance of the primary is approximately 3,000 ohms.

**G. M. S. (Calais).** We do not think the component is obtainable on the French market, and would suggest you communicate direct with the makers in this country. They may be able to assist you. Their address may be obtained from our advertisement pages.

CUT THIS OUT EACH WEEK

## Do you know

**—THAT although a metal screen between the controls and the body in a short-wave set is advisable, care should be taken in the arrangement of such a screen.**

**—THAT the inductance of coils, chokes, etc., may be modified by the presence of a metal screen of the above type.**

**—THAT electrolytic condensers offer better smoothing for a given capacity than paper-type condensers of similar value.**

**—THAT although electrolytic condensers must not be used on A.C., they may be employed in a voltage-doubler circuit such as is usually employed with metal rectifiers for A.C. mains rectification.**

**—THAT the usual method of mounting these condensers is not possible when the above circuit is employed owing to the risk of short-circuiting one condenser.**

**—THAT single output valves are obtainable which deliver an undistorted output of 30 watts (30,000 milliwatts).**

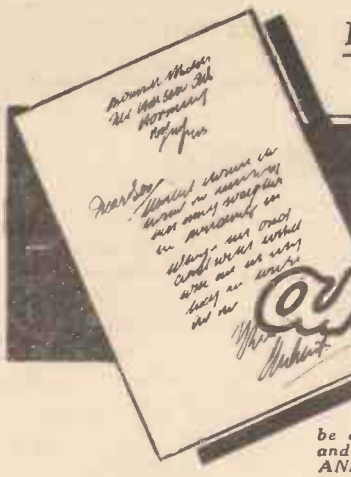
**—THAT as compared with the above valve, the usual small battery-operated power valve delivers only .15 watts (150 milliwatts).**

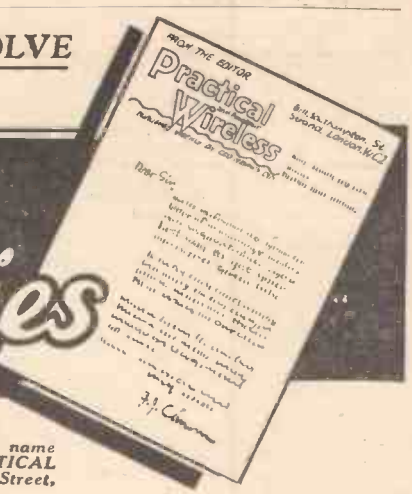
*The Editor will be pleased to consider articles of a practical nature suitable for publication in* PRACTICAL AND AMATEUR WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible 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, *Geo. Newnes, Ltd., 8-11, 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.*

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

# Queries and Enquiries






*If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.*

**SPECIAL NOTE**

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

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

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

## A Voltage Supply Problem

**"I have a superhet (battery-operated) which has given great satisfaction, but now we have had the electric supply fitted. I should like to run the set from an eliminator, but the set has 5 positive H.T. leads. What I want to know is would a Regentone mains unit do, because it says when advertised that they have 7 voltage tappings. If not, can you tell me where I can get one or what to do?"—J. S. (Newbigged-by-Sea).**

The unit you mention would be quite suitable, but there is no need to worry concerning the large number of tappings. All that is necessary is to decouple each anode circuit and then they may all be "commoned" and connected to the H.T. maximum tapping. Naturally the value of the decoupling resistance must be so chosen that there is approximately the same H.T. applied as is found necessary under present conditions, but a milliammeter included in each circuit will easily enable this to be ascertained.

## Mains Components

**"I like making my own parts, and should be glad if you could recommend a book on mains transformers, chokes, and H.T. units—how to make and build them."—B. S. S. (Southampton).**

We regret that we have no complete book dealing with the subject which you mention. We have published various constructional details in our pages, ranging from chokes and transformers to complete mains units, and these will be supplemented from time to time by further articles on the subject.

## Using Old Parts

**"Having quite a lot of spare components, could you supply me with a blue print suitable? The parts I have are from sets made up about three years ago. The new set required is for use in the country, but only for week-ends, so I do not wish to go to big expense if possible."—S. E. A. (Chatham).**

We regret that it is not possible to meet your requirements. Firstly, we do not know exactly the type of receiver which will suit you. You could use a three-valve S.G. circuit, or a four, and each would have its particular advantages to recommend it. However, you state that the parts are about three years old, and we think it would be preferable to scrap these and obtain up-to-date parts, as apart from the improved efficiency of such parts they will be smaller and neater and will enable a much more compact receiver to be built.

## Modifying the Leader Three

**"I have finished building the Leader Three, but in my district the selectivity is not quite good enough. Would it be possible to add another Wearite coil and change my condenser for a three-gang, thus making it a band-pass unit? Would you kindly tell me if this would be of any advantage?"—A. W. H. (N.W.5).**

The modification would certainly greatly increase selectivity and should not be difficult to carry out. There will naturally be a slight loss in signal strength when the band-pass circuit is used, but the gain in selectivity at your address will no doubt offset this disadvantage. We have not tried the Leader with this type of input, but we have no doubt that it will prove quite satisfactory.

## Auto-bias from Eliminator

**"Referring back to 'P.W.,' December 9th, 1933, I should like 3 negative bias leads, but the illustration only shows one. Will the single negative connection answer my purpose for 1.5, 3, and 7.5 volts?"—W. H. (Manchester).**

You will have to use a resistance in the negative lead capable of delivering the maximum negative voltage you require, but must tap this to provide the lower voltages. Without knowing the currents being passed in your receiver we cannot give you the values of the three sections of this resistance, but no doubt the application of Ohms Law will enable you to ascertain this. Instead of a tapped wire-wound resistance, three separate resistances joined in series will serve the purpose.

## Simple Arithmetic

**"If a biasing resistance of 500 ohms has to carry a current of 30 milliamps. what voltage is developed across it? I have tried to work it out but I have forgotten my arithmetic."—H. S. (East Grinstead).**

Voltage equals current multiplied by resistance, with these two factors expressed as ohms. and amps. The equation in question may therefore be expressed 500 x .03 (.03 amps. being 30 milliamps.) or 500 x 30 divided by 1,000. In the first case there are two places of decimals, and bringing this to a whole number (3) would bring 500 to 5 (by the usual rule of moving the decimal point), and thus 5 multiplied by 3 gives us 15 volts. The other method, which perhaps is simpler if you have forgotten the decimal method, gives us 15,000 divided by 1,000, which also comes to 15. We hope this method of working is now clear to you.

## Ammonium Phosphate

**"With regard to the article on electrolytic rectification recently appearing in your pages, I have tried many times to obtain ammonium phosphate salt from some of the leading chemists, including Wand's and Boots, but with no success. I am told it is unobtainable locally owing to there being no demand for it. I should be glad if you could let me know where I could obtain this chemical."—W. H. (Leicester).**

The chemical may be obtained from Messrs. Griffin and Tatlock, Kemble Street, Kingsway, London, W.C. We do not know the present market price of this particular chemical, but no doubt Messrs. Griffin will quote you upon receipt of a card stating the amount you require to purchase.

## Condenser Values

**"I am only twelve years old, but have been taking your paper for four months and have become very interested in short-wave work. I am enclosing a circuit I wish to make up and should like to know the values of the condensers in this circuit."—M. R. T. (Birmingham).**

The tuning condenser should have a maximum capacity of .00015 or .0002 mfd., and the reaction condenser .0002 or .0003 mfd. The actual values will not be critical, although a good slow-motion drive should be used for the tuning condenser. The grid condenser should be .0003 mfd., and the by-pass condenser in the anode circuit .1 or 1 mfd.—again the actual value is not critical.

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

## Miscellaneous Advertisements

**Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.**

## PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abrond carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guaranteed, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 ma. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each: 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes. Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6: 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59; send for catalogue of above and many other types.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliamp-meters, 2¾ inch outside diameter 18/6, 3¼ inch outside diameter 22/6. Westinghouse Rectifiers for above 12/6 extra.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

U.S.A. Cardboard Electrolytics, 2,000 mf. 12 volts 6/-, 100 mf. 12 volts 1/3.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna; 2,500 ohms, 37/6; all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M. 7in. cone, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radio-gram cabinets by best manufacturers at a fraction of original cost; send for list.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working 1/-; 15 mf. 100v. working, 1/-.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5, 3/-; Philips 6+4+2+1+1, 4/6.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v. 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps., 30 hys., 5/6; 150 milliamps., 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps., 20 hys., 2/9; 250 milliamps., 30 hys., 20/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt, 10/-.

PREMIER L.T. Charger Kits, consisting of Premier transformers and Westinghouse rectifier, input 200-250v. A.V., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Truspeed Induction Type, A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

(*Continued at top of column three*)



(*Continued from foot of column one*)

SPECIAL Offer of Wire-wound Resistances, 4 watts, any value up to 50,000 ohms, 1/-; 8 watts, any value up to 100,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

WHITELEY Boneham Energised M/c Speakers, 2,000 or 2,500 ohms. Power, Pentode or Push-pull Transformers, 8 inch diameter, 9/11.

COSSOR Permanent Magnet M/c speakers, large Darwin Cobalt Steel Magnet, 8 inch diameter, please state transformer required, 13/6.

LISSEN 2-Gang Condensers, Uniknob Trimmer, Disc Drive, .0005 each section, 5/6.

POLAR STAR, manufacturer's model, 3-gang condensers, fully screened, 7/6, with trimmer; unscreened, 5/-.

WIRE End One Watt Resistors, our assortment, 2/- per dozen.

ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

MAINS Transformer, with Westinghouse rectifier, output 200v. 30 milliamps, and 4 volts 3 amps., L.T., 15/- the pair.

U.S.A. 3-gang Condenser, .0005, with trimmers, 3/11; a really solid job; Utility disc drive, 1/6.

SPECIAL Offer.—0.00015 brass short wave tuning condensers, with slow motion and complete dial, 3/9; short-wave chokes, 10-200 metres, 9d.

DUBILIER Electrolytic Condensers, 12 microfarads, 20 volts, 6d.; 8 plus 4 microfarads, 500 volts, 4/-; 50 mf., 50 v., 1/9; 8 mf., 500 v., 3/-.

RELIABLE Intervalve Transformers, 2/-; M.C. Multi-ratio output transformers, 2/6; 2-1 or 1-1 output transformers, 2/6; microphone transformers, 50 and 100-1, 2/6; 3 henry chokes, 2/6. 100 henry chokes, 2/6.

KOLSTER BRANDES Model 301 Pick-up with Arm; list price, 35/-; our price, 10/6.

RELIABLE Canned Coils with Circuit, accurately matched, dual range, iron core, 2/11.

UTILITY 3-gang Condenser, 0.0005, fully screened, with trimmers, ball bearing, straight or superhet, 6/9; complete with disc drive, 7/6; the best 3-gang available.

T.C.C. Condensers, 4 mf., 450v. working, 4/-; 4 mf., 750v. working, 6/-.

VARLEY Constant Square Peak Coils, band-pass, type B.P.7, brand new in makers' cartons, with instruction and diagram, 2/4.

VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

PREMIER British-made Meters, moving iron flush mounting, accurate .0-10 .0-15. 0-50 m.a., 0-100, 0-250 m.a., 0-1, 0-5 amps.; all at 6/-; read A.C. and D.C.

POTENTIOMETERS by Best Manufacturers, 200, 350, 500, 1,000, 2,500, 5,000, 8,000, 10,000, 15,000, 25,000, 50,000, 100,000, 250,000, 500,000, 1 meg., 2/-; 5,000, 10,000, 15,000, 100,000, 250,000, with mains switch, 2/-.

U.S.A. Electrolytic Condensers, 550v. peak working, standard tubular metal condenser, 4 mf., 8 mf., 12 mf., a real bargain, 1/9.

BRITISH Radiophone 2-gang 0.00016 Short-wave Variables, all brass with steatite insulation, 5/6.

1,000 Ohm 150 Milliamp, semi-variable resistance, 2/-; 1,000 ohm 250 milliamp., tapped, for any number. 18 valves, 3/6; 800 ohms 350 m.a., tapped, 2/-.

COSMOCORD Pick-ups with Arm and Volume Control, wonderful value, 10/6.

RELIABLE Smoothing Condensers, 250v. working, 1 mf., 6d.; 2 mf., 1/-; 4 mf., 2/-; 350v. working, 1 mf., 1/-; 2 mf., 1/6; 4 mf., 3/-.

ALL Premier Mains Transformers have Engraved Panels, terminal connections, all low tension, windings centre tapped, tapped and screened primaries, 200-250 volts.

PREMIER 250-0-250 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 10/-.

PREMIER 350-0-350 150 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-4 amps, 12/6.

PREMIER Combined H.T.8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

PREMIER H.T.10 Transformer, rectified output 200 volts 100 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, 19/6.

PREMIER H.T.11 Transformer, 500 volts, 120 milliamps, rectified output, 4 volts 2 amps., 4 volts 2 amps., 4 volts 3-5 amps. 22/6; with Westinghouse rectifier, 42/6.

THE Following Lines 6d. Each, or 5/- per dozen: 4- or 5-pin baseboard or 4-, 5-, 6- or 7-pin chassis mounting valve holders, American valve holders, 1 watt resistances, wire end, every value; tubular wire end condensers, 1,500 volt, every value up to 0.5, 0.3 amp., 2- or 3-point switches. Cyldon double trimmers, 6 yds. Systoflex, 1, 1.5, 2 or 2.5 mm., 1 yd. 7-way cable, 9ft. resincored solder, 6yds. push-back connecting wire.

## PREMIER SUPPLY STORES

(Dept. G.N.), 20-22, High St., Clapham, S.W.4. 'Phone: Macaulay 2188. Nearest Station: Clapham North Underground.

SOUTHERN RADIO'S WIRELESS BARGAINS: SPEAKERS.—Blue Spot Permanent Magnet Speakers. Universal Transformers for Power, Super-Power, Pentode or Class B. All brand new 1935 series. Type 99 P.M., 24/6; 45 P.M., 20/-.

ELIMINATORS.—Regentone Eliminators, 1935 Series. Brand new and boxed. Type W.5a for A/C mains, 200/250v. With Trickle Charger for 2, 4 or 6 volt accumulators, 39/6. Type WIa (less Trickle Charger) to carry 30 milliamps, 33/-. Type WIC (less Trickle Charger), 30/-.

CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each, standard full size 0.0005 (not midget). Lotus 3-gang 0.0005, 11/-; 2-Gang 0.0005, 7/3. All Lotus Condensers Brand New. Fully screened with trimmers complete with Dials, escutcheons, etc.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 I.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5 with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New.

PICK-UPS.—Marconi Model K.25, 21/- (List 32/6).

RECEIVERS.—Burgoyne Class "B" Three-Valve Sets, complete with 3 Mullard Valves. Exide Batteries and accumulator. Magnavox Moving Coil Speaker. In modern cabinet beautifully finished in chromium plate. Brand new. £3/18/6.

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MISCELLANEOUS.—Westinghouse Metal Rectifiers, Type H.T.8, 8/9. Bifo Static Cut-outs, definitely eliminate all interference, 2/3. Lewcos Spaghetti Resistances, all capacities, new and boxed, 1/6 per dozen assorted. Telsen short-wave Chokes, H.F. Screened, 1/9. Telsen Binocular H.F. Chokes, 2/-. Telsen ACE L.F. Transformers, 3-1 and 5-1, 2/9. Deemark Dual Range Coils, with circuits, 2/-.

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CLARION VALVES.—All brand new; battery types, 2-volt, HF.2, LF.2, LP.2, 1/9. Super power, PP.2, 2/6; screens and pentodes, 3/9; A.C. Mains, 4-volt, 1 amp., general purpose, 3/3; power, 4/-; screens and pentodes, 4/6; full wave rectifiers, 3/6; postage paid, cash with order, or C.O.D. over 10/-. Clarion Valves, Dept. 2, 885, Tyburn Road, Erdington, Birmingham.

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**10/6** Only, original price 30/-.—Energised, 8in. cone, 6,500 ohms field, for direct use on 200-240 volts D.C. mains; also 1,800, 2,000, 2,200 or 2,500 ohms field; price includes power, pentode, or universal transformer as required.

**14/-** Only, usual price 45/-.—As above, but with 10in. cone, a very powerful quality speaker capable of handling large outputs.

**15/6** Only, usual price 35/-.—Permanent magnet model with cobalt steel magnet of high efficiency, 8in. cone, power, pentode, or universal transformer.

**18/6** Only, usual price 39/6.—As above, but with 10in. cone, powerful quality speaker giving large output with given input.

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**24/-** Only, usual price 70/-.—As above, but with 10in. cone, ideal for use with quality receivers.

**2/9** Only.—Brand new cabinets, suitable for any of above.

**59/6** Only.—Brand new Auditorium speakers, suitable for P.A. or quality receivers and amplifiers, for use on D.C. or A.C. mains; rectifying equipment for latter, 17/6, usual price for these speakers £9. Purchaser writes: "I have had considerable experience with high quality reproduction, but must admit that the speaker you supplied surpasses anything I have so far heard." Field resistance 1,000, 1,250, 1,500, or 2,000 ohms. Speech coil 7, 10 or 15 ohms.

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MAINS Transformers, chokes, etc., to specification, repairs promptly executed. Guaranteed satisfaction. Prices on request. Henry Peace, Ltd., Wednesbury, Staffs.

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RADIOMART. Utility 8/6 Microdisc. The finest silent short-wave dial; high reduction, 3/11.

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RADIOMART. Telsen 100-hy. chokes, 1/11; Telsen 100 m.a. Fuses, 2d. Telsen preset condensers, 9d.

RADIOMART. British Radiophones, fully screened, 2-gang, .0005, top trimmers, latest compact type, 5/11.

RADIOMART. Radiophone 3-gang straight or superhet, 7/6. Radiophone 4-gang superhet, 9/6, all boxed.

RADIOMART. British Radiophone, 2-gang as above, but fitted Uniknob trimming: wavelength moving-scale dials, 8/3.

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RADIOMART. Telsen matched screened Dual-range coils 2/6, pair 4/6. Presets 9d.

RADIOMART. Differentials. Telsen .00015, .0003, 1/3. Astra .00015, 1/-. Polar .0003, 1/3.

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RADIOMART. Resin-cored solder, 9ft., 6d. Bulgin 1-amp. fuses, 2d. Bulgin twin fuseholders, 4d.

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RADIOMART. Western Electric microphones (cost £1/1/-), 2/9. Heavy mike transformer, 2/6.

RADIOMART. Supremus 27/6 battery economisers fitted Westinghouse Rectifiers; save half battery bill, 7/6.

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RADIOMART. NSF 8+8-mfd. electrolytics, 3/6. Dubilier 8-mfd., 2/11, both 500v. working.

RADIOMART. Variable condensers: Lotus, .0003, 1/-; Utility, .0005, 1/3; Ready Radio, .00075, .0003, .0005, 9d.; Telsen, .0001, .00015, 10d.

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DARIO 4 Volt Valves: Super H.F., Detector, R.C., L.F. 1/3.

CELESTION 45/- list 7in. Permanent Magnet, Universal transformer 17/6, ditto LOTUS 14/6. Cash with order, 24 hours service, carriage paid. FAERITONE RADIO, Faeritone Corner, 57, Praed Street, London, Paddington 0251.

RADIO CLEARANCE, 280, High Holborn, W.C.1, offer the following stupendous bargains: limited quantities only; all orders over 5/- post free.—'Phone: Holborn 4631.

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RADIO CLEARANCE.—Palliard Gramophone Motors, complete with unit plate, turntable, automatic stop and start, 2 models available, 100 to 150 volts, 200 to 250 volts: list price £5/5/0, our price 30/-.

RADIO CLEARANCE.—Earl permanent magneto moving-coil speakers, 7½in. cone, unused and boxed; list price 29/6, our price 10/11.

RADIO CLEARANCE.—Magnavox permanent magnet moving-coil speakers, 6in. cone, fitted pentode transformers, list price 27/6, our price 11/-.

RADIO CLEARANCE.—Standard Telephones and Cables mains Transformers, shrouded type, for H.T.8 Rectifier, with 4v. 4 amp. C.T., L.T. windings, exceptional value at 6/- each.

RADIO CLEARANCE.—Utility 3-gang Midget type superhet condensers, 2 0.0005 sections and 100 kc/s oscillator section, fully screened, with trimmers, complete with dial, 7/6.

RADIO CLEARANCE.—Utility 3-gang Midget type straight condensers, 3 0.0005 sections, fully screened, with trimmers, complete with dial, 7/6.

RADIO CLEARANCE.—Utility 3 0.0003 and 0.0005 bakelite dialectric, 9d. each.

RADIO CLEARANCE.—British Radiophone 3-gang Superhet Condensers, unscreened 2. 0.0005 sections and 110 kc. oscillator section, 3/11 each.

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VAUXHALL.—Station named scales for Radiopaks complete with Rivets. New wavelengths.

VAUXHALL.—Magnavox permanent magnet Speakers universal for Class B, power, pentode or push-pull; 7in. cone, 16/6; 10in. cone, 22/-.

VAUXHALL.—Magnavox energised types, 2,500 or 6,500; 10in. cone, 22/-; 7in. cone, 15/3. All brand new complete with humbucking coils, state power or pentode.

VAUXHALL.—Polar three gang condensers, Midget, 8/9. Arcuate dial and drive. 5/-.

VAUXHALL.—Iron-cored intermediate transformers on bases, with terminals 110 k/c, centre tapped, 6/6.

VAUXHALL.—Benjamin. Class B transformers 1-1½ to 1. Terminals fixing, 6/6, boxed.

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VAUXHALL.—Westinghouse rectifiers set manufacturers surplus skeleton type H.T.8, 9/6; H.T.9-10, 10/-.

VAUXHALL.—Westinghouse Westectors, W.4, W.X.6, 5/9.

VAUXHALL.—Gramophone motors: Collaro 32 model, 32/6. Universal model for 110, DC. 200/250 AC/DC, 47/6.

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COMPONENTS: THEIR ACTION, PRINCIPLE AND PURPOSE

# Practical and Amateur Wireless

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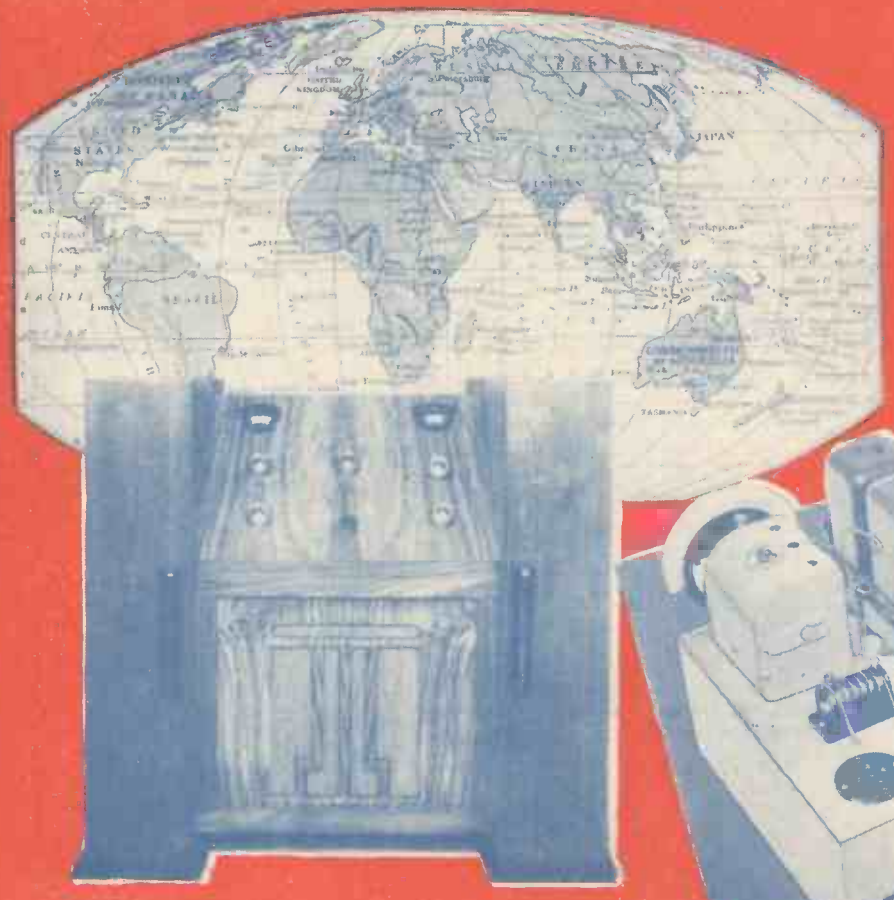
Edited by F. J. CAMM

AND AMATEUR TELEVISION

A GEORGE NEWNES Publication

Vol. 6. No. 136. April 27th, 1935.



ROAMING THE WORLD ON F. J. CAMM'S SILVER SOUVENIR



**Thermion's Notes are on Page 175!**


# 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. VI. No. 136. April 27th, 1935.


# ROUND *the* WORLD *of* WIRELESS

### Alternative Radio Programmes for Paris

IN view of the fact that the transmissions from Poste Parisien have proved so popular, the Paris P.T.T. has decided that it is now time to provide its listeners with high-class alternative programmes. For this purpose a plan has been drawn up by which Radio-Paris and the Eiffel Tower transmitter on 206 metres may shortly supply these broadcasts.

### A High-power Station for Bulgaria

IT is reported from Sofia that the Council of Bulgarian Ministers has placed an order with German wireless works for the supply of a 100-kilowatt transmitter to be erected in the neighbourhood of the capital. The work will be put in hand at once, but it is unlikely that the station will be ready until towards the end of 1936.

### French Radio Festival

PARIS this year, over the period May 26th-July 7th, is organising special programmes, some of which will coincide with the French Radio Exhibition. Other broadcasts on a large scale are to be made on June 1st and 2nd from the Villacoublay Aerodrome, as well as on June 20th with a special relay from the Paris Opera House. On this date listeners will be given an opportunity of hearing a concert to which some of the most famous French and foreign military bands are contributing. The transmission will be taken by other European stations.

### Continent will Relay Jubilee Celebrations

IN addition to a rumour that many of the Continental transmitters will relay some of the B.B.C. programmes during the Jubilee celebrations, it is definitely reported that the Vienna studio will send to London its own commentator to describe the Royal Procession to St. Paul's Cathedral on May 6th.

### Germany's Wired Wireless

AS in the opinion of the German Authorities the number of radio channels at the disposal of the country is limiting the growth of the broadcasting network, following a series of experiments made at Berlin, it has been decided to install shortly a new system whereby owners of the popular type of wireless receiver will be able to take their programmes through the telephone. By this method the radio entertainments are superimposed over the ordinary telephone network on some wavelength between 1,000 and 2,000 metres, and will not interfere with the telephone messages. To make the service popular, the authorities propose, in the case of listeners not in possession of telephone installations, to permit them to connect their receivers to outside telephone landlines. It is expected that by this means the wireless programmes can be distributed cheaply throughout Germany with the assurance that reception is a good one and without the risk of any outside interference.



### Stand by for Radio-Romania

THE new 150-kilowatt Romanian national transmitter at Bod (Brasov) is now ready for tests, and we may expect to hear experimental broadcasts from this station on 1,875 metres during the Easter holidays. Some readjustment, doubtless, will have to be made in the channel used, as the wavelength is one already used by Kootwijk (Holland).

### Second High-power Swiss Station

CONTRARY to the decision previously taken by the Swiss Authorities, when the Sottens transmitter closes down on September 1st for reconstruction the station will be rebuilt to increase its power to 100 kilowatts, and thus bring it on a par with Beromünster.

### Radio at the Brussels International Exhibition

THE I.N.R. responsible for the operation of the two Brussels broadcasting stations has installed a large studio in the Exhibition buildings; it is built on the lines of those used by the National Broadcasting Company of America, inasmuch as the public is separated from the artists by a triple glass screen. Special programmes to be given during the period of the Exhibition will also be relayed to the Brussels stations.

### Projected U.S.S.R. Giant Short-wave Station

THE Soviet Authorities are putting in hand the construction of a short-wave transmitter in the environs of Moscow. It is reported that its power is to be 120 kilowatts, in order that the broadcasts may be heard throughout the world.

### Oslo Time Signal

WHAT has been sometimes taken by listeners on 1,154 metres for the beginning of a television transmission is, as a matter of fact, merely a time signal given out by Norway's capital studio. At 30 seconds before B.S.T. 20.00 (8 p.m.) you may hear 25 short dashes of a flute-like character which are produced by an oscillating valve; then, following a pause of 5 seconds, a final longer dash is broadcast to indicate the exact hour.

### Iceland's Shipping Broadcasts

OCCASIONALLY when tuning near Motala you may pick up broadcasts in English and German dealing with weather forecasts, and storm warnings which are evidently destined to shipping in the Atlantic Ocean and North Sea. These, as a matter of fact, emanate from Reykjavik on 1,442 metres (208 kc/s), which transmits five times daily not only in Icelandic, but also in languages understood by fishing craft of other nations. Curiously enough also, the Reykjavik studio relays transmissions from its local Parliament, of which the meetings sometimes last six or seven hours daily. It is, so far, the only station which broadcasts speeches direct from its legal assembly.

# ROUND the WORLD of WIRELESS (Continued)

### Sweden's New Giant Station

THE reconstructed Motala transmitter—now 150 kilowatts—has been heard testing in the late evening hours, at the conclusion of the day's programmes, on 1,389 metres (216 kc/s).

### The King's Broadcast

IT is now possible officially to confirm that the King's broadcast from Buckingham Palace on May 6th will take place at 8 p.m. This broadcast will be from a room overlooking the Palace gardens. The technical arrangements will be the same as those for the Sandringham broadcast at Christmas. The King will speak alone from a room adjoining that in which the technical controls are placed. All equipment will be in duplicate and the lines connecting the Buckingham Palace switchboard with Broadcasting House will be specially chartered private circuits.

### News from Road and Track

THE Earl Howe is to give the second talk in the series "News from Road and Track" on April 26th. These talks are intended to keep Ulster listeners in touch with motor sport, in preparation for the T.T. Race in September. Lord Howe, owing to a prior engagement, will record his talk the evening before it is actually heard by listeners, probably within a few hours of his return to London from Monte Carlo, where he will have been taking part in the Monaco Race.

### Jubilee Concert from Birmingham

THE Jubilee Concert at the Birmingham Town Hall on May 11th will be relayed in the Midland programme. The City of Birmingham Orchestra, the Festival Choral Society, and the City of Birmingham Choir join forces for this concert. They all combine in Elgar's "Coronation Ode," for which the soloists will be May Blyth (soprano), Muriel Sotham (contralto), Parry Jones (tenor), and Samuel Saul (baritone). Handel's Water Music and the "Hallelujah Chorus" are also to be given. The conductors are Leslie Heward, G. D. Cunningham (who also plays an organ solo), and Harold Gray.

### Variety from Bolton

AN excerpt from the variety bill will be broadcast from the Grand Theatre, Bolton, to Northern listeners on May 2nd.

### The Red Sarafan

THE B.B.C. announces that on May 7th a new feature, entitled "The Red Sarafan," will be introduced to listeners by the Light Entertainment Department. As the title suggests, this feature will be Russian, and an entirely new orchestra is being formed under the direction of Emilio Colombo, formerly court violinist to the late Tsar of Russia. Emilio Colombo is known to British listeners through his work with the Hotel Metropole Orchestra, but before the War he was a leading figure in the entertainment world of St. Petersburg, where he directed four orchestras.

## INTERESTING and TOPICAL PARAGRAPHS

### Ballad Concert for Midland Listeners

THREE of the leading Midland artists—Miriam Licette (soprano), Roy Henderson (baritone), and W. H. Squire ('cello)—will give a ballad concert for Midland listeners on May 5th, the first two each singing two groups of songs.

AN H.M.V. AUTORADIOGRAM

*Putting the finishing touches at the H.M.V. factories at Hayes, Middlesex, to an "His Master's Voice" "Duo Diffusion Autoradiogram Nine," one of which was installed on H.M.S. Sussex for H.R.H. The Duke of Gloucester's personal use on his recent journey to Australia.*

### "Bath and the Beau"

THIS is the title of a programme in which incidents from the lives of Richard Nash and his Court will be dramatised. This programme, which is being arranged by M. H. Allen, will be given for Western listeners on April 27th.

### Lunch-time Music from Coventry

COVENTRY Hippodrome Orchestra, relayed from the Theatre on May 10th, will be heard at lunch-time in a Midland programme representing twenty-five years of melody. It includes numbers from pre-war operas like "Merrie England," wartime tunes, and popular music of the post-war years. Charles Shadwell, the conductor, has drawn up the programme.

### "Pleasure on Parade"

FOR the last time this season Northern listeners will hear Frank A. Terry's winter concert party, "Pleasure on Parade," on May 3rd, this being a repeat performance of the show included in the main Regional programme on Thursday afternoon. A large studio audience is expected, and for their benefit as well as to create "atmosphere," the show will be presented in full costume.

### "The Desert Song"

ON May 8th and 9th John Watt is producing Edith Day and Harry Welchman, in conjunction with Lee Ephraim, in "The Desert Song." Henrik Ege is adapting the stage version for broadcasting. The radio version will play for about one and a quarter hours. All the popular music has been left in, and a dancing chorus and large wireless chorus will be employed. The Theatre Orchestra will be under the direction of Stanford Robinson.

### Guards Band Concert

ON May 7th, the Band of H.M. Coldstream Guards, conducted by Lieut. J. Causley Windram, will give a popular programme at the Arboretum, Derby, and this is to be relayed to Midland listeners. This band represented British Army Bands at the funeral of Marshal Foch. It was also the first Regimental Band to tour Canada. A variety bill will be relayed from the Grand Theatre, Derby, the same evening.

### "Music of the People"

MEMBERS of Leeds Technical Training School for the Blind have recently formed a dance band, which is to be broadcast to Northern listeners in the "Music of the People" series on May 1st. All the bandsmen are blind and have been taught to play from Braille music; they are employed as either basket, brush, or mat makers.

### Not the Volga Boatmen

THE new Polish 24-kilowatt station recently opened at Torun (pre-War Thorn) has adopted a distinctive musical interval signal which consists of the first two bars of a local folk-song popular amongst the timber drifters on the River Vistula.

## SOLVE THIS!

**Problem No. 136.**

After using his H.F.-detector-power receiver for a few months Whyte decided to use grid-bias for the H.F. valve to obtain better results. Not wishing to disturb the coils and their connections he fitted a .0001 mfd. condenser in the grid lead and joined a 2-megohm leak between grid and the grid-bias battery applying 1.5 volts. This gave every satisfaction, and he eventually decided to use a variable-mu valve in this stage. He accordingly obtained the variable-mu valve, and in place of the 2-megohm leak he fitted a 2-megohm potentiometer of the volume-control type. He found, however, that this did not provide any variation in volume. Why? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 136 in the bottom left-hand corner, and must be posted to reach this office not later than the first post Monday, April 29th, 1935.

**Solution to Problem No. 135.**

The grating noise in Jackson's receiver was due to the home-made pig-tail coming into contact with the bare spindle. By insulating the pig-tail the noise would have been removed, or a longer piece of wire could have been used so that it did not come into contact with anything throughout the complete movement of the rotating member.

The following three readers successfully solved Problem No. 134 and books will be forwarded to them: V. Playford, 4, Elizabeth Place, Military Road, Rye, Sussex. C. Thompson, 13, Felbridge House, Dog Kennel Hill, S.E.22. G. N. Patchett, 71, Moorside Road, Eccleshill, Bradford.

# COMPONENTS

## Their Action, Principle & Purpose

The Components Associated with the Variable-mu Volume Control Circuit are Explained in this Second Article of the New Series

NOW that we have gained a reasonably good idea of the function and principles of the preliminary, or aerial, tuning circuit we can pass on to the rest of the receiver with more confidence, and in the knowledge that the most difficult part of the circuit has been disposed of. Following the aerial circuit we have the high-frequency amplifying valve, this being shown in the circuit as a variable-mu screen-grid type. Actually, the main principle would be just the same if the valve did not possess variable-mu characteristics, but as this type of valve is now most generally employed, we may as well keep our knowledge up to date.

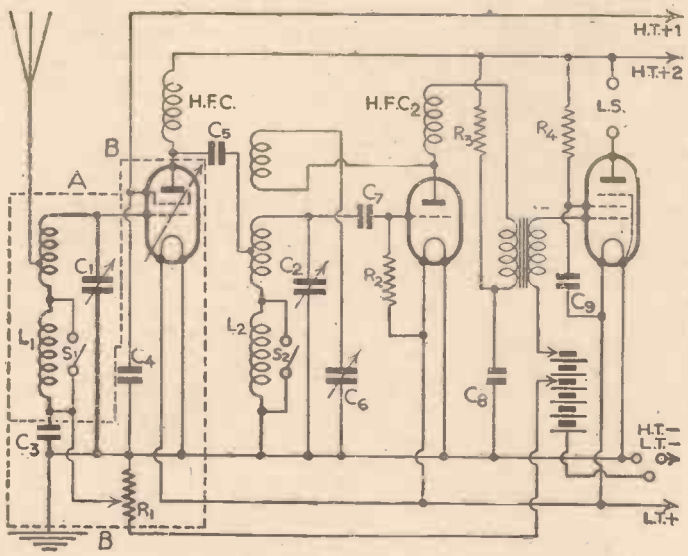



*Fig. 1.—The complete three-valve circuit considered in this series of articles, the components described this week being enclosed in the box marked B.*

### The V.M. Valve Simply Explained

As this series of articles is being written with the object of explaining the components, it is not proposed to go into detail concerning the valves; in any case their function has been dealt with in a comprehensive manner in previous articles. It is, however, necessary to keep in mind the main features and principles so that we can more readily appreciate the exact purpose of the components used with them. It is well known to all regular readers that a current of electricity passes from the heated filament (or cathode in the case of an indirectly-heated valve) to the anode, due to the positive and negative potentials applied to the anode and filament, respectively. As, however, the grid is interposed between the other two electrodes, the current—in the form of a stream of electrons—has to pass through it. The grid is nearer to the filament than is the anode, so that if a fairly strong positive potential were applied to it the electrons would be attracted to the grid rather than to the anode. On the other hand, if the grid were made negative with respect to the filament, it would tend to repel some of the electrons, just as the south pole of a magnet repels another south pole placed near it.

Without going more fully into the question, it will be understood that a variation of potential applied to the grid will cause a variation in intensity of the current passing through it to the anode—in other words in the number of electrons driven past it. It is due to this that the valve is able to function as an amplifying device. The fluctuating signal voltages, which change from maximum positive to zero to maximum negative, and so on, when applied to the grid cause corresponding fluctuations in the filament-to-anode current. The variations in anode current, however, are much greater than the variations in signal current causing them, and so comes the amplification.

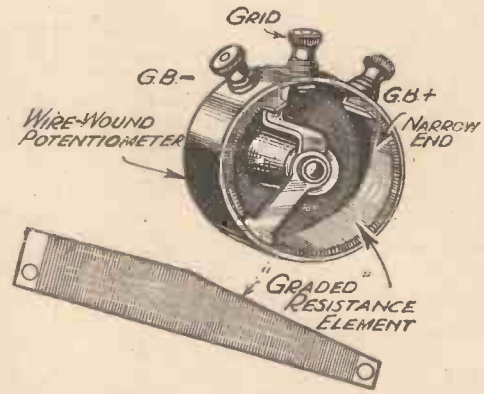
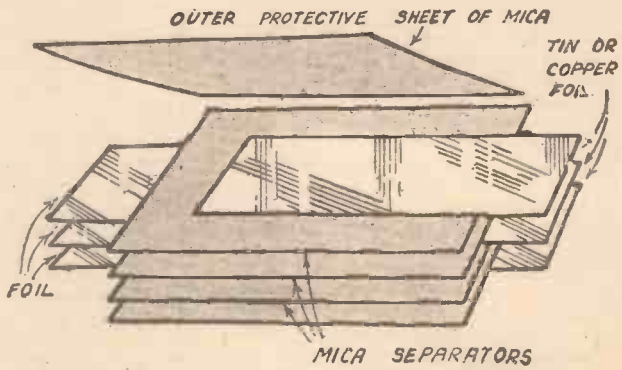



*Fig. 3.—Showing the usual form of construction of a "graded" potentiometer.*

### The Screening Grid

In the V.M. valve shown in Fig. 1, there is another grid between the *control grid* (the reason for this name will now be evident) and the anode. This *screening grid* is made positive by its connection to the H.T. supply, and the potential remains constant. The screening grid is also kept at earth potential with respect to the signal voltages due to its being joined to earth through the fixed condenser C4. The purpose of the screening grid is to prevent an effect which was noticed when using three-electrode valves for H.F. amplification; due to the speed at which the electrons struck the anode some of them "bounced" off again and returned to the grid. This



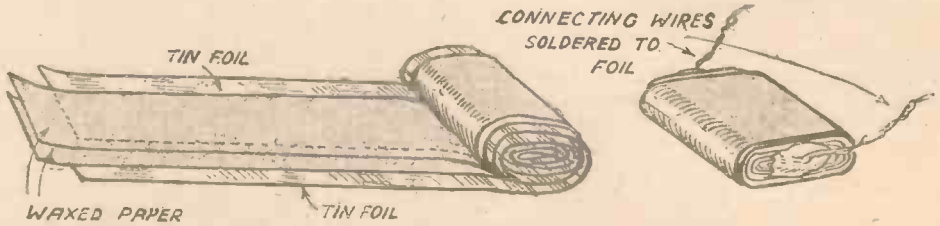




*Fig. 2.—The above illustrations show the different forms of construction used for ordinary and non-inductive fixed condensers. The differences and reasons for the choice of non-inductive for certain positions in the circuit are fully explained in the text.*

meant that "feed-back" took place and caused an undesirable reaction effect. This need not be discussed at any further length here, but we shall consider it in greater detail when dealing with the detector circuit.

The screening grid now "catches" the "bounced back" electrons, which are allowed to leak back to earth through C4. The capacity of this condenser must thus be such that there is a free path for the high-frequency voltages which build up on the screening grid. If the capacity were too low, or if the condenser were omitted, the screening grid would have little or no effect, since it would become "saturated." For reception on medium waves a capacity of about .1 mfd. is ample, but on long waves a capacity up to 1 mfd. is desirable. The reason for this is that the impedance offered by a condenser is proportional to the wavelength, or inversely proportional to the frequency, and the impedance of a .1-mfd. condenser to frequencies of about 1,000 kc/s (300 metres) is about 1½ ohms, or to frequencies in the neighbourhood of 200 kc/s (1,500 metres) is 7½ ohms. There is no harm in using a higher capacity than .1 mfd. or 1 mfd., provided that the condenser is absolutely non-inductive, but it is generally most convenient to use 1 mfd., this being suitable for all broadcasting wavelengths.

## Non-inductive Condensers

Let us consider the question of inductive and non-inductive condensers for a moment. An inductive condenser is one which possesses the same property as a tuning coil, whilst a non-inductive condenser, as the name clearly implies, has capacity but no inductive value. The construction of condensers of the two types is shown in Fig. 2, where it may be seen that the inductive condenser is made by rolling alternate layers of tinfoil and waxed paper. In the case of the non-inductive component the layers are shown as being flat; actually it is not essential that they should be flat, and various methods of manufacture have been devised whereby space can be saved by rolling and inductance cancelled out by rolling in different directions, or by pleating the electrodes and dielectric as in a paper fan.

If C4 were inductive, it would act as another oscillatory circuit like that formed by L1 and C1. This means that it would "tune" to a certain frequency, and thus prevent the passage of currents of that frequency through it. And if the "resonant frequency" fell within the tuning range of the set the condenser would be valueless at that frequency.

## The By-pass Condenser

The very same conditions apply to the condenser C3 which is joined between the lower end of L1 and earth; this also must be non-inductive. The purpose of this condenser is to provide free passage to the high-frequency currents appearing in the tuning circuit, but to prevent the grid-bias supply from being short-circuited to earth. Even if the capacity were reduced to .0001 mfd., C3 would serve the purpose mentioned, but it would be quite unsuitable. This is because the condenser is actually in series between the tuning coil and its corresponding condenser, and the capacity of condensers in series is less than the capacity of either condenser by itself. The total capacity of two condensers in series is easily found from the simple formula: $C = \frac{c.1 \times c.2}{c.1 + c.2}$ where C is the total capacity and c.1 and c.2 represent the capacities of the two condensers wired in series. Thus, if the capacity of C3 were .0001 mfd., the total capacity of C3 and C1 would be

$$\frac{.0001 \times .0005}{.0006} \text{ or } \frac{.00000005}{.0006}$$

which is equal to approximately .00008 mfd. On the other hand, if the capacity of C3 were made .01 mfd. (a usual value), the total capacity would be

$$\frac{.00005}{.0105}$$

which is practically the same as .0005 mfd. Thus it will be seen that the use of a condenser of .01 mfd. has no real effect on the tuning capacity; the difference caused is, in fact, so slight that it does not preclude the use of a two-gang condenser for C1. and C2.

## The Volume-control Potentiometer

The variable-mu potentiometer, R1, is the next component to consider. Its object is to enable a variable grid bias voltage to be applied to the V.M. valve, or, in other words, to make it possible to vary the sensitivity of that valve. Without going too deeply into the matter, it can be explained that the greater the G.B. voltage applied, the less becomes the sensitivity of the valve. The reason for this will be fairly evident from the explanation given above, in which it was pointed out that the application of a negative voltage causes a reduction in anode current. And if the steady current is reduced in this manner the variations caused by the signal voltages on the control grid will also be reduced.

It would be possible to dispose of the potentiometer by connecting the lead which goes to its slider to a tapping on the G.B. battery, but it would then be necessary to move the wander plug into different sockets to vary the degree of amplification, or to control the volume in the H.F. stage. This would be inconvenient, as well as being a very rough method, since variations of grid voltage would only be possible in comparatively large steps. The potentiometer makes it possible to vary the bias very gradually and evenly between zero and the voltage of the negative tapping into which the lead from the end of the potentiometer is connected. The idea is that there is a gradual voltage drop along the resistance element of the potentiometer, and thus, by connecting the bias circuit to one end of the resistance and to the slider, any particular voltage or potential can be chosen.

## Potentiometer Resistance

The maximum resistance of the potentiometer is not critical nor, theoretically, important. In practice, however, it must be so high that only a small current flows through it from the G.B. battery—otherwise the life of the battery would be short. A very high value, on the other hand, is not so good, because the current flowing through the resistance element is then practically nil, and the voltage is not always proportional to the position of the slider. A really complete explanation of this point would be rather laborious, besides being of little value, so we will leave the matter as being a fact. The average value used for the potentiometer is between 25,000 and 50,000 ohms, the lower value being suitable when the V.M. valve is of the "short-base" type taking a maximum G.B. voltage of about 9, and the latter is better in the case of a "long-base" valve which requires up to about 18 volts negative bias. In either case the current passed by the potentiometer approximates to .3 m.a.—9 (volts) divided by 25,000 (ohms) and multiplied by 1,000 (milliamps per amp.).

This current is not drawn from the G.B. battery continuously, but only while the set is in use. The reason is that a three-point on-off switch is employed, and this breaks not only the low- and high-tension circuits, but also the lead from the G.B.+ terminal to the potentiometer. Constructors often make the mistake of using an ordinary push-pull switch here, and then find that the G.B. battery runs down very quickly.

## "Graded" Control

Returning to the potentiometer itself, we ought to explain that this should preferably be of the "graded" type. This means that the resistance element is tapered towards one end, as shown in Fig. 3. In consequence of this the change in G.B. potential obtained is not the same at different positions of the slider. The narrowed end of the resistance element should be connected to G.B.+—or earth—so that the increase in negative bias takes place more gradually near the "full-volume" position of the control. The reason for this is that an increase in G.B. voltage from, say, 1 to 2 volts has a much greater effect on volume control than has a variation of, say, 6 to 7 volts. Almost every maker is able to supply the necessary potentiometer in "plain" and "graded" types, whilst several makers supply the "graded" one only, since this is of greater general utility. For the purpose in question it is not important whether the potentiometer is of the wire-wound or "composition" type.

We must leave the inter-valve H.F. circuit and the detector until the next article.

## A Needle-cup Dodge

A SIMPLE method of overcoming the necessity of emptying the used needles from the usual cup fitted to a radio-gram. is as follows: Drill a large hole in the bottom of the cup and fit a large-necked bottle by means of a suitable shelf and supports, immediately under the hole. This will hold a far greater quantity of needles than a cup, and it can be emptied with much greater ease. If inconvenient to fix the bottle immediately under the cup it can be fitted in any other suitable position if a piece of ordinary hose-pipe is employed to guide the needles into it.—R. E. G. COPP (Thornton Heath).

## *FURTHER NOTES ON*

# F. J. CAMM'S ALL-WAVE SILVER SOUVENIR

**Using the Gramophone Pick-up, and Some of the More Obscure Operating Details are the Points Explained in This Article**

THOSE readers who have now completed the Silver Souvenir and have experienced the wonderful results which it gives on all wavebands will, obviously be keen now to try the apparatus for the reproduction of gramophone records. The theoretical diagram shows gramophone pick-up connections between the detector grid and a grid bias tapping. The terminal strips already attached to the receiver are not provided with sockets for pick-up connections, and thus those constructors who wish to include this refinement will have to obtain a further terminal strip suitably engraved, and this must be mounted near the L.S. terminal strip. There will be only two wires to connect to this, one being joined direct to the grid of the detector valve (in addition to those already joined to that point), and to the other socket a flexible lead must be fitted. The plug to be fitted to this lead should be marked G.B.—2, as indicated on the circuit diagram.

### Using the Pick-up

The type of pick-up to employ is not critical, and practically any well-known make will be found to provide splendid results. In view of the fact that there are on the market to-day some gramophone records which provide rather hefty volume, probably the type of pick-up which is fitted with its own volume control will prove most serviceable. There will be two leads from the pick-up, even if it is provided with a volume control, and these may be inserted into the socket strip on the receiver in any order—there being no polarity to preserve. In many pick-ups there will also be found an additional wire, which is internally connected to the metal parts of the carrier-arm for earthing purposes, and if such is fitted to the instrument which you obtain, the wire should be joined to the earth terminal on the receiver.

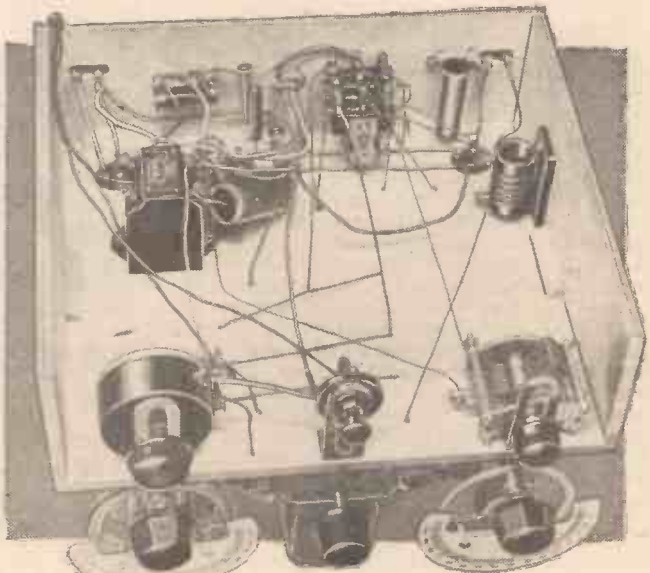
Use good needles—preferably of the medium-tone type—and the reproduction will be all that you desire, both from the point of view of quality and volume. The bias plug should be inserted into the 1.5 volt tapping on the battery, and it may, of course, together with the pick-up, be left permanently connected, although a switch could be provided to completely disconnect the pick-up from the grid circuit when the change over to radio is made. Such a switch should be of the single-pole change-over type and would take its place on the rear strip near the pick-up socket strip. The arm of the switch should be connected to the grid terminal of the detector valve, all the leads at present shown connected to that point, then being connected to one side of the switch, and the other side of the switch going to the pick-up socket. No troubles or instability should arise when this addition to the circuit is made, but in the event of any difficulties cropping up owing to peculiarities in the layout, etc., the recent article on the pick-up and instability should be studied.

*Here is F. J. CAMM'S Silver Souvenir in its new and original cabinet. The panel is inclined for ease of operation. Chromium-plated knobs are used. The two lockers provide accommodation for phones, testing equipment, batteries, books, etc.*

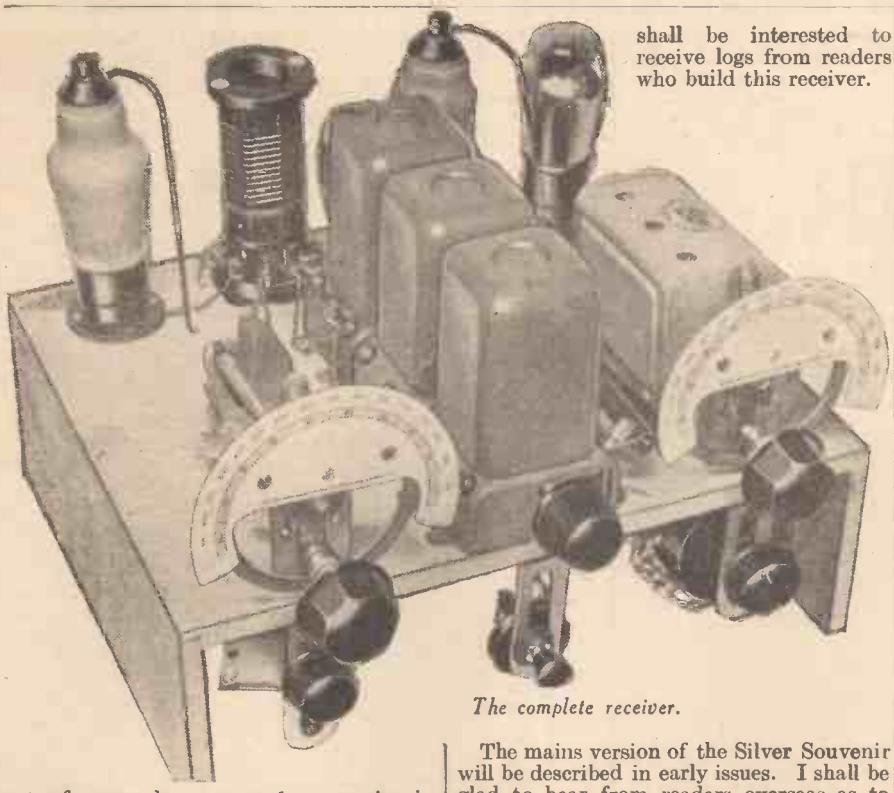
### Keeping Down the Current

If reference is made to the operating instructions in our issue dated April 13th, it will be seen that the bias to be applied to the output valve (G.B.—3) is 9 volts. This is the makers' recommended value and will give, with 150 volts H.T., an anode current of about 18 or 19 milliamps. If it is thought that this drain on the H.T. battery is too great it may be considerably decreased, without much loss of quality, by increasing the grid bias up to, say, 12 or 15 volts. The volume of the output will

*This rear view shows the short-wave change-over switch.*



*An underneath view of the Silver Souvenir.*



*The complete receiver.*

not, of course, be so great, but a saving in current will be effected, and this will probably prove of greater interest to many constructors than the volume which is obtained.

### When To Listen

Some indication of the times of the more important short-wave transmissions may prove of value to those who have not had previous experience of the short waves, and, therefore, the following notes have been prepared. Zeesen, DJD and DJC, should be heard most evenings after 7.30. At 9 o'clock these stations broadcast news items in German and English, so that no difficulty will be experienced in identifying them. DJC broadcasts on a wavelength of 49.83 metres, and DJD on a wavelength of 25.49 metres. In addition to these, English-speaking items will be found on Madrid on 30.43 metres, from which at various times the announcement, "Here is the voice of Spain," may be heard. At this time of the year this signal is very good round about 11 p.m., and can easily be identified.

Our own Empire transmissions will also enable you accurately to calibrate your receiver, GSB, on 31.55 metres, and GSC, on 31.35 metres, coming in after 9 p.m., and no difficulty should be experienced in identifying our own announcers, even if the items or newsletters are not actually heard.

From the positions indicated above it should be a fairly simple matter to judge the settings for long-distance stations, such as Pittsburgh, Schenectady, Rio de Janeiro, etc. Pittsburgh will be found on a wavelength of 25.27 metres after 9 p.m., and Schenectady uses two separate wavelengths, one on 31.48 metres and one on 19.56 metres, but conditions vary from time to time, and during the past month it has been possible on several occasions to hear the American stations in daylight, although on other occasions they have not come in well until after midnight.

### Other Stations

This does not, of course, exhaust the list of good short-wave stations, and we shall be interested to receive logs from readers who build this receiver.

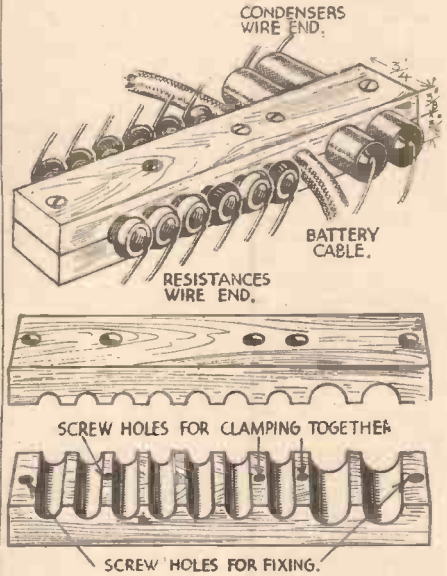
The mains version of the Silver Souvenir will be described in early issues. I shall be glad to hear from readers overseas as to results obtained on the Silver Souvenir.

## SPECIAL FEATURES

- **Short waves in addition to normal broadcasting wavelengths without the use of special components.**
- **Special short-wave circuit employed—the change being carried out by means of a simple switch.**
- **Simplicity of control—only one tuning knob for each waveband.**
- **Three Pentode valves—providing maximum efficiency in each of the three stages.**
- **Undistorted output of 1 watt.**

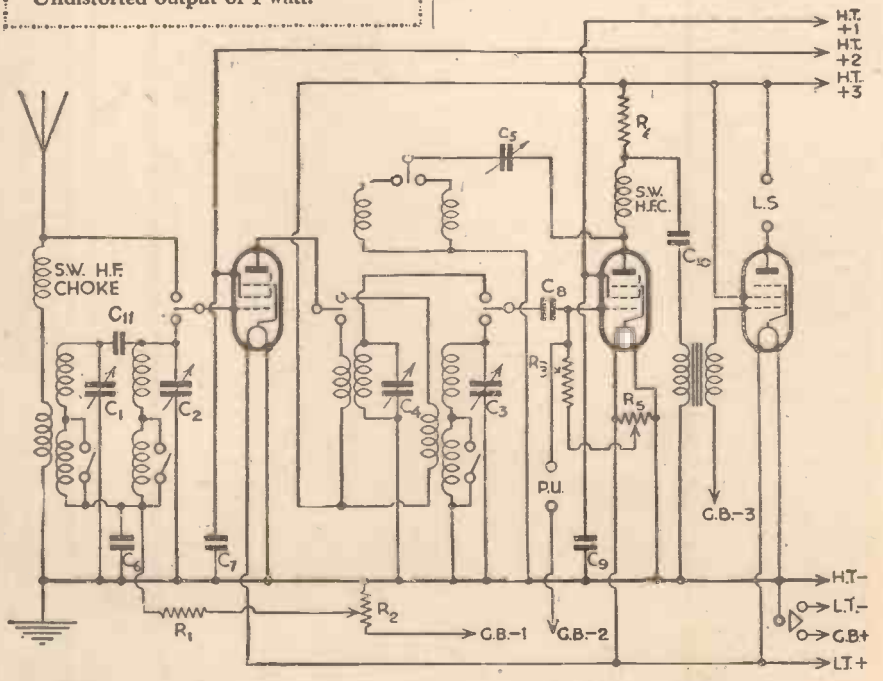
## A HANDY GROUP BOARD

THE group board device shown in the accompanying sketches will be found a great help in obtaining neatness. Two pieces of hardwood $\frac{3}{8}$in. by $\frac{3}{4}$in. and of the length necessary are required for the body, and these are clamped together temporarily for drilling. Using the joint as centre line, drill holes $\frac{1}{2}$in. apart for the required number of resistances. These holes should be of such size as to hold the components




*The simple component group board described in this paragraph.*

firmly without undue pressure. Additional but larger holes are made for small tubular wire-ended fixed condensers. Lastly, a hole is made to take and hold firmly the battery lead cable. The two halves are then separated and given a coat of varnish. After assembling, the whole is held together firmly by two or three wood screws. Finally, two holes are drilled to take the fixing screws.—W. T. WHITBY (Hull).




*Theoretical circuit diagram of Mr. F. J. Camm's All-Wave "Silver Souvenir."*

# On Your Wavelength

By Thermion

## Making Tuning Easier

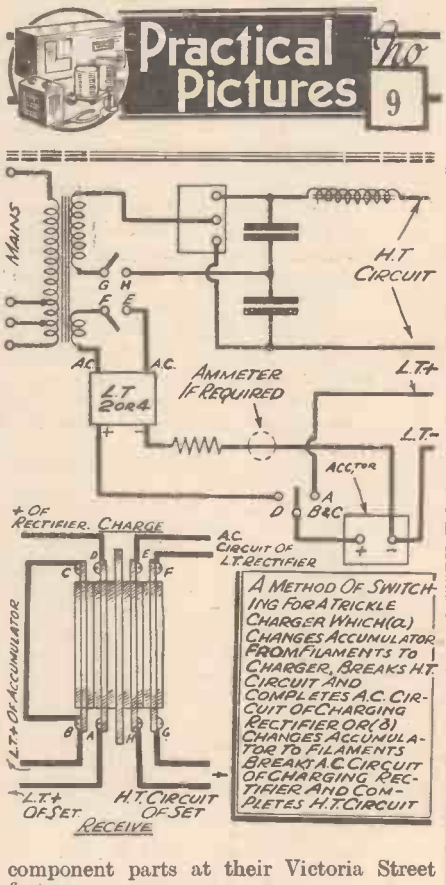
I HAVE recently completed a new receiver in which I have used one of the well-known makes of dual-drive slow-motion scales. This employs a double knob control, the rear portion acting as a direct drive, giving with the particular component quite a good slow-motion dial as compared with a drive joined direct to the condenser spindle, and the small front portion of the knob gives about a 100 to 1 reduction, thus making the dial ideal for a receiver designed to cover short waves as well as the ordinary broadcast bands. After using the receiver for a short time I decided that the control knobs could conveniently be increased in size, and going through my junk box I found two variable condensers with a slow-motion gear fitted to the spindle. These condensers were provided with a 3in. ebonite dial, giving direct drive and a slightly smaller knob driving the slow-motion gear. By taking off this latter knob from both condensers, and drilling one out to take the larger spindle of my present dial, I was able to fit it with two 3in. control knobs, and this, in conjunction with the extremely low-speed drive, renders tuning a much more comfortable job. I wonder there are not more of these large-size controls fitted, for they are extremely convenient to use and do not by any means look out of place. The hint may be of use to my readers.

## High-note Losses

I ATTENDED a demonstration the other day of a new loud-speaker. This gave a response extending into the upper frequencies to a point hitherto unheard of. It was fed from various amplifiers, and when connected to a *good* broadcast receiver, the quality of the speech from one of the B.B.C. stations had a most remarkable clarity, and was a revelation to those who have become accustomed to the average set with a moving-coil speaker confined in a small cabinet. After some discussion with a friend the subject of high-note response and losses was gone into very thoroughly, and it is really surprising how many sources of loss there are in the average type of receiver. Starting with the grid leak and condenser, there is the difference in impedance at various frequencies, of these two parts. Capacities to earth will form ready leaks for the high frequencies, and it is interesting to examine an actual receiver and to see just what little pitfalls there are in this way. I might mention such items as a condenser in a metal case, mounted on a metal chassis which is earthed. If this is connected in some parts of the circuit unexpected losses will occur. Unfortunately, on most broadcasts it is not worth while improving the top-note response on account of the fact that the music would be marred by heterodyne whistles, oscillation noises from nearby sets, static, etc.

## A New Television Company

MESSRS. WHITELEY ELECTRICAL RADIO CO., the well-known loud-speaker manufacturers, will soon be manufacturing television receivers and




component parts at their Victoria Street factory.

This side of the business will be handled by the formation of a new company under the title of the Whiteley Television Co., Ltd., with a nominal capital of £1,000. Mr. A. H. Whiteley, head of the firm, stated that so far only experimental work confined to research has been carried out. "The new company," he said, "has been set up so that as soon as an efficient television service becomes definitely established, we shall be in a position to put receivers and components on the market. We anticipate that the first demand will be in the way of home-constructed sets."

## The H.T. Supply Unit

THE constructor is very apt to think that one mains transformer is as good as another, a fact which was brought to my notice the other evening. A friend had made up a mains superhet using a full-wave valve rectifier with a rated output of 250 volts at 60 m/A. This was fed from a mains transformer which was also rated to give a secondary output of 250-0-250 volts at 60 m/A. I mention these points before telling you that the results provided by the receiver were in some ways unsatisfactory, although general reception was moderately good.

When the set was first switched on, signals could be faintly heard after about 20 seconds (the condenser being already tuned to the correct position for the Regional) and after that they gradually increased in strength up to full volume. Later, however, instead of reception remaining satisfactory, the receiver burst into a form of oscillation, groaned and growled for twenty seconds or so; then the oscillation gradually ceased, signals returned to normal and finally faded away to little more than a whisper. They could be brought up to full strength by advancing the volume control, but reproduction was by no means so good as when the set was first switched on.

I diagnosed the fault as being in the mains-supply section, but my friend assured me that there could be nothing wrong here. In order to prove my point a high-resistance voltmeter was connected in parallel with the output terminals from the rectifier. This immediately "gave the show away," for the voltage registered after switching on the set went up to 200, 250, 350, and then fell gradually, but surely, to slightly more than 150. I should explain that the rectifier was of the indirectly-heated type. The trouble was found to be due entirely to the mains transformer which had very poor "regulation" and was quite incapable of delivering the rated output. The rectifying valve was quite in order, for a new transformer entirely cured the trouble originally experienced.

## Tuning Condensers and Dials

A FEW comments relative to the choice of tuning condensers and slow-motion dials may be of interest. Tuning condensers specially designed for short-wave reception are to be recommended. They must be of low-loss construction with a positive pigtail connection. The rotor must work freely and be silent in operation, ball bearings or mechanically sound plain bearings being most desirable.

Slow-motion dials incorporating friction drive, and a reduction ratio of no less than 16 to 1, 22 to 1, 60 to 1, are needed, whilst a dual ratio of 8 to 1 for rough tuning, and 150 to 1 for fine tuning, would be ideal. An 8 to 1 reduction alone would, of

(Continued overleaf)

(Continued from previous page)

course, be of little practical use. Standard broadcast dials of good make may be used in a band-spread system as tank condenser and spreader controls, a high reduction gear ratio being unnecessary.

### Checking Battery Voltages

H.T. and L.T. voltages are important, yet batteries are often neglected. A run-down H.T. battery will cause body capacity effects, and a similar effect will be produced when the L.T. accumulator is in a run-down condition. Battery voltages should always be checked before trying out short-wave apparatus. In addition to the foregoing, faulty components, lay-out, wiring, and unsuitable associated apparatus external to the receiver may cause trouble, but one thing will be certain, namely, that the circuit is not at fault, whatever the symptoms. Valves nowadays are comparatively cheap, and the use of old and obsolete types is to be deprecated. Ploppy reaction and poor amplification caused by the use of valves which are losing their emission, or are unsuitable for the purpose, will prove to be a constant source of annoyance.

### The Use of Fuses

THE inexperienced constructor and expert amateur should not query the value of fuses as a safeguard. One may be careful, experienced, and thorough, but nevertheless, the unexpected sometimes happens, and it is better to be safe than sorry when too late. Standard fuses, however, should be used and not flash-lamp bulbs.

A complaint sometimes heard is that when a receiver is constructed on chassis lines, it is difficult to trace the various leads and circuits. The use of coloured insulated wire or systoflex, for example, red for plate leads, black for filament, and green for grid leads, will remove this difficulty.

Successful and trouble-free reception depends largely upon the individual, his understanding of constructional work, component testing and receiver operation practice, study and enthusiasm together with the realisation that in order to obtain the best from radio, and short waves in particular, it is necessary to put the best into the set materially and individually.

### Micro Waves and Television

NEAR Genoa are some secret laboratories of Marchese Marconi, where experiments are being conducted to produce a micro-wave method of transmitting television signals which will be free from interference and also be non-fading, and yet have quite a considerable range. It has generally been regarded that the horizon was the limit over which these waves could be transmitted, but it is now being claimed that the waves can be "bent." If this is the case, then these signals can be sent beyond the horizon, or, in other words, they will travel, within limits, in conformity to earth curvature. The results of the work now being undertaken are therefore being awaited with great interest, if only for the purpose of providing a link between a remote scanner (located in a distant studio or in the open air) and the radio transmitter which will radiate these signals in all directions to cover a definite service area.

### Censorship

ALTHOUGH there is no service of high-definition television pictures available, and the nature of the programmes it is intended to use has yet to be decided, some people are already taking up the question of censorship. Since television is to be an "eye service," no doubt this problem is an inevitable one, but surely it is better to wait until the public are in a position to judge the type of pictures which are to be radiated, than to attempt making premature restrictions which are only likely to hold up progress.


### Calculating Filament-dropping Resistances

IN last week's notes it was mentioned that the value of the dropping resistance in the heater circuit of D.C. and Universal receivers is governed by the number of valves in circuit. The value of the required dropper can easily be calculated by application of Ohm's Law. For example, if the mains voltage is 200 and five 20-volt .2 amp. valves are to be used, the total resistance required will be 1,000 ohms, and therefore as the total valve resistance is 500 ohms, the external dropping resistance should have a value of 500 ohms. If one valve is omitted, however, the total valve resistance will be 400 ohms, and therefore the dropper must be increased to 600 ohms in order to keep the current at .2 amp.

### Short-Wave Converters

SHORT-WAVE CONVERTERS using a triode or screen-grid valve operating on the autodyne principle have been very popular in the past, and can still be designed to give moderately good results, but it is now an accepted fact that this type of converter has its short-comings. The modern heptode frequency changer gives better results than the triode and has the advantage of being suitable for use in conjunction with an I.F. amplifier tuned to a high frequency. When the autodyne principle is used, the I.F. has obviously to be comparatively low, otherwise there will be too great a difference between the oscillator and signal frequencies for satisfactory results to be obtained. This disadvantage is not present when a heptode or pentagrid valve is used, as the oscillator and signal frequency circuits are separately tuned. I.F. transformers having a frequency of 465 k/cs are now available and are very suitable for use in short-wave receivers. It is usually desirable to use the converter in conjunction with a broadcast receiver of the straight type having one or more S.G. H.F. stages, however, but, fortunately, it is a very easy matter to tune the H.F. stages to 465 k/cs, the easiest method being the addition of a .0003 mfd. pre-set condenser across each of the tuning condensers. If these condensers are set at approximately half-way setting the H.F. circuits will be tuned to the required 465 k/cs, provided that the wave switch is in the medium-wave position.

### Reducing the H.T. Consumption

THE small type of H.T. battery sold at between 6s. and 10s. is very commonly used nowadays, but most constructors seem to overlook the fact that these batteries will only satisfactorily supply a steady current of up to approximately 10 m.A. Constructors who already own super-power and power pentode valves need not be discouraged, however, as the current consumption of these valves can very easily be reduced to a sufficiently low value by increasing their bias voltage. The normal power pentode requires a bias of approximately 9 volts, and consumes a current of approximately 15 m.A. By increasing the bias to 12 volts, however, the consumption is reduced to approximately 7 m.A.

### Ambitious Hopes

THE work of Nikola Tesla, especially in the realm of power transmission, is well known, and he has now sprung into prominence again as a result of sweeping claims for his new methods of radiating energy to a distance in the form of a thin stream. Among the many manifestations of Tesla's proposals is the fact that he states undreamed of results will be possible with television, for there will be no limit to the size of the picture, intensity of illumination, or distance over which the pictures are radiated. Coming from a man of Tesla's standing such ambitious claims merit attention, but until the principles involved have been demonstrated outside the laboratory we must be content to use established methods in the work now being undertaken.

### A New G.P.O. Post

I WONDER if there is any television significance attached to the creation of a new executive post at the G.P.O. It has been called Director of Telecommunications, being a new department which is merging both the telegraph and telephone services. Particular interest attaches to the man appointed, for he is Mr. F. W. Phillips, one of the members of the original P.M.G.'s television committee which reported in January, while he is also included in the new television advisory committee, which came into being for a period of five years as a result of the report.

### Pioneer Work and Upper Norwood

IN view of the claims of Upper Norwood to be associated with the early developments of high-definition television because of the Baird Company's laboratories and studios at the Crystal Palace, it is interesting to recall its relation with another pioneering effort. This was the first Edison "phonographs" which were heard in this country. Col. Gourard was Edison's agent in this country, and people calling at his house in Beulah Hill some forty years ago heard the faint reproductions from wax cylinder records by plugging their ears with rubber tubes attached to the instrument.

### "Gramovision"

ONCE more that vexed question of "bottled" television records has cropped up as a result of the information that a London firm is making them for initial distribution to radio dealers for demonstration to the public. These records—when the principles were first established by Baird in 1928 they were called phonovision records, but this has now been changed to gramovision—have a double track for sound and vision and are played with a special electrical pick-up which passes the signals to the vision and sound reproducers respectively. It is understood that these first records are made from the thirty-line television programmes provided by the B.B.C., and if they do prove satisfactory experimenters will welcome them as a means for providing test signals at any time of the day, instead of reliance being placed on the two television transmission periods now available each week.

# A PAGE OF PRACTICAL HINTS

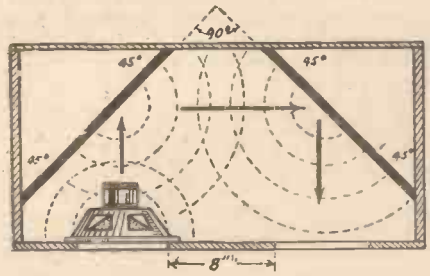
SUBMIT YOUR IDEA

# READERS WRINKLES

THE HALF-GUINEA PAGE

## Single-unit Stereophonic Speaker

ALTHOUGH the increase in realism of reproduction which is obtained by the use of two speakers mounted side by side (owing to the stereophonic effect) is well

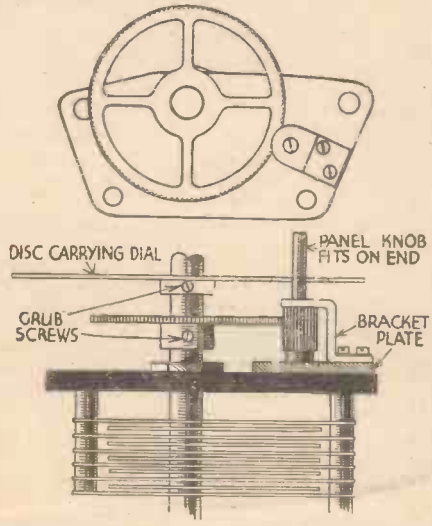



*An idea for a single-unit stereophonic loud-speaker.*

known, not everyone is able to go to the expense of buying two loud-speaker units. The accompanying diagram shows a cabinet in which use is made of the sound waves from the back of the single unit used. At first it would appear that this method would lead to loss of the bass frequencies, but provided the two apertures in the cabinet are at least 8in. apart, this loss is not appreciable. Various materials can be used for the reflectors. The best results were obtained by using pieces of polished marble, 1in. in thickness, but plate glass, ebonite, or even hardwood can be employed. There are various ways of mounting the reflectors, but they must be rigidly fixed, and the angle between them must be 90 degrees.—E. W. FORSTER (Folworth).

## A Simple Slow-motion Drive

THE slow-motion drive, shown in the accompanying sketch, was made with two gear wheels taken from an old gramophone motor. I selected a spindle with an




*A slow-motion drive made with old gramophone motor gear wheels.*

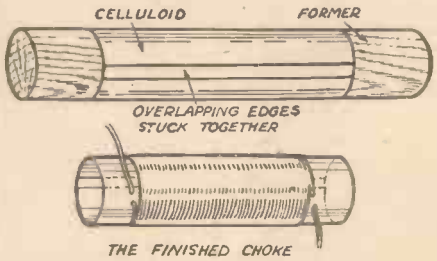
### *THAT DODGE OF YOURS!*

**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., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.**

arbor, and a gear wheel with teeth of the same pitch, and found it was an easy job to take the large brass wheel off the spindle. To this wheel I sweated a piece of brass rod in the centre, then drilled both to clear the condenser spindle. The plate for the lower bearing of the arbor spindle I made from ⅛in. brass sheet, and drilled it to clear the spindle end. The bracket is made from 1/16in. sheet brass, and drilled to clear the opposite end of the arbor spindle. The plate and bracket are fixed to the condenser support by two small screws. The opposite end of the spindle was filed down to suit a knob I had on hand. The scale disc I made from 1/32in. sheet brass and this is cut to a conventional shape.—G. A. BRYDON (Pelaw-on-Tyne).

## A Neat Former for Chokes

A CHEAP and efficient former suitable for short-wave chokes can be made by obtaining an old photographic negative, which is then soaked in water and the

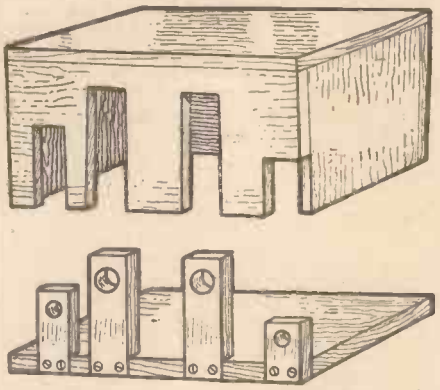



*A neat method of making formers for chokes or other small coils.*

emulsion removed with a stiff brush. It is then possible to use the clear celluloid which is left by wrapping it around a wooden former, as shown in the sketch, and sticking its overlapping edges by means of a little amyl-acetate. After winding the choke with silk-covered wire, the windings are stuck to the former by giving them a coat or two of amyl-acetate and allowing it to dry. The wooden former is then removed, and the finished choke can be suspended directly in the wiring of the set by its ends. No dimensions are given as these are left to the user's discretion. It is possible to make a large number of chokes in this way, the only cost being the wire and cement for the celluloid.—W. HARVEY (Leicester).

## Handy Experimental Assembly

THE skeleton panel and baseboard arrangement shown in the accompanying sketch may appeal to those who like trying out new circuits and com-



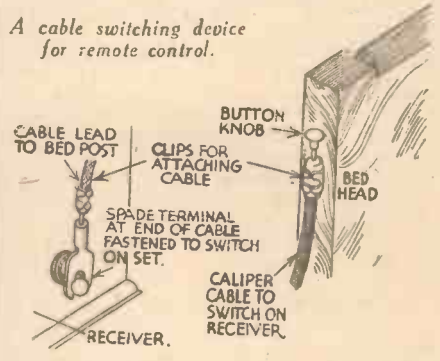
*A handy skeleton panel and baseboard arrangement for the experimenter.*

ponents. When possible finality in the number of ebonite supports has been reached, a cover, of sewing-machine shape, may be made to keep out the dust—and prevent damage—and the set will then be presentable for daytime use by the family. If portability is desired it is a simple matter to fit fastening clips and carrying handles. —D. M. STEWART (Stranraer).

## A Cable-operated Switch

NOT wishing to interfere with the wiring of my set, or to run any live wires other than the speaker wires into my bedroom, I thought of trying out the flexible cable idea, shown in the accompanying sketch. It works satisfactorily, and is easy to fix or to remove when necessary; also, the fixing screws being so small do not cause any damage to the set or furniture. It has worked very well every night for about six months without

*A cable switching device for remote control.*




fail, and costs next to nothing. The dodge is a boon to anyone wanting a simple remote control for a receiver, and not wanting to interfere with the wiring of their sets, and not wishing to run live wires about the house.—A. E. BALL (Morden).

# TELEVISION FOR ALL

## RECEIVING U.S.W. SIGNALS

By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

THE complete absence of any form of ultra-short-wave television service (although we may console ourselves with the knowledge that one is due to start in the late autumn of this year for the London district), makes it difficult for anyone to conduct really serious experimental work in that region. That is to say, although one may design and build a set which is capable of conforming to the rigid requirements imposed by high-definition television signals, it cannot be tested to prove its efficiency or otherwise.

### Gaining Experience

On the other hand, since it is known that the sound which is to accompany this television service is also to be radiated on ultra-short waves (the Germans at the present moment use 6.7 metres for vision and 6.985 metres for sound), the reader can at least accustom himself to work in this region, and thus be in a better state of preparedness when the dual service starts. Quite a number of amateurs can be heard on the ultra shorts, and the short-wave section of this journal has from time to time dealt quite fully with the question.

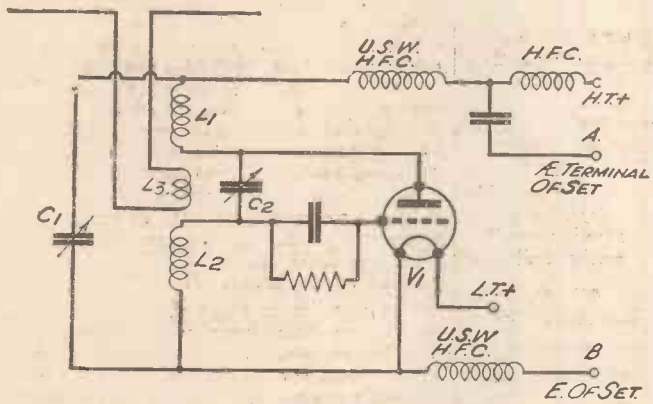



*Fig. 1.—The circuit for a suitable ultra-short-wave converter.*

The importance attached to the work, however, at least merits a slight measure of overlap, although it must be made clear straight away that a set which is capable of receiving sound signals on the ultra shorts, and reproducing them with clarity in the 'phones or loud-speaker, is in no way suitable for handling the vision signals. Adapters or converters can make the home broadcast set into one which will tune in these ultra-short-wave signals, but for vision's frequency sideband that same set acts as an excellent barrier, and would produce a useless output for passing on to the picture-reproducing apparatus.

### A Satisfactory Unit

Nevertheless, some interesting work can be undertaken with apparatus of this nature, and quite a wide range of circuits is open to individual choice. As a case in point, reference can be made to Fig. 1, which shows a very satisfactory scheme for a converter to use in conjunction with an efficient radio set. It is as well to mention here that some confusion exists as to the functioning of either adapters or converters. The first named is a unit which has a plug for inserting into the detector valve-holder stage, the valve normally used in this stage being employed in the unit. The tuning system of the original set is thus ignored (and the H.F. stages, if any are included in the receiver), and the signals from the ultra-short or short-wave adapter unit are amplified by the low-frequency side of the set.

With a converter, however, a frequency change takes place, for the unit converts the set to work on a super-heterodyne principle. One of the requirements for using a converter is that the set should contain one or more efficient high-frequency stages. The unit then works as a combined oscillator and first detector, while the H.F. stages become the intermediate-frequency stages with the set's own detector working as a second detector.

### Acting as a Converter

The theoretical circuit featured in Fig. 1 functions in this manner. The coils $L_1$ and $L_2$ are separate, being wound on a ⅜in. outside diameter paxolin former. The number of turns required for each will vary according to the wavelength it is desired to receive, but as a guide it may be stated that seven turns of No. 18 gauge wire having a spacing between turns equal to the wire diameter is suitable for a wave of 8 metres. This can be altered to five turns for 6 metres, and four turns for 5 metres. Both coils can be identical, although in some cases it may be found desirable to reduce slightly the turns of the anode coil $L_1$ for efficient and stable oscillation. The degree of magnetic coupling between the coils can best be determined on site, and in consequence either $L_1$ or $L_2$ should be capable of sliding gently along the former to locate the optimum position, after which it can be fixed in place.

These coils are tuned across their extremities with a high-grade short-wave condenser $C_1$ of .0002 mfd. maximum capacity. Condenser $C_2$ (.00005 mfd. capacity) is in effect a reaction condenser controlling the measure of energy feedback to maintain the condition of sustained oscillation which, as pointed out before, is essential for the converter's action as a combined detector and oscillator. Two ultra-short-wave H.F. chokes are inserted in the positive and negative H.T. leads respectively, suitable types for this purpose being the Eddystone 947, while in the positive high-tension feed is also included a standard broadcast form of high-frequency choke of the fieldless type, to prevent feedback from the converted I.F. stages of the set itself.

### A Dipole System

The H.T. lead joins to the set's earth terminal, while the aerial terminal of the set connects to the junction of the two H.F. chokes *via* a fixed (or semi-variable) condenser of about .00005 mfd. capacity. Either a separate H.T. and L.T. source can be used, or, if preferred, a tapping can be made to the set's own battery supplies. Furthermore, if the set happens to include a pre-set condenser in the aerial lead, this should be screwed to its maximum value or, better still, short circuited.

When receiving the ultra-short waves, it is much better to use an actual aerial designed for this purpose. This is shown in Fig. 1, and consists of a straight length of wire mounted (for the best results) vertically in the highest possible position on the roof of the house in which reception is being undertaken. It is really a dipole, being of total length just half the wavelength of the transmission it is desired to receive. Thick stiff copper wire is quite satisfactory, and at the centre is a definite break giving a gap of 2 to 2½ins. To these wire extremities is joined the aerial feeder, a length

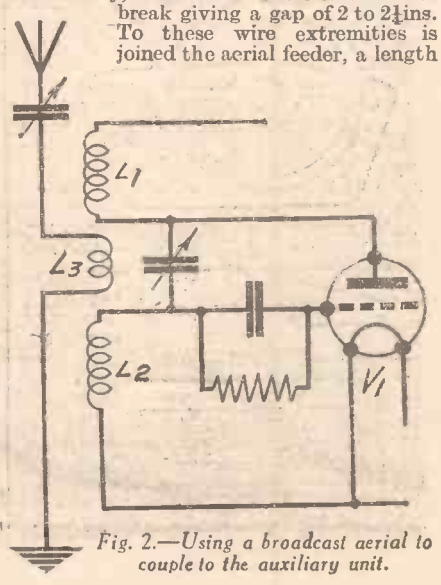



*Fig. 2.—Using a broadcast aerial to couple to the auxiliary unit.*

of twisted flex kept well insulated from the house wall, and led into the unit to be joined to the ends of the coil $L_3$. This is a two-turn coil wound close to $L_2$ on the earth end of the same former-used for $L_1$ and $L_2$. The exact degree of coupling between $L_3$ and $L_2$ can be determined experimentally for efficient working.

## Operation

If it is inconvenient to use an ultra-short-wave dipole of this character, then the ordinary broadcast receiver aerial can be employed. This is as shown in Fig. 2, where coils $L_1$, $L_2$, $L_3$ are as before and a .00005 mfd. maximum capacity variable condenser is inserted in the aerial feed to $L_3$. A valve which oscillates readily should be used in the unit, such as the L210, 210LF, or PM1LF, and in laying out the components be sure that all leads are kept as short as possible. Where it can be arranged, mount the coils directly by the side of the tuning condenser, and certainly restrict the grid leads to a short path.

With the valve oscillating freely, tune the unit carefully and slowly, having the broadcast set tuned to a long wavelength if possible. The scheme is simple and effective, and will certainly give a measure of practice in searching and handling ultra-short-wave components in readiness for future application. If desired, the unit can be disconnected from the broadcast set and a pair of 'phones joined across points A and B (Fig. 1), the converter then being used as a single valve set.

## Another Auxiliary Unit

Yet another form of auxiliary unit suggested on the Continent is shown in Fig. 3. The tuning system $L_1$ $C_1$ follows standard practice, the coil turns of $L_1$ depending on the coil diameter and the wavelength it is desired to tune. Reaction (when desired) is effected by including a small differential condenser $C_2$ in the position shown. In the anode circuit of $V_1$ is an ultra-short-wave H.F. choke and a load resistance of about 20,000 ohms. The "coupling circuit" consists of a fixed condenser of .01 mfd. capacity, and a fixed resistance of 100,000 ohms value. The terminals AB can then be joined to the tuning circuit of the ordinary set's detector stage by means of a vario-coupled coil, or to the H.F. amplifier, or to R.C. coupled L.F. stages.

## Experimental Details

In addition to experimental ultra-short wave radiations, which have been conducted in this country, a large number of tests have been made in America with special reference to their application to television signals. As far as can be ascertained it is proposed to transmit the vision and sound signals from two separate and distinct ultra-short-wave radio transmitters working on different wavelengths when the first London service is started. On the other hand, experiment has shown that one single communication channel can be used, this consisting of the vision carrier and its own modulation signal, together with an accompanying sound carrier and signal modulation. The

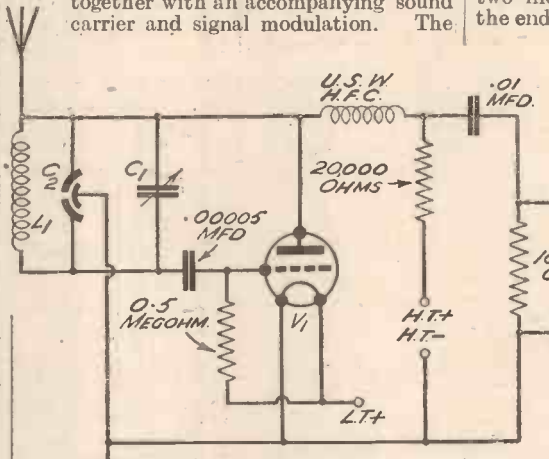



*Fig. 3.—Another suggestion for an auxiliary U.S.W. unit.*

radio receiver used for this work then had a solitary band-pass tuning system for receiving and accommodating the complete channel (that is, both carriers and their own sidebands). Then a heterodyne oscillator beat with the two carriers to produce two intermediate frequencies, separated by a predetermined frequency which was the frequency separation of the sound and vision carriers. From here the separated signals passed through distinct sections of the radio set, the output in one case feeding the loud-speaker, and in the second the picture-reproducing device.

## Aerials

The aerial system used for receiving an ultra-short-wave system of this nature varied according to the nature of the district and the degree of "screening" experienced from the transmitting aerial. In many locations the aerial could be fixed inside the house (its exact interior position was a matter of experiment on site), and consisted of a vertical rod almost half a wavelength long (dipole). The feeder lines from this could be twisted flex, as previously mentioned, or two wires spaced about 2in. apart throughout their whole length. Short spreaders maintained this separation, being placed at convenient intervals. Another type of receiving array is the Zepp aerial, which consists of two rigid and parallel feeders separated by approximately two inches. One of these terminates at the end of a vertical dipole, while the other is left free. Any tendency for the feeder to radiate is neutralised by the double wire. In some cases the dual feeder consists of two concentric metal tubes, the inner one joining to the base of the dipole, while the outer is an effective neutraliser.

## Ample Scope

On the question of receiving ultra-short-wave transmissions, it would appear that the suitability of different types of aerial arrays is going to provide a very fruitful source of experiment to the interested home constructor. It is known that directive aerial arrays can be built, and the improvement in signal strength and increase in range of reception derived from this have proved of marked advantage. In some cases the assembly of spreaders, aerials, and reflectors becomes a trifle cumbersome and requires a large flat roof or open space for erection, but reasonably compact modifications of these, although, of course, not so effective as their properly designed counterparts, will repay amply the time and work spent in building and erection. This only serves to confirm the statements which have of late been so often reiterated in the columns of PRACTICAL AND AMATEUR WIRELESS—namely, that the development of high-definition television services is going to provide the home constructor with an entirely new and profitable interest, as well as an outlet for his ingenuity and capabilities.

# TELEVISION NEWS

## Television in France

THAT the French people are alive to the value of high-definition television transmissions on the ultra-short waves is borne out by the fact that work has now started on the installation of a television broadcasting station at the Ministry of Posts and Telegraphs in Paris. This station will be State-owned, and will work on a wavelength of 7 metres, but as yet no details are furnished concerning the proposed inauguration of any service or which particular system of television is to be employed.

## A Stereoscopic Screen

TO be able to obtain the effect of true relief in any picture without the use of any optical viewing apparatus has long been the cherished wish of many inventors. That this may materialise shortly is borne out by the information that Imperial Chemical Industries are preparing a cinematograph screen for some inventors who are controlled by a French syndicate. It appears that a celluloid structure with a prepared surface is used, and this really gives the effect of a special viewing screen. While this will have an important bearing on cinema-picture presentation, it should also be possible to use it for showing television pictures. If the invention is adaptable to this work, it will do much to popularise the new television service which is to provide pictures of great detail in the home.

## The Jubilee or Derby?

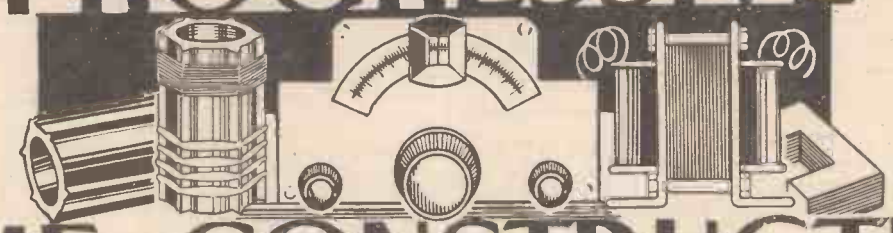
WHILE still a matter for conjecture, it is not too much to hope that one or more of the television firms engaged in development work will make it their business to transmit by television scenes either from the Jubilee celebrations or the well-known Derby race. If this is done it will help very materially to draw the attention of a waiting public to the form of service which will be offered to them. Either the electronic camera or a portable intermediate film equipment could be employed for the purpose, and although the range over which signals could be received would, no doubt, be limited to Greater London, the resultant publicity should establish television on an even firmer footing than at present.

## Seeking the Heights

A PROVINCIAL paper was dealing recently with the question of the work being undertaken by the Television Advisory Sub-committee in seeking a suitable site for establishing the new television transmitter. Pointing out that the engineers had worked from "hills and housetops," they hinted that these engineers were desirous of carrying their researches much farther, and in consequence proposed employing an autogiro. While realising that the sub-committee are a live and energetic body, we, as yet, have found no authority for accepting such a statement, and frankly fail to see how a machine of this character would help matters.

Previous articles in this series were published in the issues for Jan. 26th, Feb. 2nd, Feb. 9th, Feb. 16th, Mar. 2nd, Mar. 9th, Mar. 16th, Mar. 23rd, and April 6th.

# PROGRESSIVE HOME CONSTRUCTION



The subjects already dealt with include Home-made Components, Making an L.F. Transformer, a Single-valver, an H.T. Battery Eliminator, H.T. Rectifier, an H.F. Amplifier, Converting a Battery Set, and a Class B Amplifier.

**The Experimenters This Week Tell You How to Make Different Types of Low Tension Trickle Chargers, Using Home-made Components**

*by The Experimenters*

AS we have now described the construction of a fair variety of receiver units, of an H.T. eliminator, and also of the mains equipment necessary to convert a battery receiver for A.C. operation, we propose to accede to the request of a large number of our readers by giving constructional details for trickle chargers of various types. In conjunction with an H.T. battery eliminator, a trickle charger provides the simplest means of operating a battery set from the mains supply. In addition, the conversion is less costly than that involving the use of special A.C. valves, because it makes possible the use of exactly the same components as before. Yet another advantage is present when the mains supply is D.C., because the modification of a battery set to run from this supply is not always easy.

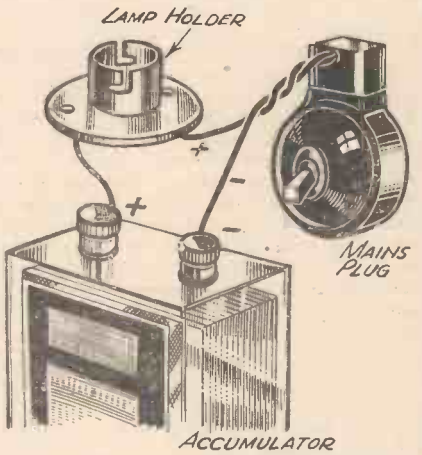



*Fig. 1.—Showing the simple arrangement of a trickle charger for use on D.C. mains.*

The trickle charger can be made up either as a unit entirely on its own, or as a part of the H.T. supply unit. In this article, however, we will consider the L.T. portion as being separate from the rest of the power supply, although readers will readily understand how it can be incorporated.

## For D.C. Mains

The very simplest form of trickle charger is that for use on a D.C. supply, since this does not necessarily involve the use of any wireless components at all, but only of an electric lamp, lamp-holder, and a length of flex. The arrangement is shown in Fig. 1, where it will be seen that the electric lamp is wired in series with one lead to the accumulator from the supply socket. The purpose of the lamp is to limit the current passing through the accumulator to the correct figure for charging purposes. Thus, by changing the lamp for others of different wattage rating the charging current can be varied as desired. This is a point which is frequently misunderstood, and readers often write to ask how the lamp can possibly be suitable since a voltage approximately equal to that of the mains supply must be applied to its terminals, and thus the same voltage must be applied to the accumulator. This reasoning is not sound, for the voltage actually applied to the lamp or to the accumulator is dependent upon the resistance of the component concerned. (If you cannot appreciate this, apply Ohm's Law, which has been given often enough in these pages.)

## Varying the Charging Current

We have said that the charging current depends upon the wattage of the lamp, so we must now explain further. The wattage is the product of the applied voltage and the current in amps, so that if the voltage is, say, 240, a 60-watt lamp will pass .25 amp. (60 divided by 240). In the same way, a 40-watt lamp will pass .16 amp., or a 100-watt lamp about .4 amp. The same method of working can be applied to other supply voltages and other lamp ratings.

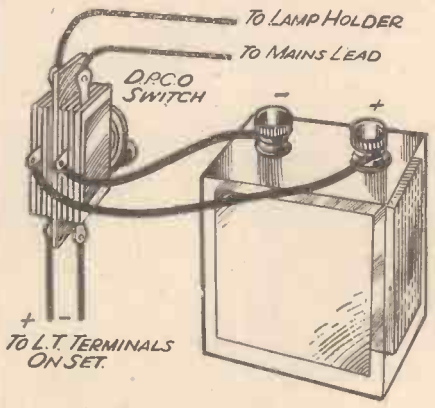



*Fig. 2.—The switching system for transferring the accumulator leads from the set to the charger when the former is out of use.*

Generally speaking, a charging rate of between .25 and .5 amp. will be suitable, and a 60- or 100-watt lamp can thus be used. There is only one point to watch in connection with this simple form of charging from D.C., which is that the polarity of the supply to the accumulator must be correct and as shown in Fig. 1. There are different methods of finding the polarity, but the simplest of all is to dip the two leads to be connected to the accumulator terminals into a glass of salty water. Keep the leads well apart, grip the insulated flex with a strip of rubber or other good insulating material and observe the bubbles given off from the ends of the wires; the wire from which the greater number of bubbles is liberated is the *negative*. After finding this, clearly mark the leads by binding coloured string round them, or by fitting coloured spades. Also mark the mains plug connector so as to ensure that it is always replaced in the socket with the pins the same way round.

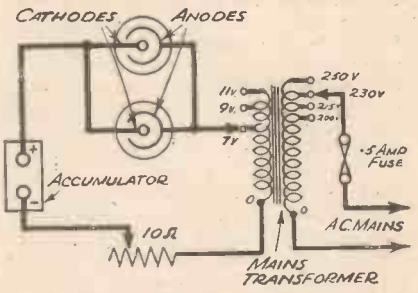



*Fig. 3.—The circuit for the A.C. charger described, and which uses two chemical rectifiers wired in parallel.*

## Switching from Charger to Set

It will be convenient to provide a simple switching arrangement so that when the L.T. supply to the set is cut off the accumulator is automatically put on charge. This can most easily be done by connecting a double-pole-double-throw Q.M.B. switch as shown in Fig. 2. The time of charging should be such that slightly more power is put into the accumulator by the mains than is taken out by the set. Thus, if the L.T. consumption of the set is .4 amp. and the

(Continued on page 182)

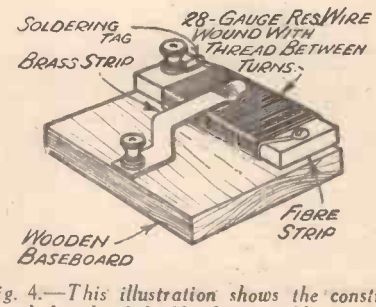



*Fig. 4.—This illustration shows the constructional details of the 10 ohm variable resistance described.*

(Continued from previous page)

charging rate .25 amp., the accumulator should be charged for about two hours for every hour the set is in use. By careful choice of the lamp wattage, however, it will be possible to leave the accumulator on charge for the whole of the time that the set is out of use.

## An A.C. Trickle Charger

Charging from A.C. mains is an entirely different proposition, because it is necessary to reduce the supply voltage to a suitable figure, and also to rectify the current, so that D.C. is applied to the accumulator. In practical terms, this means that a transformer and a rectifier must be interposed between the mains and the accumulator. The transformer can be made in precisely the same manner as explained in connection with the H.T. transformer (PRACTICAL AND AMATEUR WIRELESS, dated March 9th), but using three dozen No. 4 stalloy stampings for the core, and allowing sixteen turns per volt for both primary and secondary windings. The primary may be wound with 38-gauge enamelled wire, and the L.T. secondary with 24-gauge d.c.c., assuming a charging current up to .5 amp. to be suitable.

The actual charging voltage required is 2.7 volts per 2-volt cell, but allowance must be made for the voltage drop across the rectifier. The latter, incidentally, can be done by using two of the cells as described for the H.T. section wired in parallel, as indicated in Fig. 3. The secondary should then be wound to supply 7 volts (112 turns) when a 2-volt accumulator is to be charged, 9 volts for a 4-volt accumulator, and 11 volts for a 6-volt accumulator. In nearly every case the lowest voltage will be used, but it is a good plan to wind the transformer for the highest, and to take tappings for the other two outputs. We are not going to give any further constructional details for the transformer, because these have all appeared in previous articles of this series.

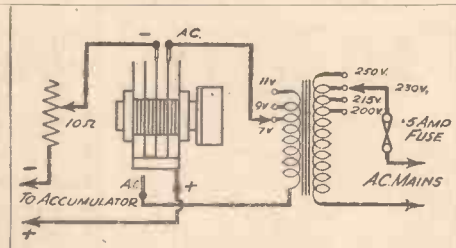



*Fig. 5.—The circuit required when using the Westinghouse L.T.2 rectifier.*

## Making the Variable Resistance

A variable resistance is shown in Fig. 3, and, although this is not strictly essential, it is very desirable, since it prevents fluctuation of the charging voltage and allows the current to be varied over fairly wide limits. The resistance is shown as being of 10 ohms, and it can be made by winding 2½ yards of bare 28-gauge Eureka wire on a strip of fibre, and making a springy brass strip to slide over it, as shown in Fig. 4. It will not normally be necessary to vary the resistance, and the slider can be set to its midway position, but it is well to check the current in the first place by inserting an ammeter between the resistance slider and the accumulator positive terminal. The resistance can then be varied until the charging current, determined as described above, is provided.

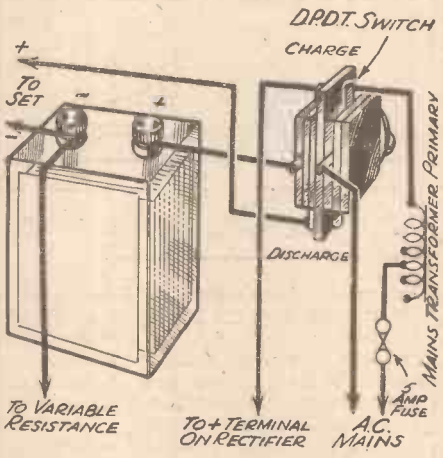



*Fig. 6.—The switching system required when using an A.C. trickle charger.*

There may be some readers who would prefer to use a ready-made metal rectifier, and the Westinghouse style L.T. 2 is ideal when a maximum charging current of .5 amp. is required. This type of rectifier is, of course, more reliable, more convenient, and less cumbersome than the chemical rectifier, and is of the full-wave type. It can be used with the transformer and resistance described above, and the connections are as shown diagrammatically in Fig. 5.

## Switching with the A.C. Unit

The method of switching the accumulator from "charge" to "discharge" is somewhat different from that suggested in connection with the D.C. unit, but a reliable (and it must be of good make) Q.M.B. switch can be used by following the connections indicated in Fig. 6.

It is possible to modify the mains transformer used for H.T. supply so that it includes an L.T. winding to feed the rectifier, but this is not quite so satisfactory from the constructors' point of view. Should any readers care to adopt the idea, however, it will only be necessary to wind the L.T. secondary winding over the other windings on the spool—placing a layer of oiled silk or insulating tape between the windings—and to connect this to the rectifier. The number of turns will be according to the voltage required and the turns per volt allowed on the original transformer. When this system is followed the method of switching the accumulator will be the same as that shown in Fig. 2, except that the two upper terminals on the switch will go to the variable resistance and rectifier, instead of to the negative mains lead and the lamp. It will also be necessary to include an additional on-off switch in the H.T. circuit.

# The New "Ekco" Universal Receiver

THE new "Ekco" model AD36 receiver is of the universal type for use with either A.C. or D.C. mains supply. There are four valves, including the rectifier, the circuit comprising a pentode H.F. amplifier, a triode detector, and a pentode output valve. A notable feature is the employment of a special compensating circuit to ensure constant sensitivity on all wavelengths. The receiver is housed in an unconventional, circular moulded cabinet, 14in. in diameter and 6½in. deep. In the standard finish of figured walnut the price is £8 8s., there being an extra charge of 10s. 6d. for a striking black and chromium finish. Cabinets in onyx green and pearl ivory are available to special order at £10 10s. Sensitivity and selectivity controls are disposed on each side of the station selector, while the wavechange and mains switches are conveniently placed on the left-hand side of the cabinet. The station-scale is readily detachable for replacement should the occasion at any time arise.

## The Circuit

Aerial input is by way of an aerial-series condenser acting as a capacity-volume control, and a special tuned-choke coil to a single-tuned circuit preceding the pentode H.F. amplifier. The tuned-choke coil forms part of the compensating circuit used to obtain constant selectivity throughout both wavebands. Between the H.F. amplifier and the triode detector there is a choke-capacity tuned-grid coupling. The detector operates on the grid-leak condenser system with capacity-controlled reaction, and there is a resistance-capacity coupling to a high-slope output pentode capable of delivering an A.C. output of 2,500 milliwatts. On A.C. mains, H.T. current is supplied through a new half-wave rectifier which, on D.C. mains, operates as a resistance of low value. The heaters of the valves are connected in series together with a tapped ballast resistance across the mains supply. The loud-speaker is of the energised moving-coil type.

Model AD36 is provided with internal tappings for immediate adjustment to operate on A.C. or D.C. mains of any voltages between 200 and 250, where the periodicity of A.C. mains is 40 to 100 cycles.

We understand that the set will work on 95 per cent. of the mains of Great Britain regardless of any future change-over, in connection with the "Grid" system of electrification.

*The new "Ekco" Universal Receiver (Model AD 36) in its attractive moulded cabinet.*

# VALVE TYPES AND USES-8

## Diode Triodes and Diode Pentodes

THERE are four types of valve in the diode-L.F. amplifier class, and it is not always easy for the set builder to decide as to which is most suitable for his requirements. The types referred to are the double-diode-triode, the double-diode-variable-mu pentode, the double-diode output pentode, and the triple-diode triode. The first is best known, and is available in all makes for both A.C. and battery operation. Like the other valves in the category we are considering, it consists of two valves mounted together on one base and in a single glass envelope. One of the diodes may be used for detection, or second detection, the other being used to provide a variable negative voltage, as required for A.V.C. A typical valve of this kind is the Cossor D.D.T., which is shown in the circuit Fig. 1; the pin connections are indicated in Fig. 2, and technical details are given in a panel on this page. With regard to the latter, it will be seen that details are only given in respect of the L.F. portion of the valve, since the diode does not have grid-volts anode-current characteristic curves, as explained in a previous section of this series.

### Two Valves In One

The cathode is common to the diode and triode sections, but otherwise the two parts of the valve may be considered as being entirely separate and independent, for they act individually exactly as if there were two valves. The L.F.-amplifier portion of this valve, and of other double-diode triodes, is intended for first-stage use only, and the output is insufficient to operate a loud-speaker, and for this reason it must be followed by the usual output triode or pentode. This is, in fact, evident from the technical specification given, for it can be seen that the impedance is 17,000 ohms, and the amplification factor 41. The output from the valve is very similar to that which would be expected from a power-grid detector, and is therefore adequate for feeding the output stage.

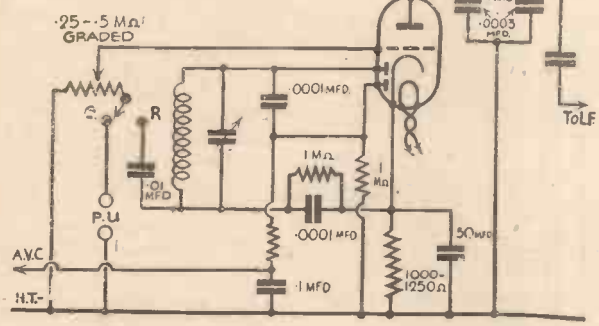



*Fig. 1.—This circuit shows the connections for a double-diode triode used as second detector, A.V.C., and first L.F. amplifier.*

### Detector-output Pentode

Somewhat in contrast to the D.D.T. is the Mazda A.C/2-Pen.D.D. This is a double-diode pentode having a seven-pin base, but in this case the pentode portion is suitable for feeding a loud-speaker direct. Apart from this, however, the valve is similar in principle to the Mazda AC/HL.DD, the Mullard T.D.D.4 (both double-diode triodes), and the Cossor D.D.T. mentioned above. It can also be used in a circuit similar to that reproduced in Fig. 1, with an additional H.T. circuit for the auxiliary grid of the pentode section.

**Cossor D.D.T. (Double-diode triode)**
*Technical Specification*

| | |
|---|---|
| Heater Voltage | 4 |
| Heater Current | 1 amp. |
| Maximum Anode Volts | 200 |
| Mutual Conductance (at 100 volts on anode and zero grid volts) | 2.4 m.a./volt. |
| Impedance | 17,000 ohms. |
| Amplification Factor | 41 |

**Mazda A.C.2/Pen.D.D. (Double-diode output pentode)**
*Technical Specification*

| | |
|---|---|
| Heater Voltage | 4 |
| Heater Current | 2 amps. |
| Maximum Anode Voltage | 250 |
| Maximum Screen Voltage | 250 |
| Mutual Conductance (at 100 volts on screen, zero grid volts) | 8 m.a./volt. |
| Optimum Load | 6,700 ohms. |

**Cossor D.D./Pen (Double-diode pentode)**
*Technical Specification*

| | |
|---|---|
| Heater Voltage | 4 |
| Heater Current | 1 amp. |
| Maximum Anode Voltage | 250 |
| Maximum Screen Voltage | 200 |
| Mutual Conductance (at 100 volts on anode, zero grid volts) | 2.7 m.a./volt) |

### For Corrected A.V.C.

Another double-diode pentode with the same pin connections, but designed for an entirely different purpose, is the Cossor D.D./Pen., a circuit for which is given in Fig. 3. This valve has double-diode and pentode sections, but the pentode is not designed to feed directly into the speaker. Instead, although of the L.F. type, it has variable-mu characteristics; in other words the degree of amplification which it gives can be varied by altering the bias voltage supplied to its grid. By using the circuit shown, what is known as corrected A.V.C. is obtained. This is best explained by saying that most normal methods of automatic volume control do not cause the reduction in amplification to be exactly proportional to the voltage of the signal being received. This means that the volume on all transmissions does not remain quite uniform, as it should, but varies within certain limits. But by arranging that the control shall be effective on both high-frequency and low-frequency portions of the receiver circuit the control is almost exactly linear. This system should not be confused with quiet A.V.C. with which an excessive bias is applied to the grid of the first L.F. valve when signal strength is below a definite pre-determined standard. In the latter case the bias voltage may be considered as acting in opposition to the controlling voltage, whereas in the corrected system the control voltage is applied similarly to both high- and low- frequency circuits.

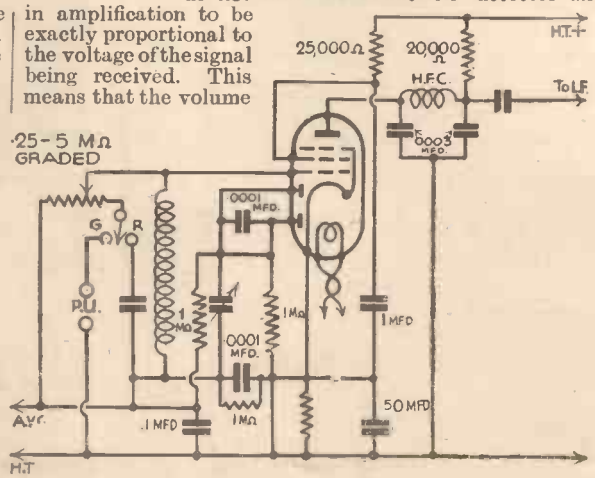



*Fig. 3.—A typical circuit for corrected A.V.C., using the Cossor double-diode pentode, type D.D./Pen.*

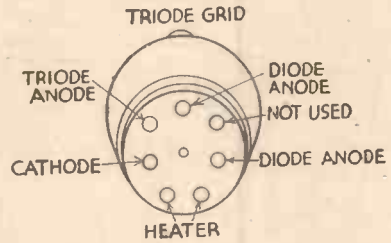



*Fig. 2.—The valve base connections for the double-diode triode.*

### A Triple-diode Pentode

The fourth type of diode-triode valve mentioned above—the triple-diode triode—was fully described in a complete article which appeared in PRACTICAL AND AMATEUR WIRELESS, dated March 2nd, 1935, under the title, "An Interesting Multi-purpose Valve," so there is no need to describe it in full here. It may simply be stated that the valve is similar to the double-diode triode, but has three diode anodes and is fitted to a nine-pin base. Of the three diode sections one may be used for normal detection (or second detection), the second for amplified A.V.C., and the third for noise suppression and to make aural tuning (as opposed to visual tuning, generally essential with receivers provided with A.V.C.) possible.

All of the valves dealt with in this article are intended primarily for use in the second detector and preliminary L.F. circuits of superhet receivers, but they can be used in "straight" circuits when there are at least two stages of high-frequency amplification. Generally speaking, however, it is better to apply the A.V.C. voltages to the intermediate-frequency amplifier, and also to the first detector (when a modern frequency-changing valve is employed).

Although not shown in the circuits, it will be understood that the A.V.C. feeds to the various variable-mu valves must be decoupled one from the other to avoid inter-action. This can be done by taking each feed through a 100,000-ohm fixed non-inductive resistance and connecting a .1-mfd. non-inductive condenser from the "grid" end of this to earth.

# THE HIGH-FREQUENCY AMPLIFIER: POINTS OF DESIGN

## In This Short Article the Author Makes Reference to a Few Details which Frequently Puzzle the Experimenter Who Designs His Own Set.

By FRANK PRESTON

DESPITE the large number of varied receiver designs published from time to time in PRACTICAL AND AMATEUR WIRELESS, there are hundreds of readers who prefer to evolve their own circuit designs, particularly in connection with experimental receivers. This is as it should be because, to the keen experimenter, much of the fascination of home construction is lost when rigidly following a published design. But the amateur who works out his own circuit is often confused by the variety of circuit arrangements which he sees in this journal; he is apt to try to modify one of them by adding some particular feature or another, and this often leads to unsatisfactory results. For this reason the experimenter is advised either to adhere strictly to a published circuit or carefully to work out his own circuit, and then to use this as a basis for experiment.

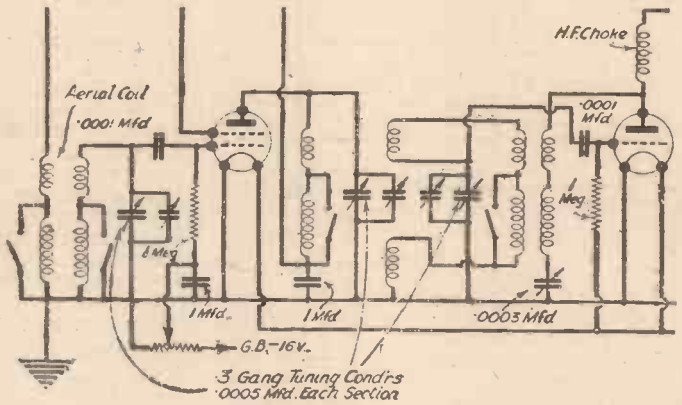



*Fig. 2.—In this diagram the band-pass tuning circuit is shown between the first two valves. The advantages of this arrangement are explained on this page.*

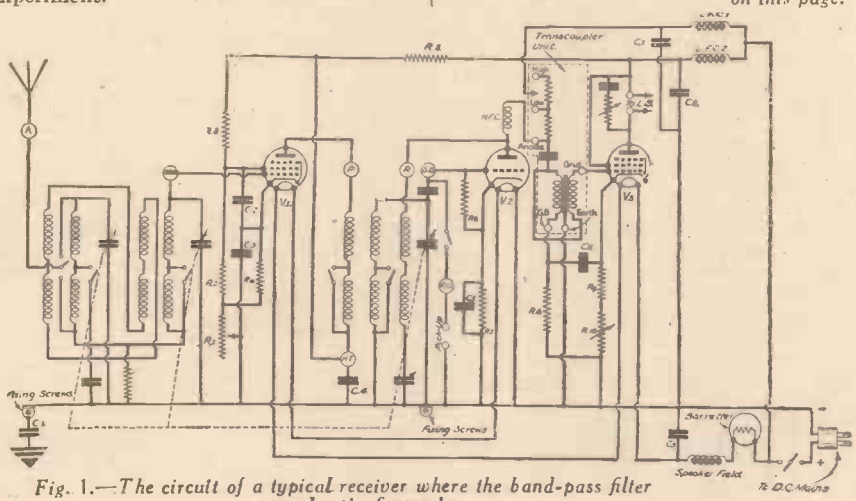



*Fig. 1.—The circuit of a typical receiver where the band-pass filter precedes the first valve.*

### When to Use a Band-Pass Filter

The detector and L.F. portions of the receiver rarely present any problems which are difficult of solution, but the high-frequency amplifier and pre-second-detector circuits of a superheterodyne are in a rather different category. One of the first problems in connection with a plain H.F. amplifier is whether or not a band-pass tuning circuit should be used and, if so, what position it should occupy in the circuit. The answer to this depends upon two things: the degree of selectivity and the quality of reception required. In the majority of instances the sharpness of tuning is of paramount importance and, given modern iron-core coils and high-efficiency valves, the necessary selectivity can frequently be obtained by single-circuit tuning arrangements when there are at least two tuned circuits. But when selectivity is obtained in this manner there is bound to be an appreciable amount of side-band cutting, with the consequence that quality of reproduction suffers. A certain amount of restoration of the high notes can be brought about by the use of tone-control transformers and similar devices, but this is not so satisfactory as using a preliminary circuit responsive to a wider band of frequencies. Thus, the band-pass circuit may be considered as being of most value as a means of ensuring the necessary degree of selectivity without losing anything in the way of quality.

When only a single H.F. stage is employed it is generally better to place the band-pass network before the first valve, as shown in Fig. 1, especially if the aerial is not a very long one and is not heavily damped. When the aerial is subject to damping, however, (due to its being low or near to buildings or trees), it is liable to spoil the correct matching of the band-pass circuit, with the result that reproduction may be impaired, rather than improved, at certain settings of the tuning condenser. In other words, the aerial-damping has a different effect on different wavelengths, and so throws the band-pass filter out of balance.

### Band-Pass Inter-Valve Coupling

In such cases there is much to be said for placing the filter between the first and second valves (as shown in Fig. 2) if reaction is not employed. The aerial circuit then remains rather flatly tuned, and the necessary degree of selectivity is obtained in the inter-valve circuit. This arrangement is particularly good when two H.F. stages are employed, since such a circuit is liable to introduce serious high-note cut-off when there is a sharply-tuned, undamped circuit between the two H.F. valves, and another similar circuit (probably with reaction) between the second H.F. stage and the detector. In that instance a pre-H.F. band-pass filter may be of very little real value, its effect being lost in subsequent circuits.

The general principles explained apply

(Continued overleaf)

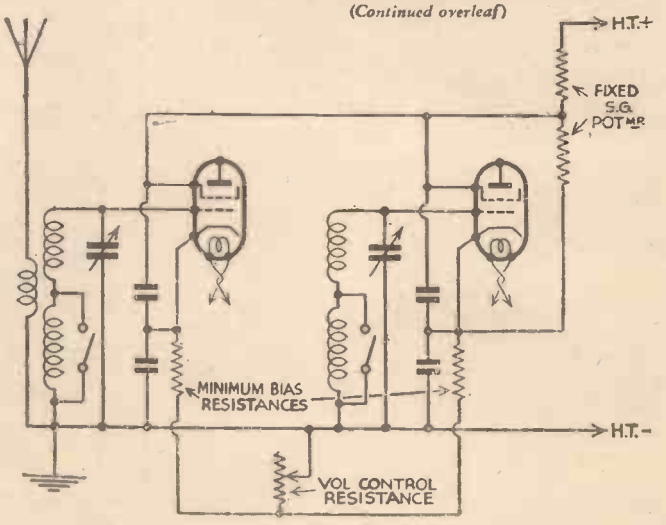



*Fig. 3.—A system of variable-mu volume control frequently used in 2 H.F. or superhet. mains receivers. It often proves inferior to the circuit arrangement shown in Fig. 4. Component values are not shown, since they depend entirely upon the particular valves employed.*

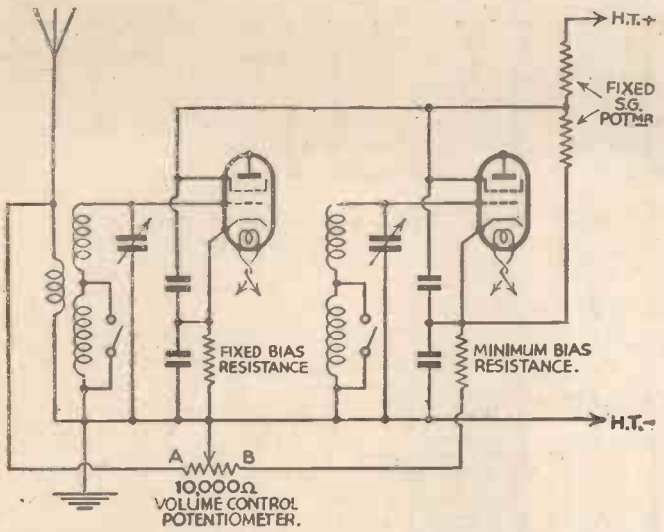



*Fig. 4.—Another system of volume control which has many important advantages.*

(*Continued from previous page*)

also to a superheterodyne circuit in which an H.F. stage precedes the first detector, which may, for present purposes, be considered as a second H.F. amplifier. It is, however, always desirable—if not essential—to use a band-pass filter prior to the first detector in a superhet., since it has a more important function to perform than that of increasing selectivity; it prevents long-wave interference and second-channel interference.

### Types of Filter

It is scarcely necessary to consider the relative merits of various forms of band-pass filter because all of those produced by the better-known coil manufacturers can be trusted to prove satisfactory in any type of circuit. With earlier coils it was usual to recommend the inductively-coupled filter for use in a superhet. and the capacity filter or mixed filter for "straight" circuits, but it was proved in the case of the £5 Superhet. Three that top-capacity coupling was just as efficient as inductive coupling. It is, however, wise to avoid bottom-capacity coupling, since the coupling condenser is liable to permit the "leakage" of long-wave signals which would cause interference. But bottom capacity is rarely used in complete tuning units now on the market, so that little consideration need be given to this point.

### Volume Control and Stability

The question of volume control is an important one where a two-H.F. amplifier is employed in an A.C. receiver, and not always so simple as may at first appear. Variable-mu valves are now used almost universally, and it would therefore seem that a circuit on the lines of that shown in Fig. 3 would prove entirely satisfactory. In practice, this is not always the case, for it is frequently found that the receiver becomes unstable at certain parts of the tuning scale and at particular positions of the variable bias resistance (volume control). The reason is largely bound up with the fixed potentiometer used to feed the two screening grids. The cathodes of the separate valves are decoupled, but the "earth" end of the potentiometer is connected to only one of them. The difficulty can often be overcome by using two separate fixed potentiometers—one for each valve—but the method illustrated in Fig. 4 frequently proves to be better. It will be seen in this case that the bias voltage applied to the first valve (through the cathode resistance) is fixed, a variable bias voltage being applied to the second only. The variable bias resistance is actually a potentiometer, a portion of which is in parallel with the aerial-tuning circuit. Thus, as the bias on the second valve is increased, by moving the slider towards the end marked A, the resistance in parallel with the tuning circuit is reduced in value, so that artificial damping is applied. The scheme is often found to be much superior to that normally employed and tends to give better quality. This is because the tuning of the first circuit is broadened slightly as that of the second is sharpened, due to the increased impedance of the second valve. A value of 10,000 ohms is assigned to the volume-control potentiometer, but it might often be found better to include a fixed resistance having a value between 5,000 and 10,000 ohms between the end of the potentiometer marked A and the aerial terminal.

### Applicable to Superhet.

It should be mentioned that precisely the same idea is applicable to a superhet. of the type not having a signal-frequency amplifier, in which case the first valve shown will be the first detector, and the second the I.F. amplifier. A tetrode is shown in the first stage, but this might be the detector portion of a frequency-changing valve, such as an octode or pentagrid. Additionally, the first valve may be of the variable-mu or fixed-bias type, for the arrangement functions equally well in both cases.

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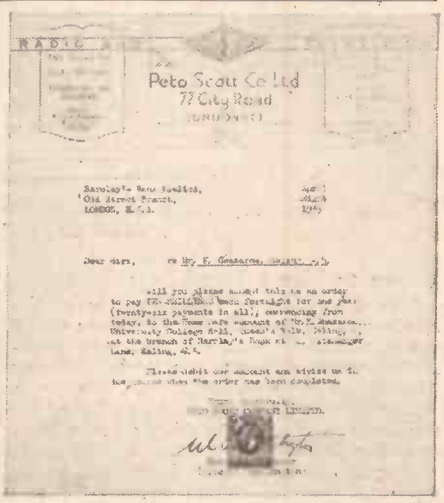
A PRACTICAL illustration of the fact that it pays to shop by post is illustrated below. This photograph shows the Editor of PRACTICAL AND AMATEUR WIRELESS handing to Mr. K. Ghazaros, of University College Hall, Queens Walk, Ealing, W., an order from Messrs. Peto-Scott, Ltd., on Barclays Bank, to pay Mr. Ghazaros the special and additional prize of 10/- a fortnight for one year, awarded to him as the second prize-winner in the AvoMinor Competition, details of which were published in this journal. As the second prize amounted to 10/- a week for a year (this being awarded by the makers of the AvoMinor in accordance with the rules of the competition), Mr. Ghazaros thus receives a total sum of £39. He hence has a tangible reward for his use of a remarkable little instrument, and for his patronage of Messrs. Peto-Scott, Ltd., the famous wireless firm, who are one of the pioneers of the constructor market. Mr. Ghazaros is a reader of this journal, and further to signalise this success, we have awarded him a free year's subscription to PRACTICAL AND AMATEUR WIRELESS.

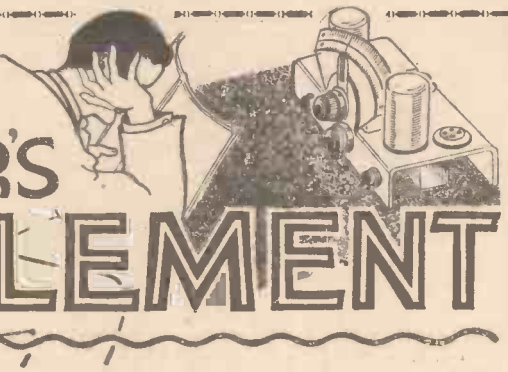
*The Editor of "Practical and Amateur Wireless" handing to Mr. K. Ghazaros (second prize-winner), the special prize of 10/- per fortnight for one year awarded by Messrs. Peto-Scott, Ltd., in the recent AvoMinor competition.*




*Messrs. Peto-Scott's order on Barclays Bank.*

Becoming an Amateur Transmitter

# BEGINNER'S SUPPLEMENT



**This Article Contains Useful Information Concerning the Necessary Licence and Post Office Regulations**

THERE are many who, while they may be seriously interested in amateur transmission, are needlessly deterred from becoming active transmitters themselves by reason of the fact that they do not know how to obtain a licence. There is also a widespread belief that amateur transmission involves a heavy expenditure and a considerable technical knowledge. There is also, of course, the morse difficulty.

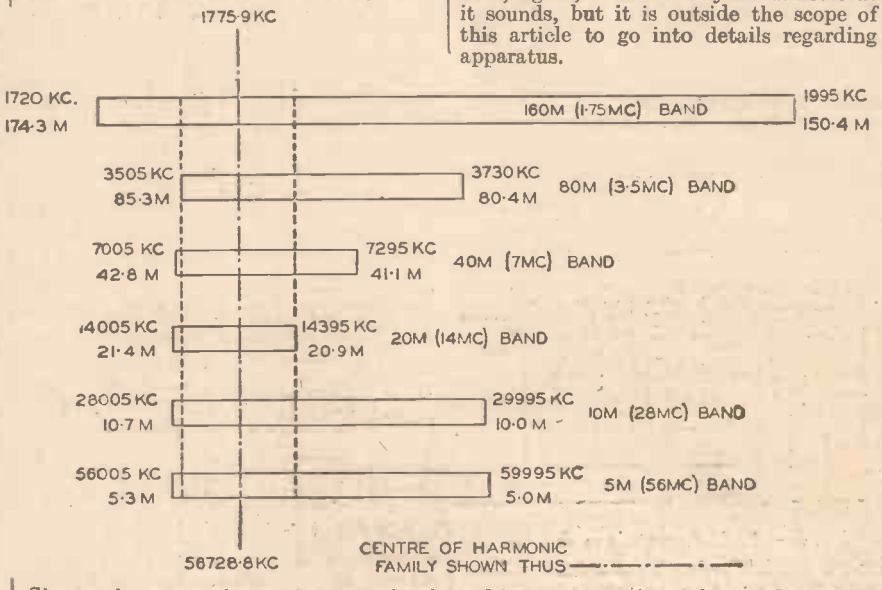
But all these deterrents can be gradually overcome in an interesting and instructive way by any short-wave enthusiast who is keen and who, having had normal experience of the construction of short-wave receiving apparatus, is able to build comparatively simple gear.

In the first place, transmitting licences are of two grades, the full radiating permit and the artificial aerial licence, and they are granted and issued to those applicants who are able to satisfy the Postmaster-General that, in wishing to undertake experimental work with transmitting apparatus, they have some definite object in view. This might be investigation into modulation systems, skip distance effects, behaviour of aerials, or any one of the many different problems in connection with which useful work can be done. Licences are not granted simply because the applicant wishes to transmit; an experimental programme must be indicated.

In the case of the full radiating permit, with which a two-letter call such as "G6FO" is issued, the only actual examination which has to be taken is in the morse code. To pass this, the candidate must be able to send and receive at a speed of not less than twelve words (sixty characters) a minute for five consecutive minutes, a small percentage of error being allowed. The test is usually taken at the nearest main Post Office after the P.M.G. is satisfied that the applicant is a fit person to have a licence.

## A Full Permit

The full permit allows the use of CW telegraphy and telephony, with a maximum input of ten watts to the valve feeding the aerial, on bands of frequencies in the neighbourhood of 160, 40, and 20 metres. The wave-bands open to amateurs are shown herewith, together with their frequency widths. It will be seen that they are approximately in harmonic relation and that there is one family of frequencies which are in true harmonic relation throughout the whole range. This diagram is necessarily based, for clearness, on the lowest frequency band, 1720-1995 kc/s, and while it shows the true wavelength relation, it should be noted that the *frequency widths* of the 160-, 40-, and 20-metre bands are approximately the same, but, in terms of frequency, the amateur 5-metre band is fourteen times as wide as any of these. The 80-, 10-, and 5-metre bands are normally "closed"; that is, permission to use them can only be obtained through the Radio Society of Great Britain, the British amateur transmitter's own organisation which represents him in these matters and is recognised by the Post Office as a competent body. In certain cases, however, the use of the 10- and 5-metre bands may be granted in an original licence, though normally it is necessary that the applicant should have held a transmitting licence for a reasonable time. The same stipulation applies to high-power licences, and permission to use more than ten watts is only given where special proficiency is shown and a recommendation obtained through the R.S.G.B., inputs up to 500 watts being sanctioned in steps of fifty watts at a time. Power greater than ten watts is never allowed on 160 metres under any circumstances, owing to its proximity to broadcasting and also because the band is shared with trawlers and other small coastal vessels.




*Showing frequency relation of amateur bands, and frequency-wavelength limits. Frequencies in harmonic relation are shown between outer dotted lines, the centre dotted line indicating the centre of harmonic family.*

## Closed-circuit Work

These requirements and conditions will appear a little difficult and bewildering to the beginner, who is probably not able in any case to take the morse test. But there is still the artificial aerial licence, with which a three-letter call-sign such as "2ABC" is issued, and for which no morse test is required. Transmission with an open (radiating) aerial is not allowed and the apparatus must only be used for closed circuit work (not for communication purposes) in such a way that signals cannot be picked up outside the premises on which the station is situated.

It is usually desirable that those taking up amateur transmission should gain some experience with the apparatus before they go on the air and, further, it allows of a transmitting station being built and equipped while this necessary knowledge is being acquired and the morse code learnt. In fact, many of the best known transmitters in the country started with their "A.A." licences, and it is a method of breaking into amateur work for which a great deal can be said. There is one other important point which must be mentioned, and that is in connection with frequency (wavelength) control and transmitter stability. The amateur bands are comparatively narrow, and the Post Office rightly demands that an amateur should be able to tune his transmitter into these bands and *keep it there*. This involves either crystal-control of the transmitter, or a calibrated heterodyne frequency-meter of some sort (there are various types) used in conjunction with a crystal resonator. This, again, is not nearly as difficult as it sounds, but it is outside the scope of this article to go into details regarding apparatus.

## Post Office Regulations

Once the licence is granted, the operator of the station is able to follow any line of work he pleases, so long as he keeps within the regulations and his allotted frequency bands. Stations are inspected officially once a year by the Post Office to ensure that the regulations are being observed. The two cardinal crimes are using more power than that for which one is licensed and transmitting on a frequency outside the amateur bands, either of which usually results in the licence being cancelled. The next consideration

(*Continued on page* 196)

# SHORT WAVE SECTION

## AT THE SHORT-WAVER'S BENCH—2

In This Article Several Further Useful Ideas for the Experimenter are Discussed

### A "Booster" Unit

MOST short-wave sets either have no L.F. stage or else a single stage generally transformer coupled. As a result, a little extra "punch" is often found desirable in order to receive a signal on the loud-speaker. The simple unit shown in Fig. 1 has been found very useful for connecting to a set in such circumstances. It takes up little more space than a valve-holder, and consists simply of a stage of resistance-capacity coupling with a power valve for loud-speaker working. It can be made up, as shown, on a small base-board, or, in a better manner, built inside the cabinet of the loud-speaker. Resistance coupling should be used, for compactness and stability, and to minimise the back-ground noises caused by excessive L.F. amplification.

### Short-wave Detectors

The triode is not, of course, the only, nor often the most satisfactory, form of short-wave detector, and surprisingly in-

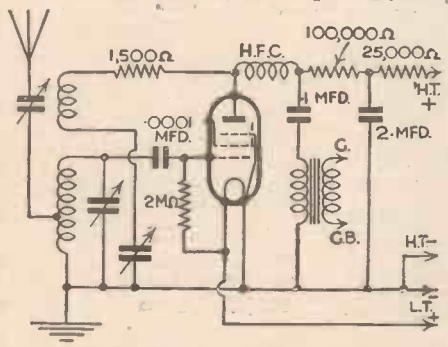



*Fig. 2.—An H.F. pentode as detector.*

creased efficiency can be obtained with a screen-grid or H.F. pentode detector. The latter valve has, in particular, become very popular with short-wave enthusiasts, especially across the Atlantic. In this country it is generally recommended as a sensitive good-quality anode bend detector. As a grid-leak detector, however, the H.F. pentode is tremendously sensitive and gives a very large output. In order to get the utmost amplification it is necessary that the valve be followed by resistance capacity, or resistance-fed transformer coupling, using a high value of resistance in the anode circuit. In the circuit shown in Fig. 2, the 1,500-ohms resistance in

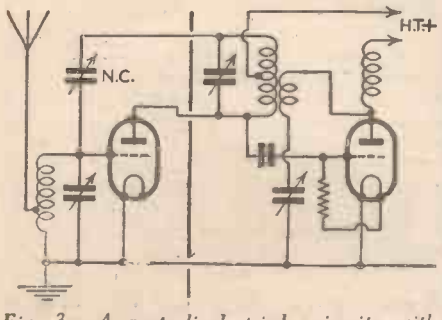



*Fig. 3.—A neutralised triode circuit, with centre-tapped tuned anode.*

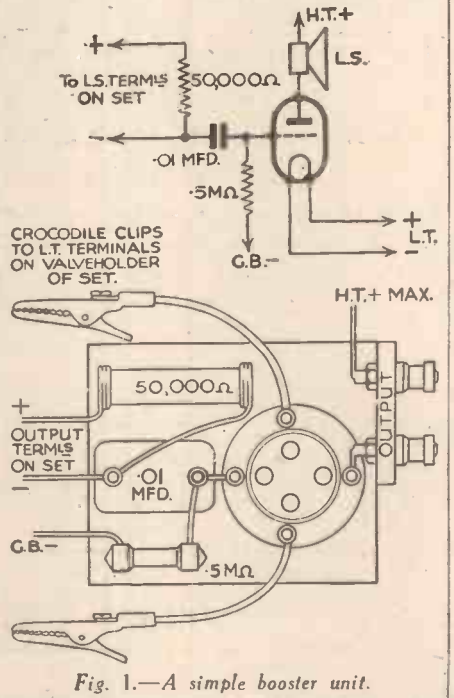



*Fig. 1.—A simple booster unit.*

series with the reaction winding must be given special mention. The value of this is not critical, but a resistance is imperative in this position to prevent spurious oscillation and to give smooth reaction control.

### "Neutralizing" the Screen-grid Valve

Older readers will remember how several years ago, in order to overcome self-oscillation in H.F. stages, due to the inter-electrode capacity of the H.F. valve, neutralised or "neutrodyne" circuits were used. These allowed a particularly good measure of H.F. amplification to be obtained when compared with that given by an H.F. stage kept stable by "loss" methods, but with the coming of the screen-grid valve all preconceived ideas of H.F. amplification went by the board. Small though it may be, the screen-grid valve still has a small amount of inter-electrode

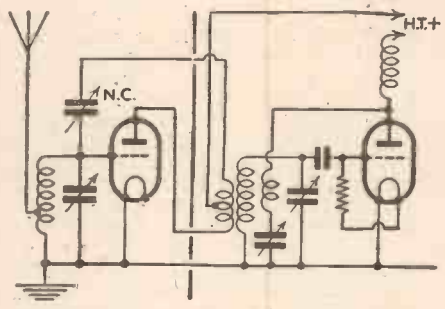



*Fig. 4.—A modification of Fig. 3—using a tapped H.F. transformer.*

capacity left, and it would form an interesting basis of experiment to see how the H.F. amplification obtainable on short waves is improved by neutralising the screen-grid amplifying valve. Figs. 3, 4, and 5 show three neutralised triode valve circuits which may be used as bases for the experiment. The neutralising winding and the neutralising condenser will only need to be very small. A vertical screen will be required between H.F. and detector circuits, and bare wire plug-in coils would be best, owing to the ease with which a section may be tapped off with a crocodile clip for the neutralising winding.

### Automatic Tone Compensation

It is a well-known fact that reaction cuts top notes, and as a result, because reaction is imperative in a "straight" short-waver, quality is frequently inclined to be "woolly" or over-emphasised in the bass. There are one or two transformers on the market designed to have a rising characteristic to compensate for this defect, but unless some control of the high note response is incorporated, reproduction will be unduly shrill when little reaction is being used. This is best carried out by means of a variable condenser across the primary or the secondary of the trans-

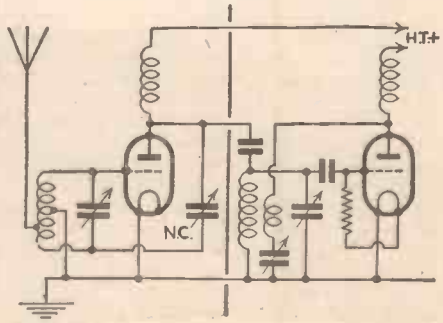



*Fig. 5.—A further modification of Fig. 3.*

former, and the complete tone compensating arrangement is shown in the circuit given in Fig. 6.

The disadvantage of the arrangement is that it adds a manual control which has constantly to be altered according to the setting of the reaction. Further, its action is entirely the reverse of that of the reaction control—that is to say, when the reaction condenser is at minimum and so not cutting the top, the tone condenser must be at maximum in order to level out the response and *vice versa*. It is because of this that the two controls have never satisfactorily

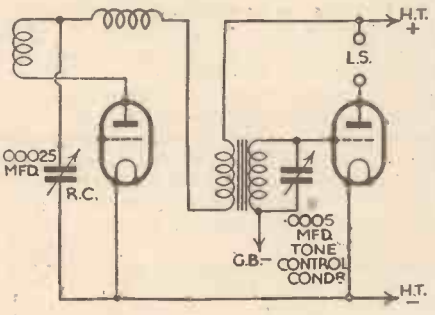



*Fig. 6.—A simple tone control.*

been ganged. It has recently occurred to me that there is, apparently, no reason why this should not be done, however, and this is the method of carrying it out. Two condensers are used of the type which have spindles projecting at each end for ganging purposes; they are still made by several manufacturers—one of .00025 mfd., and one of .0005 mfd., capacities are used, the .00025 mfd. size being mounted on the panel for reaction control in the normal manner. On the section of spindle projecting at the back of the condenser an *insulated* ganging connector is fixed, and behind this a small bracket in such a position to allow the other condenser to be ganged up with the reaction condenser *from the back end*. That is to say, the bracket will be at the remote end of the second condenser from the panel. Fig. 7 should make the idea clear.

The second condenser is now operating as a "left-handed condenser," and with one condenser set at minimum and the other at maximum, the gang-coupler is tightened on to the spindles. The first condenser is the reaction control connected up in the normal manner, and the second is the tone control connected across the secondary of our compensating transformer. As reaction is increased the capacity across the transformer is decreased, the high notes are thus boosted by the transformer, and the response level is maintained. The arrangement is entirely automatic throughout the reaction range. Two points worthy of mention are: the gang-coupler must be insulated, as there should be no connections between the condensers, and, secondly, if you have not a .00025 mfd. condenser as required, a .0005 mfd. with a .0005 mfd. fixed condenser in series with it serves the purpose just as well.

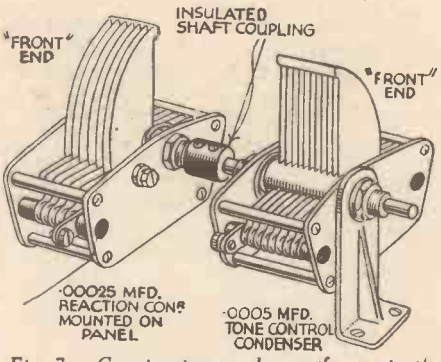



*Fig. 7.—Ganging two condensers for use in the circuit given in the first column.*

# Technical Topics

## In This Article the Author Discusses Important Points Which Should Receive Attention in Order to Ensure Trouble-free Reception on the Short Waves

By ALF. W. MANN

RADIO enthusiasts inexperienced in the technique of short-wave constructional work sometimes take much for granted when building short-wave receiving apparatus. The whole subject is viewed from an entirely wrong angle, and the final results are very disappointing.

The correct and only way in which to make a start is to build a published receiver exactly to specification, and thus gain constructional and operating experience under the most favourable circumstances. Unfortunately, everyone does not follow the procedure outlined in order to ensure that satisfactory results will be obtained

### Using Spare Components

Having spare components to hand they decide to build a short-waver incorporating these components, and follow the specified layout as closely as physical dimensions will allow. A receiver built on these lines by an inexperienced short-wave constructor will undoubtedly prove to be inefficient.

Body capacity effects, or even uncontrollable oscillation due to magnetic interaction between various high- and low-frequency components, may be experienced. Cramped layout and interaction between plate and grid wiring are also likely causes of instability.

It is most important to remember that the substitution of tuning coils of a different type, as, for example, two-pin plug-in coils in place of the valve-base mounting type, will alter the whole receiver, so far as the field spread relation of the tuning circuits and magnetic fields of other high- and low-frequency components are concerned, with drastic results.

### Modifying a Circuit

To design a receiver suited to individual requirements is impossible, and to suggest modifications in order to modernise old circuits is difficult, as there are a large number of variants, even of simple circuits. It sometimes happens that a circuit on hand requires a slight modification, which at first sight appears to be but a simple undertaking. Take, for example, an S.G., detector, and R.C.C. transformer L.F. combination. Having two L.F. transformers on hand it is decided to use them, one replacing the specified R.C.C. unit.

The substitution of the R.C.C. unit is in itself a simple matter. The stabilising of the receiver is, however, a problem which calls for a thorough knowledge of by-pass and decoupling systems, and the beginner is, therefore, advised to leave well alone. Testing out short-wave receiving apparatus, and using a standard H.T. battery eliminator as the source of H.T. current supply, is a method of procedure which usually ends in disappointment.

### Battery Eliminators

The beginner strange to short-wave tuning further handicaps himself by his own creating of the most difficult mains-hum problem he is likely to meet. Headphone reception, apart from code, is impossible, and to plug in the loud-speaker by no means improves matters, as in addition to hum ploppy reaction will be very much in evidence. If it is desired to use a standard H.T. battery eliminator in conjunction with short-wave receiving apparatus, the constructor should be prepared to undertake a little extra expense in order to ensure freedom from mains hum.

A standard H.T. battery eliminator may operate silently when used with the home broadcast receiver, and yet function badly when a short-wave adapter or superheterodyne converter is attached.

Should this be the case, it is no reflection on the manufacturer, because in the first place the eliminator was designed for operation with broadcast receivers. Extra smoothing is necessary in order to obtain hum-free short-wave reception on the lines suggested by a contributor in the February 2nd, 1935, issue of this journal, together with receiver modifications. In addition to extra smoothing equipment, variable detector voltage regulation is necessary.

### Wider Frequency Coverage

Attention is frequently drawn to the fact that short-wave tuning is sharper than broadcast tuning, owing to wider frequency coverage. Nevertheless, one hears of beginners who attempt to tune in *via* the loud-speaker. Weak signals and carrier waves which might be resolved into strong loud-speaker signals are missed, and many interesting transmissions are unheard. In addition, the operator is not thoroughly acquainted with short-wave tuning, and an evening spent in searching under these conditions will produce little, apart from the erroneous impression that short waves are tricky and of no apparent practical interest.

The fact that hundreds of short wave stations are operating to daily schedules throughout the world and are being heard constantly by distant listeners is overlooked, quite apart from the most important fact that the listener is handicapped by the procedure he has adopted and has not troubled to study a station list in order to see exactly what is on the air during his period of searching. Even though a loud-speaker receiver is used, it is advisable to use headphones, which may be plugged in so that the last valve is cut out of circuit, and thus make quite sure that when searching, the weakest carriers are heard and nothing is missed.

## LEAVES FROM A SHORT-WAVE LOG

By J. G. ABRAHAMS

LISTENING during the past week has been exceptionally good for the period of the year, and many stations which had not been heard for some little time have been captured at excellent strength. One star performer in particular has been VK2ME, Sydney (N.S.W.), which now would appear to be a regular entry in the log every Sunday. Bear in mind that it is only on this day of the week that the Sydney station is on the air, and it would be wise to make a note of its new schedule of transmissions for the months of April and May. There are three broadcasts, namely, from B.S.T. 07.00-09.00; 11.00–15.00; and 15.30–17.00. The last transmission during May is extended for a further thirty minutes.

VK3LR, Lyndhurst (Victoria) on 31.32 metres, on the other hand, is on the air daily from B.S.T. 04.00–06.00; 09.15–13.30; and 22.00–24.00.

### Alterations

FURTHER alterations are again to be noted in the broadcasts made by the Rome I2RO short-wave stations, as the two new 40-kilowatt transmitters have been brought into operation. The channels most favoured now are 25.4 metres (11,811 kc/s), 31.25 metres (9,600 kc/s) and 49.3 metres (6,085 kc/s), with two wavelengths held in reserve, namely, 30.67 metres (9,780 kc/s) and 42.98 metres (6,980 kc/s). The new schedules are: Broadcast to North America on 49.3 metres, B.S.T. 00.00–04.00, to South America on 31.25 metres at the same times. A further transmission destined to Brazil and the Argentine is made on 25.4 metres between B.S.T. 16.00–24.00. For the Far East the 25.4-metre channel is also used between B.S.T. 10.00–13.00, changing over to 31.25 metres from 13.00–16.00.

Occasionally, when searching for American stations and, in particular, on Sundays, you may pick up a talk or a relay of some historical event which is easily identified as emanating from Great Britain or the Continent. The Columbia Broadcasting System carry out international relays almost weekly, and specially relays of commentaries on historical anniversaries which may be of interest to listeners in the United States. Such a one was recently picked up of a talk given at Grasmere on the occasion of the 165th anniversary of the birth of Wordsworth. This was heard through W2XE, Wayne (New Jersey), one of the short-wave outlets of WABC (New York) on 19.65 metres (15,270 kc/s). This wavelength is used for the afternoon transmissions only, namely, B.S.T. 17.00–19.00, the longer channel of 49.02 metres (6,120 kc/s), being used between 00.00 and 05.00. As stated, through this medium it is often possible to pick up broadcasts of European happenings which are not transmitted through the usual Continental stations. As the Columbia people are anxious that these transmissions should be heard throughout the world, announcements are made in English, French, German, Spanish, and Italian.

### Summer Time

SIMILARLY to the principle adopted in Great Britain, and also by other European countries, the U.S.A. also advances its clocks by one hour towards this period of the year. On this occasion the change over is being made on April 28th, and from that date, in view of the fact that we have already gone forward one hour, the difference between Eastern Summer Time and B.S.T. will still be five hours. In connection with this change in time the Schenectady stations advertise their new schedule for W2XAD (19.57 m.) and W2XAF (31.48 m.), namely, for the former daily from B.S.T. 20.00–21.00, and for the latter from B.S.T. 23.30–05.00.

Although we find frequent reports published of U.S.A. stations, it is more seldom that any reference is made to a capture of one of the Canadians. A station, however, which is being heard fairly well now is Halifax, VE9HX, on 49.1 metres (6,110 kc/s), a 500 watter which, apart from taking programmes from its local medium-wave station, also relays radio entertainments from Montreal. The call is: *This is the Canadian station VE9HX, located in the Lord Nelson Hotel, Halifax, and associated with the Halifax Herald and the Halifax Mail, two of the Dominion's great newspapers.* Apparently there is no interval signal, but the studio opens up at B.S.T. 20.00 with the National song, *O Canada*. All announcements are given by a man and the French language is only used when the programme emanates from Montreal.

### Canadian Stations

SOME care must be taken to identify this station as it would be quite an easy matter to mistake it for VE9GW, Bowmanville, on 49.26 metres (6,090 kc/s), which is a Canadian Radio Commission station relaying CRCT, Toronto. Through this channel occasionally also one may hear a U.S.A. programme from the N.B.C. network. Fortunately, in the case of VE9GW, the call in full is given out every fifteen minutes and thus obviates a long wait and consequent loss of time. Bowmanville is on the air nightly from B.S.T. 21.00–06.00 (Mon. Tues. and Wed.), 13.00–05.00 (Thurs., Fri., and Sat.) and 19.00-03.00 (Sun.).

When searching around 49 metres recently, a mysterious French transmission was found, and although held for some little time no indication was given as to its origin. At a later date, however, as luck would have it, the call of Radio Colonial was picked up, and this information, in connection with a search of the programmes, afforded a clue to the solution. Needless to say, there is no direct short-wave transmission from the French Government transmitter on or near that channel, but P.T.T. Rennes has been taking broadcasts from Radio Colonial not only in the early mornings, but also in the afternoons and its sixth harmonic on 48.1 metres will be found to be a fairly strong one.

As it would seem to be more difficult at this period of the year to listen to either Radio Algiers or to Rabat (Morocco), it is interesting on Sundays to turn to the latter at either B.S.T. 13.30 or at 20.30 for a relay of the Radio Maroc medium-wave programme. If you do so for the first transmission you must tune in to 23.38 metres (12,830 kc/s), as for the afternoon broadcasts another channel is used, that is, 37.33 metres (8,035 kc/s). You will have no difficulty in recognising the station in view of its metronome interval signal and the long French call which includes that of Radio Maroc a Rabat. Occasionally in the evening transmission a concert of Oriental music may be included but this is not a regular feature

# CONSTRUCTOR CRUSADERS' CORNER

QUITE a large number of letters received from crusaders during the past two weeks have dealt with reception conditions on the short waves. It would appear that there is a considerable revival of interest in short-wave work, and some of the letters are most interesting. One Scottish crusader had a most imposing log of short-wave stations received on his Melody Ranger, and he had even gone to the extent of comparing the set with two or three commercial receivers owned by his friends, and he had every reason to be proud of his log. He regularly listens to American broadcasts, and VK2ME is an easy bag on Sundays.

Other readers seem to have been very active on the short waves recently and conditions would appear to have been almost ideal in most parts of the country. No doubt, those crusaders who make up the Silver Souvenir will also add their quota to the number of short-wave stations which will be heard on most evenings of the week.

## L.F. Couplings

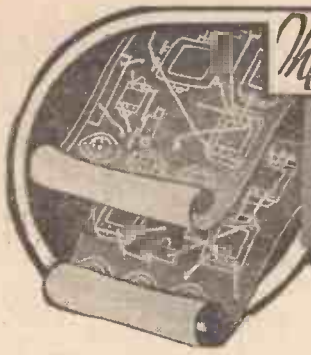
A QUERY was received from one crusader this week asking for the best L.F. coupling. What is the best coupling to use in an L.F. stage? One reader will swear by R.C. and another will prove—at least, to his satisfaction—that a well-made transformer is unbeatable. Is push-pull better than a good single output valve, and can couplings be mixed? This is one of the points where individual preferences must take the lead. The demonstration receiver installed at the Science Museum at South Kensington employs resistance-capacity networks and utilises the paraphase coupling with push-pull valves, and it certainly delivers the goods. One reader will prefer to use a really hefty output valve with 500 volts H.T. to any push-pull circuit, and yet another will state that his push-pull stage with 150 volts H.T. and its absence of second harmonic distortion pleases him better. Therefore, we cannot really advise in cases of this sort, but can simply indicate the lines for experiment.

## Making Your Own Components

DO you want more constructional features by the Experimenters? One or two crusaders appear to think this page the most interesting in the paper, and now want an extension of the articles to include loud-speakers, and in one case it was even suggested that we should tell you how to reform the vacuum in a broken valve and reseal it. Perhaps crusaders would write and let us know what they would like to find in this particular section.

## Transmitting

IT would also appear from our correspondence corner that an increasing interest is being taken in transmission. We have quite a number of requests for circuits of transmitters, but we do not think many require this information. No experiments must be undertaken with transmitting apparatus unless the Postmaster's licence is first obtained. To get this you must show a certain standard of knowledge, and if you possess this you will not write to us for a circuit! We have, however, had an article prepared on the subject of this licence and it is included in this issue. It may clear up certain doubts which exist regarding this particular form of wireless experiment.



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| C.-B. Three (D, LF, Class B) | Out of print | WM333 |
| Economy-pentode Three (SG, D, Pen) | *Oct.* '33 | WM337 |
| All-wave Three (D, 2LF) | *Jan.* '34 | WM348 |
| "W.M." 1934 Standard Three (SG, D, Pen) | *Feb.* '34 | WM351 |
| £3 3s. Three (SG, D, Trans) | *Mar.* '34 | WM354 |
| Iron-core Band-pass Three (SG, D, QP21) | *June* '34 | WM362 |
| 1935 £6 6s. Battery Three (SG, D, Pen) | *Oct.* '34 | WM371 |
| Graduating to a Low-frequency Stage (D, 2LF) | *Jan.* '35 | WM378 |

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

| | | |
|---|---|---|
| 65/- Four (SG, D, RC, Trans) | Out of print | AW370 |
| "A.W." Ideal Four (2SG, D, Pen) | 16.9.33 | AW402 |
| 2 H.F. Four (2SG, D, Pen) | Out of print | AW421 |
| Crusaders' A.V.C. 4 (2 H.F., D, QP21) | 18.8.34 | AW445 |
| (Pentode and Class-B outputs for above: blueprints 6d. each) | 25.8.34 | AW445A |
| Quadradyne (2SG, D, Pen) | Out of print | WM273 |
| Calibrator (SG, D, RC, Trans) | *Oct.* '32 | WM300 |
| Table Quad (SG, D, RC, Trans) | *Nov.* '32 | WM303 |
| Calibrator de Luxe (SG, D, RC, Trans) | *Apr.* '33 | WM316 |
| Self-contained Four (SG, D, LF, Class-B) | *Aug.* '33 | WM331 |
| Lucerne-Straight Four (SG, D, LF, Trans) | *Feb.* '34 | WM350 |
| £5 5s. Battery Four (H.F., D, 2LF) | *Feb.* '35 | WM381 |

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

| | | |
|---|---|---|
| Super-quality Five (2 HF, D, RC, Trans) | *May* '33 | WM320 |
| New Class-B Five (SG, D, LF, Class-B) | *Nov.* '33 | WM340 |
| Class-B Quadradyne (2 SG, D, LF, Class-B) | *Dec.* '33 | WM344 |
| 1935 Super Five (Battery Superhet) | *Jan.* '35 | WM379 |

## Mains Operated.

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Consoelectric Two (D, Pen) A.C. | 23.9.33 | AW403 |
| Economy A.C. Two (D, Trans) A.C. | Out of print | WM286 |

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

| | | |
|---|---|---|
| Home-lover's New All-electric Three (SG, D, Trans) A.C. | 25.3.33 | AW383 |
| S.G. Three (SG, D, Pen) A.C. | 3.6.33 | AW390 |
| A.C. Triodyne (SG, D, Pen) A.C. | 19.8.33 | AW399 |
| A.C. Pentaquester (HF Pen, D, Pen) A.C. | 23.6.34 | AW439 |
| D.C. Calibrator (SG, D, Push-pull, Pen) D.C. | *July* '33 | WM328 |
| Simplicity A.C. Radiogram (SG, D, Pen) A.C. | *Oct.* '33 | WM338 |
| Six-guinea AC/DC Three (HF Pen, D, Trans) A.C./D.C. | *July* '34 | WM364 |
| Mantovani A.C. Three (HF, Pen, D, Pen) A.C. | *Nov.* '34 | WM374 |

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

| | | |
|---|---|---|
| A.C. Melody Ranger (SG, DC, RC Trans) A.C. | Out of print | AW380 |
| AC/DC Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C. | 8.9.34 | AW446 |
| A.C. Quadradyne (2SG, D, Trans) A.C. | *Apr.* '32 | WM279 |
| All Metal Four (2SG, D, Pen) A.C. | *July* '33 | WM329 |
| "W.M." A.C./D.C. Super Four | *Feb.* '35 | WM382 |

## SUPERHETS.

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

| | | |
|---|---|---|
| 1934 Century Super | 9.12.33 | AW413 |
| Super Senior | *Oct.* '31 | WM256 |
| 1932 Super 60 | *Jan.* '32 | WM269 |
| Q.P.P. Super 60 | *Apr.* '33 | WM319 |
| "W.M." Stenode | *Oct.* '34 | WM373 |
| Modern Super Senior | *Nov.* '34 | WM375 |

**Mains Sets: Blueprints, 1s. 6d. each.**

| | | |
|---|---|---|
| 1934 A.C. Century Super, A.C. | 10.3.34 | AW425 |
| 1932 A.C. Super 60, A.C. | *Feb.* '32 | WM272 |
| Seventy-seven Super A.C. | *Dec.* '32 | WM305 |
| "W.M." D.C. Super D.C. | *May* '33 | WM321 |
| Merrymaker Super A.C. | *Dec.* '33 | WM345 |
| Heptode Super Three, A.C. | *May* '34 | WM359 |
| "W.M." Radiogram Super, A.C. | *July* '34 | WM366 |
| "W.M." Stenode, A.C. | *Sep.* '34 | WM370 |

## PORTABLES.

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

| | | |
|---|---|---|
| General-purpose Portable (SG, D, R.C., Trans) | Out of print | AW351 |
| Midget Class-B Portable (SG, D, LF, Class-B) | 20.5.33 | AW389 |
| Holiday Portable (SG, D, LF, Class B) | 1.7.33 | AW393 |
| Family Portable (HF, D, RC, Trans) | 22.9.34 | AW447 |
| Town and Country Four (SG, D, RC, Trans) | *May* '32 | WM282 |
| Two H.F. Portable (2 SG, D, QP21) | *June* '34 | WM363 |
| Tyers Portable (SG, D, 2 Trans) | *Aug.* '34 | WM367 |

## SHORT-WAVERS. Battery Operated.

**One-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| S.W. One-valve | Out of print | AW329 |
| S.W. One-valve for America | Out of print | AW429 |
| Roma Short-waver | 10.11.34 | AW452 |

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Home-made Coil Two (D, Pen) | 14.7.34 | AW440 |

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

| | | |
|---|---|---|
| World-ranger Short-wave 3 (D, RC, Trans) | Out of print | AW355 |
| Experimenter's 5-metre Set (D, Trans, Super-regen) | 30.6.34 | AW433 |
| Experimenter's Short-waver | *Jan.* 19, '35 | AW463 |
| Short-wave Adapter | *Dec.* 1, '34 | AW456 |
| Superhet. Converter | *Dec.* 1, '34 | AW457 |

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

| | | |
|---|---|---|
| "A.W." Short-wave World Beater (HF Pen, D, RC, Trans) | 2.6.34 | AW436 |
| Empire Short-waver (SG, D, RC, Trans) | *Mar.* '33 | WM318 |

**Superhets: Blueprints, 1s. 6d. each.**

| | | |
|---|---|---|
| Quartz-crystal Super | *Oct.* '34 | WM372 |

## Mains Operated.

**Two-valvers: Blueprints, 1s. each.**

| | | |
|---|---|---|
| Two-valve Mains Short-waver (D, Pen) A.C. | 10.11.34 | AW453 |
| "W.M." Band-spread Short-waver (D, Pen) A.C./D.C. | *Aug.* '34 | WM368 |

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

| | | |
|---|---|---|
| Emigrator (SG, D, Pen), A.C. | *Feb.* '34 | WM352 |

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

| | | |
|---|---|---|
| Gold Coaster (SG, D, RC, Trans) A.C. | *Aug.* '32 | WM292 |
| Trickle Charger | *Jan.* 5, '35 | AW462 |

# IMPRESSIONS ON THE WAX

By T. Onearm

FOLLOWING on his recent masterly performance of Beethoven's "Eroica," Koussevitzky gives, this month, a superb reading of Mozart's great Symphony No. 40 in G minor. He has captured the intense nervous vitality that was so obviously in the composer's mind when he wrote it. Of all Mozart's Symphonies this is probably the greatest, and this performance should not be missed by lovers of fine playing. The numbers of these records are *H.M.V. DB*2343/5. Yehudi Menuhin, whose record output has been of late more concerned with Concertos and Sonatas, now gives two superb violin pieces well contrasted; one being the Romanza Andaluza (Spanish Dance) (Sarasate) and the other the Sixth Hungarian Dance of Brahms, arranged by Joachim, on *H.M.V. DB*2413. Once again Menuhin shows his almost uncanny mastery of technique.

Each record produced by John McCormack is a gem. Not only is he the possessor of one of the finest tenor voices of this generation, but he combines with this a profound artistic understanding for each song upon which he brings his art to bear. This month he sings two supremely beautiful melodies, "Candle Light" and "An Old Sacred Lullaby," with all the tenderness at his command, on *H.M.V. DA*1404.

## Complete Chopin Valses

THE issue of these lovely works by one of the world's mostf amous interpreters of Chopin will serve as a fitting memory of Cortot's three London Lecture-Recitals, which were among the chief events of the season. His playing is, as usual, in full sympathy with that romantic personality, he conjures up pictures of the fashionable salons that Chopin frequented, playing these valses for the elite to dance to. The recording is excellent and appears on *H.M.V. DB*2311/6.

Adrian Boult leads the B.B.C. Symphony Orchestra to a magnificent performance of Schubert's last and greatest symphony in C major on *H.M.V. DB*2415-20. This is, of course, the Symphony often known as No. 7, although it is more properly No. 9. Should, however, the disputed "Gostein" Symphony ever turn up, it would again alter the C major to No. 10! So it is perhaps better to call it the "Great" C Major. Playing and recording are excellent, and it well merits its famous attribute of "heavenly length."

The Comedy Harmonists are always bound to please, and this month they have excelled themselves in "Wenn die Sonja russisch tanzt" and "Ein bisschen Leichtsinn Kann nicht Schaden" on *H.M.V. B*8296.

Evelyn Laye sings two songs from her new American film "The Night is Young" (*B*8297) and Belle Baker, who has had a most successful visit to this country, sings "Wish me good luck" and "Swing high, Swing low," a song dedicated to all the mothers of airmen killed during the war, on *H.M.V. B*8295, and "Old Mammy Mine" and "Blue Moon" on *H.M.V. B*8294.

## Light Instrumental

THIS section contains some very charming records. The Salon Orchestra, with Gordon Little singing, gives a pot-pourri of talkie tunes from recent films under the title of "Talkie Film Memories" on *H.M.V. B*8299. The London Palladium Orchestra has a fine series of Welsh melodies entitled "The Leek" on *H.M.V. C*2727, while the New Mayfair Orchestra contributes a selection from the new Adelphi revue "Stop Press," as well as the first of the "His Master's Voice" "Jubilee Records." This is a new arrangement of dance music, covering the high lights of the period of the King's reign. H.R.H. The Prince of Wales recently made his début as a composer with a new Pipe March "Mallorca," which is recorded by the Pipes and Drums of 2nd Batt. H.M. Scots Guards, directed by Pipe-Major J. B. Robertson, on *H.M.V. B*8292. This is a fine spirited march and very well performed.

## A Novel Record

IN this month's list Peter Dawson sings a duet with himself! A novel record, which nevertheless, keeps well within the limits of all that is musical, "Watchman, what of the Night" on *H.M.V. C*2728 is extremely good. The successful revival of "Merrie England" was in no little measure due to Joseph Hislop, who sings "The English Rose" and "For Love Alone" on *H.M.V. C*2729. Derek Oldham celebrates his return from a successful tour in America with two favourites, "Love's old sweet Song" and "Parted," songs of the type in which he excels. On the other hand, Al Bowlly and Ray Noble, both of whom left these shores for America last year, have collaborated in two songs of the moment, "A little white Gardenia" from the new film "All the King's Horses" and "In a blue and pensive mood," on *H.M.V. B*8302.

This month Ronald Gourley, the blind pianist, makes the second of his medleys, in which he treats most admirably such favourites as "His Majesty the Baby," and "June in January." Harry Jacobson plays the principal tunes in medley form from the new revue "Stop Press," and Renara, a new-comer to these lists, plays "I've got an invitation to a dance" in syncopated style and some clever variations on "Three Blind Mice" in the style of well-known composers. It is said that Renara is likely to take the place left vacant by the late Raie da Costa.

The dance section is well filled with the latest hits, and has special distinction in marking the return to "His Master's Voice" of Jack Hylton and his Orchestra. This famous band leader is now starring with his Boys at the London Palladium in "Life Begins at Oxford Circus," He has chosen the big success as one of the four tunes he plays. There are also records by Jack Jackson, Teddy Joyce, as well as fine examples by Paul Whiteman and other famous American bands.

# LETTERS FROM READERS

**The Editor does not necessarily agree with opinions expressed by his correspondents.**

**All letters must be accompanied by the name and address of the sender (not necessarily for publication.)**

## Pictorial versus Theoretical Diagrams

SIR,—I was interested to see from Thermion's notes, in the issue of PRACTICAL AND AMATEUR WIRELESS dated March 30th, that you have again raised the question of pictorial versus theoretical diagrams.

While quite agreeing with your view that many new-comers to radio would be scared of attempting to make up a receiver if every diagram were of a theoretical nature, it must be remembered that for those who have already been initiated into the mysteries of wireless shorthand, it is far easier to work from a theoretical diagram than from a pictorial one, where many connections must be traced through before they become understandable. I refer particularly to common connections to the H.T. and earth circuits where, for convenience, connections may be made at many different points.

Personally, whenever I have had to assemble apparatus from a pictorial diagram, I have invariably drawn out the theoretical circuit first.

I would suggest, therefore, that if pictorial diagrams are to be included for the reason stated above, theoretical circuits should in every case be included.—A. C. H. DORMER (New Malden).

## A Set with Output of 4-6 Watts Wanted

SIR,—I notice that you have recently received one or two letters from readers asking for a 2 H.F. A.V.C. receiver. May I add my support to this excellent idea? I also am waiting for a design for such a receiver, with an output of 4-6 watts. I am at present enduring the poor results of a "Straight Two" until I see a set suitable to my requirements published in your pages.—L. H. BATES (Leigh-on-Sea).

[*As soon as we find that there is sufficient demand for a receiver of this nature we shall publish details.*—ED.]

## "The Voice of Electricity"

SIR,—On looking through the April 6th issue of your paper, I noticed in the section, "Round the World of Wireless," a paragraph headed "The Voice of Electricity," where it is stated that this announcement is a recording of ten-million volt discharges of man-made lightning produced in the "high-frequency laboratories of the *G. E. Co. at Schenectady, N.Y.*"

As a keen S.W. "fan" since the days of 2XAF and 3LO, Melbourne, I first heard the above through W2XAF, who were conducting a test on Friday, January 11th, beginning at noon.

Writing to Schenectady later, I received a polite and pleasing letter of confirmation, which states that: "The Voice of Electricity" announcement is a recording of ten-million volt artificial lightning originally produced in our high-voltage laboratories in *Pittsfield, Massachusetts.*"—C. A. RIGBY (Newcastle-on-Tyne).

## Flat Baseboard *versus* Chassis

SIR,—I think the ideas expressed by Ernest F. West (of Tooting, London, S.W.) would please about 90 per cent. of your readers. I suggest a set of triple band-pass coils be used with all switches internally arranged, and details for baseboard and chassis.—H. CLARIDGE (Warwick).

SIR,—I quite agree with the remarks of E. F. West, of Tooting. No doubt many readers, especially experimenters like myself, think that flat baseboard mounting is better, and easier, from his point of view.

The layout can be shown quite easily, and adjustment after building a set can be easily carried out—especially for the experimenter to try different components. In most cases the change can be carried out in the cabinet, whereas a chassis set has to be taken out, in most cases, to get to the underside components of the chassis. —E. R. AUST (Portsmouth).

## Our Short-Wave Section

SIR,—Having been a regular reader of PRACTICAL AND AMATEUR WIRELESS for some years, I feel I must congratulate you on your efforts to popularise the Short-wave section of your valuable journal in publishing the various circuits and articles dealing with them. Few readers, I am sure, particularly those with only slight technical knowledge, realise the vast "field" or "world" available for exploration on even a small two-valve set. I can assure my fellow readers that short-wave reception is child's play when once the "touch" of the set is acquired. Before attempting to construct a set for working on the short-wave band one *must* pay particular attention to the following details:—

(1) The aerial system, especially the lead-in, which should if possible be passed through a length of glass tubing.
(2) The tuning condenser *must* be of the slow-motion type, fitted with an extension handle to the control knob, and set back from the panel.
(3) Long leads to valve-holder and coil must be avoided.

When an adapter is used (as in my own case) with an ordinary broadcast receiver, it should be obvious that unless the H.F. choke to L.F. transformer is removed or short-circuited it will be in series with the adapter choke. To obviate this a push-pull switch can be connected to short-circuit the H.F. choke on the broadcast receiver. My own adapter, made up from the junk-box, will bring in almost anything on the short-wave band. Readers who have some old condensers with slow-motion control can adapt these by removing some of the vanes, fixed and moving, and double spacing the remainder. Five or six vanes will be ample.

I trust these few hints will encourage the non-technical reader to make a venture on the short waves.—T. C. R. (Stroud Green).

## A Jubilee Four-valver

SIR,—As an amateur wireless enthusiast I once more note that Mr. F. J. Camm has designed a three-valve souvenir set.

Mr. Camm's ability as a designer is unquestionable, except that in this case he might have adopted the happy medium. His sets are either three-valve, employing new types of valves which are costly and unsuitable for the North, or superhet, which is also costly to the average amateur.

What I and many more amateurs would like to see Mr. Camm design is a Jubilee battery set consisting of four valves, two ordinary screen-grid, detector, and power or pentode transformer in the last stage, using three ganged screened coils, and also three ganged condensers (screened) of no special type or make, which, of course, would be less expensive (special types mean special prices).

I am sure that Mr. Camm could give amateurs a really good set of this specification at a moderate cost. All that is required is good long- and medium-wave reception. Short-wave reception would be much appreciated if it could be provided for at a moderate cost, but in its present stage it is not worth a big outlay.

I would be very pleased to learn what other readers think of the above suggestion. —FRANCIS BIRD (Harrogate).

[*Many thanks for these suggestions. If there appears to be sufficient interest in the class of receiver mentioned, we shall be pleased to publish a suitable design.*—ED.]

## S.W. Reception in Scotland

SIR,—In my letter which was published in the March 2nd, 1935, issue I stated that the 19 m. band was not very good, although it was a great improvement on the 13 and 14 m. bands. I have now rebuilt my set, and on April 2nd I received the following American 'phone stations:—

W2HFS, R5/FFSS/N, QSA5, QRM slight.
W8AKU, R6/FFS/N, QSA4, QRM bad.
W2GOQ, R8/N/N, QSA5, QRM bad.
W2CFU, R7/N/N, QSA5, QRM none.
W3AMV, R6-7/N/X, QSA5, QRM slight.
W2CVA, R7/N/X, QSA4-5, QRM slight.
W1XAI, R4/FFS/N, QSA3, QRM bad.
W8GOI, R7-8/N/N, QSA5 QRM none.
W9BAC, R8/N/N, QSA4-5, QRM slight.
H1YG, R8/N/X, QSA5, QRM none.

These stations were, of course, heard on the 14 m. band. My previous trouble was modulation hum, which I cured by means of an H.F. by-pass condenser and an extra choke in the mains unit.—A. H. MILLER (Strathpeffer).

**CUT THIS OUT EACH WEEK**

## Do you know

**—THAT an ordinary dual-range broadcast coil may be used as a wave-trap.**
**—THAT two half-wave rectifying valves may be used in a voltage-doubler circuit to obtain a high voltage output direct from A.C. mains without a mains transformer.**
**—THAT a sharp knife should not be used to remove the insulation from insulated wire owing to the risk of cutting partly through the wire.**
**—THAT several breakdowns have been traced to the above fault in some receivers we have examined.**
**—THAT a real quality receiver should employ flat-tuned circuits to avoid all risk of side-band cutting.**
**—THAT the above form of tuning is to be preferred to selective circuits and tone compensators.**
**—THAT the correct type of pilot lamp to use with A.C. mains receivers is the miniature screw-in bulb rated at 6.2 volts 0.3 amps.**

*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, *Geo. Newnes, Ltd., 8-11, 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.*

# Facts & Figures

## COMPONENTS TESTED IN OUR LABORATORY

### "Wolsey" Television Kit

THE present B.B.C. low-definition television transmissions provide good entertainment, and are well worth seeing. Those constructors who have not yet experimented with television apparatus will be interested in the neat kit of parts manufactured by Wolsey Television Ltd., of 54, Lamb's Conduit Street, W.C.1. This kit is designed to enable the amateur quickly to assemble an efficient disc type receiver which will be capable of giving really good pictures when used in conjunction with a suitable receiver. The kit is complete, and includes, in addition to a ready perforated disc with stroboscopic speed device, the necessary motor and speed-controlling resistances; the neon lamp, lens, lampholder, motor brackets, and incidentals, including baseboard, screws, etc. The disc is of the "solid" pattern, and the stroboscopic device consists of the letter "W" repeated eight times. The lens is of the flat-field type held in a simple spring-grip holder, and the speed-controlling resistances are composed of one fixed (700 ohms) and a variable control which enables the motor to be controlled very smoothly. The price of the kit is £3 12s. 6d., and no further accessories are required in order to obtain good results. A suitable cabinet and screen for the lens may easily be constructed by the amateur to finish off the complete apparatus.

*A neat double-pole fuse plug, manufactured by Messrs. Ward and Goldstone.*

### A Double-pole Fuse Plug

USERS of all-mains receivers, as well as those listeners who use electric cleaners, clocks, and other apparatus connected to the mains, will be interested in the new fuse plug which has been produced by Messrs. Ward and Goldstone. Should any breakdown occur in apparatus joined to the mains, the effect of an overload is to blow the fuse connected to the mains leads. In the majority of cases, the result of this is that the lights on that particular circuit are extinguished, and inconvenience is caused whilst the mains are switched off and the fuse replaced. With some types of apparatus there is also the risk that the flex connected to the apparatus will fuse before the mains fuse blows, although careful choice of leads should prevent this occurrence. However, the fuse plug referred to is provided with two cartridge-type fuses rated at only 2 amps. (the usual house lighting fuse being 5 amps.), and it will thus blow on an overload before the house fuse, thus avoiding the inconvenience of replacing the latter. The plug takes apart quite easily, and a spring holder grips the cartridge fuse, thus rendering replacement a much simpler matter than in the case of the usual house fuse. The device will be found of extreme value, and costs only 1s. 4d. complete with the two fuses. Extra fuses are 4d. each.

### Avo Testing Accessories

USERS of the various Avo test instruments often find it convenient to fit a clip to one of the test prods, or use an extension for getting into some inaccessible position. In view of the demand for additional types of lead, etc., the manufacturers of these instruments have introduced a neat kit of accessories, the illustration at the foot of this page showing the card as it is supplied, with the various parts held in position by elastic loops. The card is convenient and keeps the parts in a handy manner ready for use, whilst the accessories themselves will prove of great value, not only to users of the Avo instruments, but to those who are using other types of measuring instruments. Long insulated testing prods, coloured red and black, two crocodile clips which may be attached to insulated holders, and lengths of flex with various types of end connectors, may be joined in combination to provide any type of testing lead, and the experimenter will find this supply of accessories most useful. The price is 2s. 6d.


*The neat set of testing accessories which have been designed for use with the AvoMeter and AvoMinor group of test instruments.*

### T.25D Renumbered and Redesigned

THE well-known Mullard valve, type T.25D, which has in the past proved very popular amongst amateur transmitters, has now been redesigned and will in future be known as type TZ05-20. The actual electrical characteristics remain unchanged, but the electrode structure has been modified, and the valve is now of a much more rugged nature. The maximum H.T. rating is still given as 500 volts, but the makers state that up to 600 volts can safely be used at the higher wavelengths.

### Midget Volume Controls

MESSRS. LECHNER & CO., LTD., makers of the Kabi hum balancer referred to in our issue dated June 9th last, have now produced some further midget components including multi-contact switches and potentiometers or volume controls. The latter are of the selector arm and stud type, having 25 or 50 studs, and are rated at 2, 3, 4, 5, 7.5, and 10 watts. The three lower types have an overall diameter of approximately 1¾ins., and the high-rated types are roughly 2ins. in diameter. The depth behind panel varies according to the type, but the greatest depth is only about 1¾ins. The elements are of the wire-wound type, and the spindle is insulated, thus enabling the controls to be mounted without difficulty. Practically any rating can be obtained, from 75 ohms up to 1 megohm, and constructors who are interested should write for details. Prices vary from 4s. 6d. to 30s., and if desired the controls may be obtained with a combined Q.M.B. switch at an additional cost of 4s. 6d., or with a specially-shaped end contact for an additional 1s. 6d. The makers are Messrs. F. W. Lechner & Co., Ltd., of 61, Spencer Street, Clerkenwell, London, E.C.1.

### New Osram Double-diode Valve

INFORMATION is now available concerning a new double-diode for A.C. mains or universal sets.

This valve is interesting in that it has a filament rating of 4-volts 0.3 amp., thus making it suitable for either parallel or series filament running, so that it can be used with 4-volt A.C. or 0.3 ampere AC-DC range of valves.

The valve, known as the D.41, has an indirectly-heated cathode and is suitable for use as a combined detector and automatic volume control valve.

The price is 5s. 6d., and it can be supplied with metallised or clear bulb.

## REPLIES IN BRIEF

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

**J. G. (Newbury).** A condenser with shorting switch is indicated. This may be purchased complete, or a simple short-circuiting arm may be joined to the ordinary type of reaction condenser.

**H. L. (Brighton).** We regret that owing to difficulties in the patent situation the device in question has not appeared on the English market. A note will appear in these pages when it is available to English listeners.

**J. T. R. (N.6).** A stabiliser may be used with a standard mains unit to smooth the output and enable Class B to be used.

**G. W. (Bredbury).** The arrangement might work, but we think it risky to attempt to use the two chargers in the manner indicated.

**R. H. E. (Worthing).** The wire in question could be used. Wind 700 turns on a small bobbin with an inside diameter of 1 in. Two such coils are required.

**E. P. (E.C.1).** Ordinary S.M. condensers are suitable. The frame aerial is preferably wound with medium-wave winding spaced about 1/10th inch between turns, and with long-wave winding having adjacent turns touching. Super-power valve takes greater current and consequently your H.T. voltage drops. The G.B. may also need modifying with this valve.

**W. G. B. (Glasgow).** There is no amplifier of the type you refer to now on the market.

**D. R. H. (S.W.16).** Regret cannot understand your query. Condensers must be in step to tune in a station. How did you use the set without the S.G. valve?

**R. E. (Maidenhead).** Diameter is much too great for the short-wave coil. Data cannot be given without knowing circuit details, such as tuning capacity, etc.

**G. E. R. (Hebden Bridge).** Regret beyond the scope of a reply. Suggest you obtain the appropriate back number with full constructional details.

**G. W. J. (Lahore Cant., India).** Rewiring will be necessary, and we would advise the use of high-voltage mains valves, or the special universal valves. Messrs. Peto-Scott may be able to supply you.

**T. B. (Glasgow).** Full constructional details of the coil were given in PRACTICAL WIRELESS, No. 24—March 4th, 1933.

**K.C. (W.4).** We would not advise you to try and use the unit with your commercial receiver.

**A. G. G. (Winchester).** You will be unable to use the ganged condenser unless the three coils are matched. The fact that one coil is unscreened will definitely prevent matching of the three circuits. Changing to A.C. valves may also mean that all resistances used for voltage-dropping will have to be changed, and probably the set rewired to obtain stability.

**L. F. (Southsea).** No, the valve requires no bias for radio reception. The bias resistor is only required when the detector is used as a gramophone pick-up amplifier.

**T. M. (Dublin).** We would not recommend the use of a frame aerial with this particular receiver.

**J. F. (Edinburgh).** The secondary winding you refer to will be quite in order, and no increase in the primary winding will be needed. Your idea of the lamp in series is wrong, as the total current will be the same and the reduction of the voltage across the primary will upset all your other calculations.

**E. E. (Chalk Farm).** The impedance of the M.C. speech coil may be taken as approximately twice the D.C. resistance of the coil. The other type of speaker varies considerably at different frequencies and the makers' figures should be obtained.

**W. T. (Prestatyn).** The coil, or parts for it, may be obtained from Messrs. Peto-Scott.

**A. C. (Birmingham).** It is impossible from your remarks to trace the fault. Obviously some component is wrongly connected or defective, and careful stage by stage tests are necessary to trace the fault. Is the trimming correctly carried out?

**T. H. S. (Manchester).** Remove approximately half of the fixed and moving vanes and replace the normal spacing washers. Reaction condenser should be of .0003 mfd.

**B. E. J. (Llanstephan).** As shown, the circuit is incomplete, no earth return for the tuning condenser, wave-change switch or reaction condenser being indicated. This appears to be the only fault.

**B. G. (Blaydon).** We have several blue-prints which would enable you to use your valves, but you do not state the exact type of circuit you now require. The coil you have been using could not be employed.

**R. Le G. (E.7).** Regret query not clear. An earth must be used with an A.C. receiver just the same as with any other.

**R. B. D. (Kirkcaldy).** In view of the circuit design we would suggest that the operating conditions are not correct. The only modification which will prove of use is to fit an H.F. stage and dispose of one of the L.F. stages.

**G. L. (Cardiff).** Any make of repute could be used or the components in question. In this particular receiver it is not necessary to adhere to any one maker.

**J. P. (N.W.6).** The transformer you mention certainly goes well up the musical scale, but does it maintain its even response down to the lowest musical frequency broadcast? Probably parallel-feeding it will increase the low-note response, but be guided by the makers' instructions concerning this. Two R.C. stages could be designed to give better reproduction in our opinion.

**E. B. (Harrogate).** Regret the blue-print is now unobtainable.

**J. E. (Tring).** The output stage is unstable, and the two fixed condensers indicated in the circuit diagram should be joined across the secondary of the push-pull transformer.

**D. U. (Sunderland).** We regret that from your description we are unable to identify the receiver. We do not think it is one of our designs.

**R. T. (Thornaby-on-Tees).** The eliminator should prove quite suitable, but as we have not tried it we cannot state definitely.

**P. H. (Blackpool).** The G.B. positive lead should not be inserted as you state. It should be plugged into the positive socket of the battery, and the negative lead inserted between 4.5 and 9 volts.

**A. B. (Peckham).** Noise may simply be overloading of the output stage. Try increased H.T. and G.B., or an alternative valve.

**W. G. (Glasgow).** Items mentioned may be obtained from the Economic Electrical Company of Twickenham.

**D. L. (Belfast).** Regret that we cannot help you from the details given. Are the batteries in good condition?

**J. A. F. (Wolsingham).** Would advise you to modify the L.F. couplings and not attempt to modify response with condensers as you suggest. Use R.C. coupling in place of one of the transformers.

**L. D. T. (Rhondda).** To enable tuning to be more easily carried out a similar coil should be used for the S. G. stage. If this cannot be obtained, however, use any modern standard coil and a separate tuning condenser.

**A. A. (Via Stockport).** It would appear that either the coils are faulty, or trimming has not been correctly carried out. Is the wave-change switch functioning? The valves would not cause the trouble you mention.

**G. D. (Pontypridd).** Probably one of the modern wave-traps will prove of greatest use to you in your particular trouble.

**P. W. N. (Gillingham).** Certain D.C. valves may be used on A.C. mains, but in case of doubt the makers should be consulted.

**A. J. B. (Gosport).** Coil details will depend upon range to be covered. For 40 metres upwards a former of 2½in. diameter will be most useful, whilst for ranges below a diameter of 1in. or so may be used. Gauge of wire must be selected to avoid undue size, and spacing will depend upon circuit constants. Experiment is therefore indicated.

**F. W. (Sheffield).** Trouble is caused by an inefficient earth or an H.F. choke which is not working effectively. Try changing both of these connections—using a different type of choke, and varying the earth connection.

**W. C. (Trowse).** Regret we have no details of the transformer in question. Suggest you write to the makers. We have no circuit employing the coils you name.

**G. E. H. (Sheffield).** The receiver in question could conveniently be constructed for battery use, using correct resistances, etc., and modifying the filament winding.

**C. W. (Sheerness).** Regret details do not enable us to advise you. Would suggest that you check H.T. voltages, etc.

**O. D. (Glasgow).** Use a split adapter, made especially for the purpose, with your set. Results with your mike are quite in order. Remember that the speaker will require much more energy to operate it than will the 'phones. An amplifier will thus be necessary.

**F. G. S. (N.15).** We can only conclude that your wiring is incorrect. In view of your address, try a wave-trap tuned to the Regional in case the trouble is simply break-through.

**J. H. (Dibden Purlieu).** Sketch was only to illustrate the circuit details and no definite components are specified. 22 D.C.C. wire would be quite suitable for the aerial in question.

**A. H. (Chesham).** The different type of gang condenser will only affect results if the tuning dial is calibrated in wavelengths. If that is so, you must use the correct coils, or it will be impossible to balance the tuning against the stations.

**L. C. R. (Ossett).** A failing valve would cause the trouble, and a mains unit which is faulty could also be responsible. If these are tested and O.K. feel all resistances after the receiver has been switched on for some time. If one is found very hot, that is responsible and should be replaced by one of higher wattage rating. A test without current passing will not be of much use.

**K. L. M. (Haileybury).** The valves in question will probably be quite useful, although we have not tried them in this particular receiver. Using a 3 to 1 transformer will reduce the amplification considerably and you should adhere to the specified component unless you are content to suffer this loss.

**L. H. (S.E.4).** Are your coils of the right type? Examine the switching and, if in order, have the coils tested.

**D. C. (Edinburgh).** Would suggest your coils are wrongly wired, as a 391-metre station should not be heard on the long waves. Check connections and if necessary have coils tested.

**W. F. C. (Enniskillen).** You would probably find a pentode instead of the present power valve would prove more useful. A further stage, could, however, be added and a low-ratio transformer should be used with a super-power valve in the output stage.

**R. M. D. (Falkirk).** It would certainly appear that you have made some mistake in wiring and we would advise very careful checking, especially to the transformer. This could be the cause of the trouble.

## BEGINNER'S SUPPLEMENT

(*Continued from page 187*)

for the potential amateur transmitter is that of cost. It may be said straight away that, with inputs up to ten watts, receiving apparatus of the kind ordinarily obtainable is entirely suitable. While the cost is always what one cares to make it, it need not be more than what the normally enthusiastic constructor spends on his receiving apparatus. In fact, the simpler types of transmitter for telegraphy working are considerably cheaper than a good receiver, and can usually be made up from the spare parts to be found in every "shack." This is not to be taken to mean that any sort of junk is suitable for a transmitter, but the fact is that a highly efficient set can be built from a few standard receiving components of good quality, while such things as transmitting inductances and chokes are easily made. As for inputs of ten watts, the high-tension supply required is only of the order of 300-350 volts or less, valves of the power and super-power class are quite suitable for low-power transmission.

The great majority of transmitters in this country use inputs of less than ten watts, and under reasonably good conditions astonishing results are possible. The average ten-watt station can cover Europe easily on the 40-metre band, while on 20 metres many stations are able regularly to work America and Canada. Greater DX than this is also obtained by the more efficient (and patient!) operators, while there are others who have gained the coveted W.A.C. (Worked All Continents) and W.B.E. (Worked British Empire) certificates on ten watts. The other bands also have their various uses and interests for their particular devotees.

### DX Possibilities

Though the DX possibilities are mentioned, it must not be thought that long-distance working is the only object of the amateur transmitter. There is a vast field of interesting experimental work open to the holder of a transmitting licence which is quite unconnected with DX, and there are many transmitters who do more bench work on apparatus than actual transmission. The working of distant stations has a certain attraction of its own, however, and what usually happens is that the normal amateur gets all his DX over and then settles down to experimental work, or else he finds his bent in either one or the other. The happiest state is a combination of the two!

### Penalties

For the possession and use of transmitting apparatus of any type, and for whatever purpose, an official licence and call-sign *must* be obtained. Licences are readily granted to *bona fide* experimenters, and the fees are nominal. Heavy penalties are prescribed for unlicensed transmission, which is much more easily detected than some people suppose; further, recent cases have resulted in greater vigilance on the part of the Post Office. There is also another aspect of the matter, and that is that licensed amateurs will not tolerate unlicensed stations and are ready to give the authorities all the assistance possible in tracking pirates.

# 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 CROYDON RADIO SOCIETY

THE questions night on Tuesday, April 2nd, in St. Peter's Hall, South Croydon, was much enjoyed. The first problem came from "Amplion," music critic of the *Croydon Advertiser*, who sought the society's advice on how to adapt a gramophone and pick-up, so that piano accompaniment could take place while a record was being played. Suitable motors and their control were suggested. Next came a test of the society's musical ear, as the Technical Adviser sounded a note on his clarionet and asked the meeting to say what frequency it was. Some were wide of the mark, but the average were not far wrong, and an interesting time was spent in discussing this and other notes. One note was of 1,756 cycles, and its fine harmonics went up to 10,000 cycles, and since some commercial receivers cut off at 3,000 cycles, it was realised that many listeners were getting short weight as regards their frequencies! Of particular merit was Mr. Hancock's discussion on what was learnt from a speaker's response curve and, together with many other queries, a very enjoyable evening resulted.—Hon. secretary: E. L. Cumbers, Maycourt, Campden Rd., South Croydon.

### THE CROYDON RADIO SOCIETY

FOR the final meeting of this session, this society had a musical programme supplied by radio and records on a member's push-pull amplifier with special exponential horn loud-speaker, and Piezo pick-up. This took place in St. Peter's Hall, South Croydon, on Tuesday, April 9. Undoubtedly the star turn of the evening was the B.B.C. Theatre Orchestra playing old-time dance music. Towards the end of the evening, Mr. G. S. Vellacott, vice-president, found time to say a few words. He was, he said, a "grey-beard" of the society, having always been a member, and it fascinated him to have seen attendances increase from a dozen to four times that number. Technical advancement had been concurrent, but he suggested that more talks of an elementary nature should be given, as even highly-advanced members would find them refreshing. Incidentally, the society would be pleased to hear if PRACTICAL WIRELESS readers have ideas on this subject. The next session starts in October, when all old friends are expected to be seen, as well as many new.—Hon. Secretary, E. L. Cumbers, Maycourts, Campden Road, S. Croydon.

### ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY (LONDON BRANCH)

MR. E. NORMAN, of 20, Varley Road, West Ham, London, E.16, is organising a branch of the Anglo-American Radio and Television Society. There are no charges, and those interested should write to Mr. Norman at the above address, enclosing a stamped addressed envelope for reply.

### GOLDERS GREEN AND HENDON RADIO SCIENTIFIC SOCIETY

ALL the difficulties in the construction of large amplifiers, together with a very ingenious circuit of direct coupling, were explained by Mr. R. D. C. Pedler at a recent meeting of this society. Now that the winter has passed it is hoped that much useful work will be done during the Society's Field Days, both on 80 metres and on 5 metres. All communications should be addressed to the Hon. Sec., 8, Denehurst Gardens, N.W.4.

### INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

AT the meeting of the above Chapter, held on Tuesday evening, April 2nd, at 8 p.m., a lecture was given by Mr. D. R. Parsons, of Messrs. Stratton and Co., Ltd., entitled "Short-wave Radio Communication." In his lecture Mr. Parsons covered three important points, Propagation of Short Waves, Short-wave Transmission, and the Design of Short-wave Receivers, and a lantern and slides were used to show illustrations, circuits, etc., under discussion. Several "Eddystone" receivers and components were on view. On May 7th, at 8 p.m., the Chapter will return to its old headquarters at the British Legion, Long Street, Middleton, near Manchester, when a lecture will be given by Mr. G. V. Colle, of Messrs. Ward and Goldstone, Ltd., entitled "Interference-free Television and Radio Reception on the Short Waves." All readers in the district are welcome to attend these meetings, and anyone requiring further information should write to the secretary, Mr. R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

### INTERNATIONAL DX'ERS ALLIANCE (LONDON CHAPTER)

RECENT and imminent club activities include short and medium-wave DX'ing contests, a component exchange club, and visits to power stations, factories, a telephone exchange, etc., Should any DX'er be interested in our activities, full particulars of the club can be obtained from the address given below.—Arnold G. Ward, Publicity Manager, 59, Balaam Street, Plaistow, E.13.



# CATALOGUES RECEIVED

*To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.*

### K.B. REJECTOSTAT SYSTEM

THE interesting interference-reducing rejectostat system evolved by Kolster-Brandes has now been extended and permits 1,000 receivers to be operated simultaneously from a single aerial. It has, of course, always been possible to operate up to ten receivers from a single aerial using the standard rejectostat amplifier, and this device has proved very useful to hotels, flats, etc. For the interest of builders, electrical contractors, etc., a booklet has been prepared by Messrs. Kolster-Brandes explaining the community aerial system, as they call it, and interested readers should write for a copy.

A leaflet is also available from the same firm regarding their new car radio receiver (Model K.B. 410). This is a five-valve superhet receiver employing delayed A.V.C. and interference-suppressing circuits. The wave-bands covered are from 200 to 600 and from 1,000 to 2,000 metres, and an output of 2 watts is possible. The supply of H.T. is carried out through a power supply attached to the receiver, and this is operated from the usual 12-volt car-lighting battery. The total drain is just under 3.5 amps. The cost of the receiver, complete with six sparking-plug suppressors, distributor suppressor, two condensers and a special aerial lead is 20 guineas.

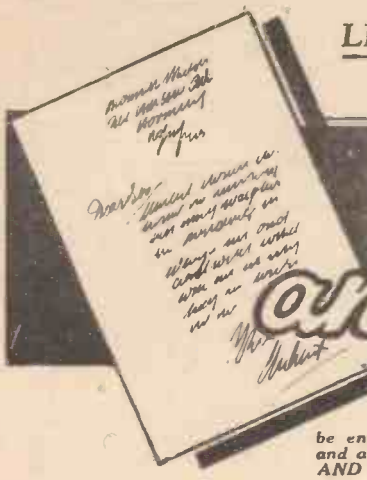
### RADIO AMATEUR CALL BOOK

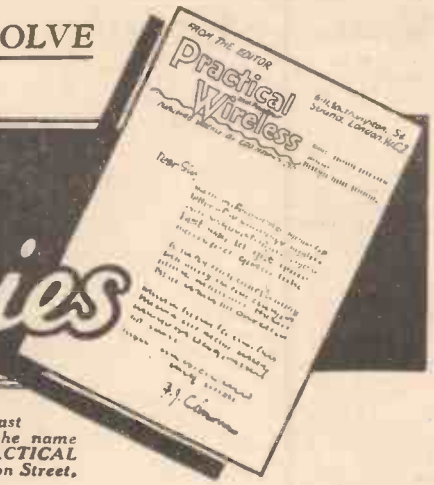
IN response to numerous requests, we have increased our orders with the publishers, and are now in a position to supply your readers with copies of the "Radio Amateur Call Book" (Spring Edition) and the "Radio Amateur's Handbook" (12th Edition). The prices are 6s. and 4s. 6d. respectively, plus 6d. postage in each case.—J. CLARRICOATS, Secretary, The Incorporated Radio Society of Great Britain.

The "Radio Amateur Call Book Magazine," 6s., is a very complete guide to all of the readers of the amateur call signs, and will no doubt be of great interest to all readers interested in short waves. It is also obtainable from: F. L. Postlethwaite, Radio G5KA, 41, Kinfauns Road, Goodmayes, Ilford, Essex.

## LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

# Queries and Enquiries





*If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.*

### SPECIAL NOTE

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

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

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

### Adding an L.F. Stage

**"Would you advise me how I should add an L.F. stage to my two-valve set? It would be transformer coupled. What connections should be made and how should I decouple the set?"—W. D. (Glasgow).**

Connect the present 'phone or speaker terminals to the terminals on the transformer marked IP and OP or P and HT (according to the type of transformer). The terminal marked OS or G should then be joined to the grid terminal on a valveholder, and a flex lead attached to terminal IS or GB to be plugged into the G.B. battery. The F or filament terminals on the holder should be wired to the corresponding terminals on the second valveholder in your two-valver, and the P terminal should be joined to one loud-speaker terminal. The other speaker terminal is then joined to H.T. positive. If decoupling is necessary a resistance (10,000 or 20,000 ohms) should be joined between the OP or H.T. terminal on the transformer and H.T. positive, and a 2 mfd. condenser connected between that terminal and earth.

### Television Signals

**"My set is a four-valve S.G., detector, L.F. and pentode receiver, and is battery operated. I receive the sound and vision signals on the loud-speaker fairly strongly. Could I receive the vision if I made a disc receiver, or am I out of range of the station?"—G. R. P. (Liverpool).**

If the vision signal gives you a good loud result from the speaker you should be able to obtain good results on a disc televisor. You will have to be careful with the type of striking voltage supply, however, as the receiver is battery-operated, and should therefore read up the various articles which have been given on this subject. You will probably find that the neon cannot be joined direct in the anode circuit of your output valve, but will have to be fed from a separate source to avoid reducing the voltage on your receiver.

### Cutting Out Droitwich

**"I am troubled with interference from Droitwich. Could you please tell me of a condenser that I could put in the aerial which would be cheaper than a wave-trap and would operate on both wavebands?"—J. F. (Myddle).**

A condenser alone would not solve your problem. The simplest solution in your case is to obtain one of the new dual wave-traps, such as the Wearite, which costs 7s. 6d., and connect this in the aerial lead. With a .0005 condenser and a simple on/off switch this will cover both medium and long wavebands and will effectively prevent all interference without loss of signal strength on distant stations.

### Blueprint Required

**"I enclose a list of parts I have by me, including Wearite Universal screened coils. Would you let me know a good three-valver to build so as to use these parts, giving me the blueprint number?"—R. F. P. J. (Pendlebury).**

The Leader III is the nearest receiver we have using most of the parts which you already possess, but we must point out that we cannot guarantee results unless you use all the specified parts. The blueprint number is PW35.

### Using an Eliminator

**"I have a Lucerne Straight Three which I built some time ago. I wish to convert the set to mains, with an eliminator. What alteration should I have to make for this?"—P. R. M. (Leyton).**

If you only intend to use an eliminator for the supply of H.T. no alterations should be necessary. Simply obtain the eliminator and connect to the mains, using the H.T. negative and positive tappings to suit the receiver. If, however, you wish to use indirectly-heated valves you will have to replace the valveholders, and in all probability will also have to re-wire the receiver, using a modified layout to avoid instability.

### A Rectifier Problem

**"The rectifier in my eliminator (early make) gets very hot after working my set (two-valve) after about one hour. On replacing the rectifier with a H.10 type which I borrowed, all appears to go well without any sign of overheating. Am I in order in retaining this type? What effect will it have? Also is there any way of telling the current output as there are no details on the eliminator case, choke or transformer?"—G. W. G. (Birmingham).**

Apparently the load on the rectifier is greater than that for which it was intended. Alternatively, it may be faulty. We think, therefore, it would be wise to retain the H.T.10 type. The only point to watch is that the current requirements of your receiver are not too much below the rated output of the rectifier, in order to avoid an undue voltage rise. This will, of course, depend upon the regulation properties of your transformer. You cannot measure the output of the old rectifier, although you could connect a milliammeter in series and note the load at which it fails to heat up. This will not be of much use if the rectifier is faulty or damaged in any way.

### Fitting a Fuse

**"I am making the one-valve short-waver recently described. Would you tell me if my drawing is correct for inserting a fuse in the circuit? Does it matter where the switch is?"—J. K. T. (Flixton).**

The fuse is placed in the common negative lead. L.T. negative should be joined to the filaments and the earth line, and one side of the fuse-holder should be joined to this connection. The H.T. negative lead is then joined to the remaining fuse-holder terminal. The switch should be in the L.T. positive lead.

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

## Miscellaneous Advertisements

**Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type 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. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," 8, Southampton Street, Strand, London.**

## PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the Following Manufacturer's New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad carriage extra; orders under 5/- cannot be sent C.O.D.; please send for illustrated catalogue, post free.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World-Famous Continental Valve Manufacturer, all the following standard mains types, fully guarantced, 4/6 each. HL, L, Power. High, Medium and Low Magnification Screen Grid. Variable-mu Screen Grid; 1, 3 and 4 watt A.C. output, directly heated Pentodes; 250-volt 60 ma. Full Wave Rectifiers; A.C./D.C. types, 20 volts .18 amp. Filaments; Screen Grid; Variable-mu Screen Grid; H, HL, Power and Pentodes.

THE following types 5/6 each: 350v., 120 ma. full-wave Rectifiers; 500v., 120 ma. full-wave Rectifiers, 2½-watt indirectly-heated Pentodes.

2-VOLT Valves, detector, H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable-mu screened grid 5- or 4-pin Pentodes. Class B D.D. Triodes, 5/-.

THE Following American Types, 4/6: 250, 210, 245, 226, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5.

THE Following Types, 6/6 each: 42, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A6, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7, 43, 59; 1A6, 1C6, 1V, 12AS, 12Z3, 19, 30, 31, 32, 33, 34, 41, 49, 56, 57, 75, 76, 79, 82, 84, 6Z4, 85, 89.

LISSEN 3-gang Superhet Coils, with switching; listed 30/-, with circuit, 6/-.

LOTUS 3-gang Band-pass Coils; 12/6 per set; with switching.

BEST British make Bakelite cased 0-1 m.c. Milliampmeters, 2½ inch outside diameter 18/6, 3½ inch outside diameter 22/6. Westinghouse Rectifiers for above 12/6 extra.

12 TO 2,000 metres. Huge Purchase of All-Band 2 gang Coils from prominent British manufacturer. Fully Screened with switching for S.G. Det. type receivers, 4 Separate Bands, 12 to 2,000 metres. 12/6 with circuit.

U.S.A. Cardboard Electrolytics, 2,000 mf. 12 volts 6/-, 100 mf. 12 volts 1/3.

MAGNAVOX D.C.152, 2,500 ohms, 17/6; D.C.154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6; all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M. 7in. cone, 16/6; 9in. cone, 22/6.

A LARGE Selection of Pedestal, table and radiogram cabinets by best manufacturers at a fraction of original cost; send for list.

T.C.C. Electrolytic Condensers, 15 mf., 50v. working, 1/-; 50 mf., 12v. working 1/-; 15 mf. 100v. working, 1/-.

CONDENSER blocks, H.M.V., 400v. working, 4+2+1+1+1+0.5, 3/9; 2+2+1+1+1+0.5, 3/-.

ALL-ELECTRIC 3-stage Amplifiers, 200-250v. 40-60 cycles, 10 watts undistorted output, complete with 5 valves, and Magnavox Super 66 energised speaker, £12/10/-.

ELIMINATOR Kits, including transformer, chokes, Westinghouse metal rectifier, condensers, resistances, and diagrams, 120v. 20 m.a., 20/-; trickle charger, 8/- extra; 150v. 30 milliamps, with 4 v. 2-4 amp., C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps with 4v. 3-5 amps., C.T., L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps., 30 hys., 5/6; 150 milliamps., 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps., 20 hys., 2/9; 250 milliamps., 30 hys., 20/-.

PREMIER Auto Transformers, 100-110/200-250v. or vice versa, 100-watt, 10/-.

PREMIER L.T. Charger Kits, consisting of Premier transformers and Westinghouse rectifier, input 200-250v. A.C., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Truspeed Induction Type, A.C. only, Electric Gramophone Motors, 100-250v., 30/- complete; ditto, D.C., 42/6.

COLLARO Gramophone Unit, consisting of A.C. motor, 200-250v. high quality, pick-up and volume control, 49/-; without volume control, 46/-.

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(Continued at top of column three)

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(Continued from foot of column one)

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ORMOND No. 4 Variable Condensers, 0.00025, 1/6. O.K. for Short Waves.

SPECIAL Offer Western Electric Mains Transformers, input 200-250 volts, output 350-0-350 volts, 120 milliamps, screened primary, 4 volts 1-2 amps., 4 volts 2-3 amps., 4 volts 3-5 amps., 9/6; input 100-250 volts, 300-0-300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 2-3 amps., 6/6; input 200-250 volts, screened primary, output 500-0-500 volts 150 milliamps, 4 volts 3-5 amps., 4 volts 2-3 amps., 4 volts 2-3 amps, 4 volts 1 amp., 4 volts 1 amp., 19/6.

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VARLEY H.F. Intervalve Coils, B.P.8, band-pass, complete with instructions, in original cartons, 2/6.

SCREENED H.F. Chokes, by one of the largest manufacturers in the country, 1/6.

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PREMIER Combined H.T.8 and H.T.9 Transformer, rectified output 250 or 300 volts 60 milliamps, 4 volts 1-2 amps., 4 volts 3-5 amps., 10/-; or with Westinghouse rectifier, either type, 18/6.

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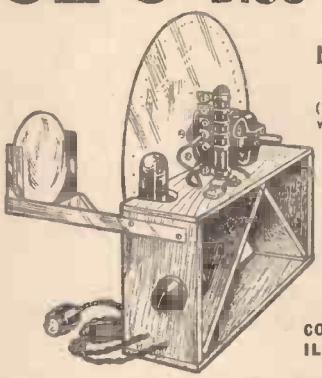

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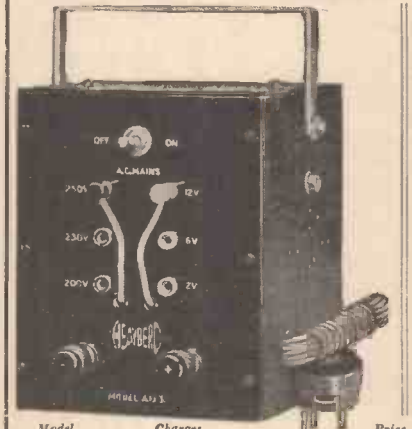


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SPECIAL Clearance Offer:—Telsen L.F. chokes, 40 h., 1/6 each; 15 henry 40 milliamps, 3/- each; limited number only; Telsen electrolytic condensers, 4 mf., 6 mf., 275 volt, 2/- each; 4 mf., 6 mf., 500 volt, 3/- each.

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