TRANSMITTING TOPICS—See page 422

Practical and Amateur Wireless

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VOL. X. No. 252. July 17th, 1937.

ROUND *the* WORLD *of* WIRELESS

H.T. from L.T.

IN this issue the full constructional details of one of the latest H.T. units are given. This type of unit is becoming very popular as it provides the battery user with all the facilities which are available to those who have access to the A.C. mains. Several set manufacturers are now producing complete receivers and radiograms in which a unit of this type is incorporated and it should prove quite trouble free in operation. By using a suitable transformer it is possible to obtain H.T. for either the battery-type of valve (maximum 150 volts) or the indirectly-heated mains valve (250 volts) and the constructional work is extremely simple. Another field to which this type of unit can be applied is in car radio apparatus where the car accumulator may be used to provide the necessary supply without the use of a rotary converter. The heaters or filaments may be supplied from the same battery and thus the apparatus becomes completely self-contained. Turn to page 420 and read how this unit may be constructed; and remember that in the event of any individual problem our Queries Department will be only too glad to do everything possible to overcome the difficulty.

International Broadcasting Union

AT the conclusion of the Summer Meeting an electric clock was presented by members of the Union to its Vice-President, Vice-Admiral Sir Charles Carpendale, Deputy Director-General of the B.B.C. The next meeting of the U.I.R. takes place towards the end of November or the beginning of December, 1937, at Nice.

Set Testing

AT the H.M.V. factories at Hayes some novel apparatus has been installed for testing all the accessories used in modern radio receivers. Cords for tuning drives and similar purposes are suspended with heavy weights attached and pins driven through the cords are measured from time to time to ascertain the degree of stretching. Metals are placed in a trough and sprayed with acids and salt solutions to judge of the effects of various climatic conditions. Complete receivers are placed on a miniature "cakewalk" or shaker and jogged about for periods up to 48 hours to judge the effects of vibration. Ovens and humidity chambers are arranged so that components and material may be subjected to extremes of temperature to ascertain their suitability for use in all parts of the world. Even the felt on gramophone turntables is tested by vigorously rubbing hard stone over it and brushing constantly with special cloth.

ON OTHER PAGES.

The Zoo at Olympia

IN connection with the television demonstrations at Radiolympia the B.B.C. has arranged to relay daily pictures from the Pets' Corner at the Zoological Gardens. Each day viewers will be able to see the chimpanzees at their tea party, and watch the children feeding the baby bears and other animals which have a certain amount of liberty in this popular section of the Gardens. This broadcast is, of course, in addition to other special features which are being prepared to provide the public with a good idea of the vast scope of the modern television programmes.

Variety from Coventry Hippodrome

IN connection with the broadcast of variety in the Midland programme on July 15th the name of the special production has now been changed to "Radiovue." This has been devised and will be produced by S. H. Newsome, Managing Director of the theatre, and Pat Aza. The artists will include Elsie Carlisle and her two pianists; Herschel Henlere; Janet Joye; Murray and Mooney; Raymond Bennett, who will compère the show, and the Coventry Hippodrome Orchestra, directed by William Pethers.

Television Range

SUCCESSFUL reception of television from Alexandra Palace has been carried out at Coventry using G.E.C. apparatus. Periodic experimental reception over phenomenal distances are now reported from many quarters and it would appear that some steps should now be taken to increase the power of this transmitter with a view to making more exhaustive tests to ascertain the correct behaviour of the ultra-short wavelengths which are employed in this case. American tests have, so far, not been so promising from the long range point of view, and there is a possibility that the horizontal aerial array which is being used in that country may play some part in the ultimate results.

Story of the Chorus

IN the Regional programme on July 16th a programme carrying the above title is to be broadcast and it will tell the story of those who played their parts in big musical successes without having their names "billed" in any of the programmes. It will remind listeners of artists who started in the chorus under the great George Edwardes, and will include Gladys Cooper, Dorothy Ward, Harry Welchman, Ivy Tresmand, June, Anna Neagle, Claude Dampier and many more.

Irish Guards' Band

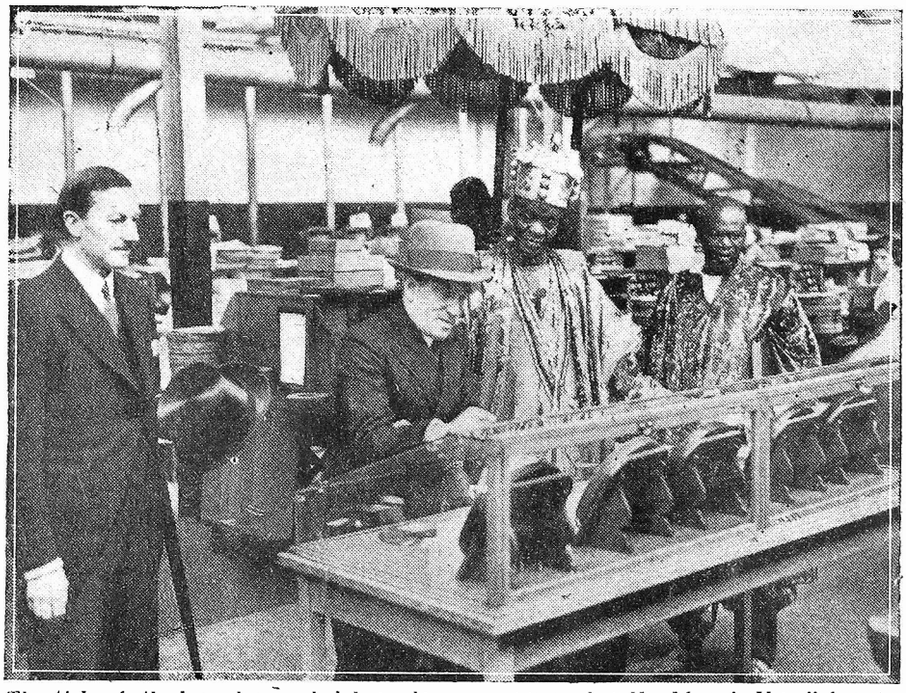
THE Band of His Majesty's Irish Guards is among the bands which are visiting Leamington Spa this season. Their performance, conducted by Captain J. L. T. Hyrd, Director of Music to the Regiment, will be broadcast in the Midland Regional programme on July 31st from the Pump Room Gardens. This band was attached to the Guards Division on the Western Front during the war, and in 1918 it had the distinction of being invited by the Italian Government to play in Rome, where it was received by Queen Elenor. It is the only Army band to have played in three Peace Processions—viz., London, Paris and Belfast.

ROUND the WORLD of WIRELESS (Continued)

Revue in Miniature

MARTYN WEBSTER will compère "Follow On" on July 20th. This is a revue in miniature which owes its title to the fact that each number suggests the theme for the following one. The sketches are by Francis Durbridge, who has written a number of radio revues and plays, and Edward J. Mason, of Bournville, who contributed a sketch to "Radio Cracker," and wrote material for Stanley Holloway's film; and the composers are Jack Hill and Basil Hempseed, both of Birmingham. The artists will be Marjorie Westbury and Dorothy Summers, John Bentley and Denis Folwell, with Leila Brittain and Harry Engleman (two pianos).

INTERESTING and TOPICAL NEWS and NOTES



The Alake of Abeokuta photographed during his recent visit to the "His Master's Voice" factories at Hayes, Middlesex.

Light Orchestral Concert

THE Orchestra of His Majesty's Theatre, Aberdeen, will give a light orchestral concert on July 22nd. It will include "The Spirit of the Matador," arranged by E. S. Pana; "Glamorous Nights," arranged by Prentice; "Snakes and Ladders," by Engleman; "The night is young," by Suesse; "Orient Express," by Mohr; and "Will you remember," by Romberg.

Somerset Music

A PROGRAMME of Somerset music by the Glastonbury Town Band, conductor, Lionel A. Leavey, will be broadcast from the Western Regional on July 24th. Hilda Blake (soprano) will be the vocalist.

Two Crime Plays

OWEN REED will produce, on July 14th, "The Vagaries of Spring," by D. C. M. Pens, and "Chance is no Artist," by Ben Pomerance, adapted from the short story "The Avenging Chance," by Anthony Berkeley. In the former Dennis Folwell and Eddie Robinson will play the two burglars; while in the latter the well-known Berkeley detective hero, Roger Sheringham, will be taken by Cedric Johnson. This broadcast will be given in the Midland Regional programme.

B.B.C. Scottish Orchestra

THIS popular orchestra, conducted by Guy Warrack, will play for an hour on July 17th. The programme will consist of, Overture, "Zampa"—Herold; "Scènes Hongroises"—Massenet; Symphony in F sharp minor by Haydn.

SOLVE THIS!

PROBLEM No. 252

Howard's A.C. set ceased to function, and when voltage tests were made it was found that no voltage was registered at the anodes of the valves, and the speaker field winding was excessively hot. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 252 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 19th, 1937.

Solution to Problem No. 251

Hemsley overlooked the fact that the battery voltage opposed the mains voltage, thereby necessitating a lamp having a higher rating than 100 watts to provide a charging current of 500 mA.

The following three readers successfully solved Problem No. 250, and books are accordingly being forwarded to them: G. P. Burn, Forest House, Epsom College, Surrey; R. G. Ordish, 76, Burnside Road, Dagenham; C. Head, Wayside, Belle Hill, Kingsbridge, South Devon.

Cheltenham Municipal Band

ARTHUR COLE is to conduct the Cheltenham Municipal Band in a popular programme from the Winter Gardens, Cheltenham, on July 15th. The band consists of twenty-six professional instrumentalists, and came into existence four years ago. It comprises the usual military band reed and brass formation, and includes a lively dance section.

New Appointment

WE are informed that Westinghouse Brake and Signal Co., Ltd., of York Road, King's Cross, N.1, have appointed Mr. I. T. Watkins to represent them in the Midlands Area. Mr. Watkins' address is: 26, Featherstone Road, King's Heath, Birmingham. Telephone: Highbury 3417.

Dance Music

IVOR KIRCHEN and his Band, who have frequently broadcast, will be heard on July 22nd, from the Midland Regional, in a programme of Old Time Dance Music.

Joe Loss, whose popular band is often heard on the radio.

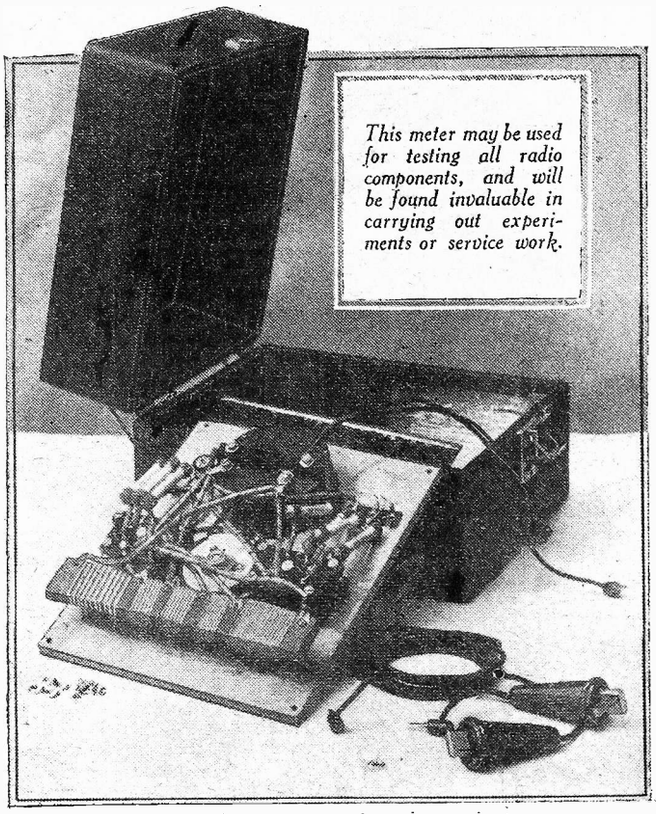
This band was engaged earlier in the summer at the Palais de Danse, Birmingham, and it is now at the Locarno, London.

Cinema Organ Music from Aberdeen

ON July 23rd, Harold Coombs, at the organ of the Capitol Cinema, Aberdeen, will play "Everybody's Melodies," including March, "Sons of the Brave," "Londonderry Air," "When the Poppies bloom again," "The Blue Danube," "Shenandoah," Reel, "Mrs. McLeod and Fairy Reel," "Smoke gets in your eyes," "Valse in D Flat," Overture, "William Tell," arranged by Harold Coombs.

THE "MULTUMETER" TEST SET

(Concluded from page 397, July 10th issue)



This meter may be used for testing all radio components, and will be found invaluable in carrying out experiments or service work.

THE values of the shunts required to measure the other current ranges provided are worked out in the same manner, and are as follows:—

20 mA range	7.9 ohms.
100 mA range	1.5 ohms.
250 mA range	0.6 ohms.
5 amp. range	0.03 ohm.

For the milliamp. ranges 30 gauge nickel-copper resistance wire will be sufficient, while 18 S.W.G. tinned copper wire will do for the 5-ampere range.

"Divided Shunt"

It is most convenient to use the "divided shunt" method in our meter, and this consists of one shunt for the lowest range tapped off at the necessary points. Since, however, the 5-amp. shunt will consist of a much heavier gauge wire in order to obviate temperature errors (this is necessary because a heavy current will be passed through the shunt, and if a high resistance wire is used it will become very hot, causing the resistance of the wire to vary and so introduce errors), we will, therefore, arrange our shunt to have a maximum value of 37.5 minus 0.03 ohms, that is 37.47 ohms. The length per ohm of the resistance wire used is 5.575 ohms per yard, so that for a resistance of 37.47 ohms we shall require a total length of 242 ins., that is 6 yds. 2 ft. 2 ins., and this is tapped as follows:—

20 mA range	1 yd. 1 ft. 3 ins.
100 mA range	9.7 ins.
250 mA range	3.87 ins.

The resistance of the 18-gauge tinned copper wire is 1 ohm per 75.4 yds. The shunt resistance we require is 0.03 ohm, so that the length of wire required is 2 yds. 9½ ins. The shunts are wound on a strip of ebonite, and may be clearly seen in the photographs.

Winding the Shunts

First anchor a soldering tag to one end of the ebonite, and solder to this one end of the tinned copper wire. Wind the wire on the ebonite, taking care, of course, that no turns are shorted, and anchor the free end of the wire to another soldering tag. To this tag also solder one end of the length of 30-gauge resistance wire and wind on 3.87 ins. (3 9/10th ins. is probably the most accurate measurement that will be obtained) and anchor the other end of this to a soldering tag. This will give the 250 mA range. Now solder another length of wire to this tag and wind on 9.7 minus 3.87 ins., *i.e.*, 5.83 ins. to give you the 100 mA range. The 20 mA range will require 1 yd. 5.3 ins., leaving 5 yds. 11 ins. to be wound on to give the total resistance required for the 5 mA range. This has given us a shunt for the milliamp ranges of total resistance 37.47 ohms tapped off at the appropriate points.

Our method of testing is as follows:—Connect a 2,000-ohm potentiometer in series with a 1.5 volt battery and the meter, as shown in Fig. 4. Adjust the potentiometer until a current of 1 mA is indicated on the meter. Now connect the shunt across the meter. If the shunt has been measured accurately the reading should now be 0.2 mA, indicating that for every milliamp. flowing through the circuit 0.2 mA passes through the meter, and 0.8 mA through the shunt. In other words, if 5 mA were passed through the circuit, 1 mA would pass through the meter, and 4 mA through the shunt. If a reading of 0.2 mA is not obtained, the last length of wire added to the shunt (that is the length of 5 yds. 11 ins.) must be adjusted. If the reading is lower, it indicates that the shunt is passing too much current, and a small amount of wire should be added until accurate reading is obtained.

When the 5 mA range is adjusted accurately, adjust the potentiometer until the meter again reads 1 mA, indicating that a total current of 5 mA is flowing. Short out the last part of the shunt (or what is better still, have the shunt connected up in the meter and adjust the switch position, so as to take into account when making these adjustments of the shunt resistance, the resistance of the switch, wiring, connections, etc.), and convert to the 20 mA range. A current of 5 mA would be indicated by a meter reading of 0.25 mA, and adjustments to the shunt should be carried out as described above if this reading is not obtained. The same procedure is carried out for every range, but if the wire has been measured accurately, it should not be found necessary to make any adjustments. Of course, if a multi-range milliammeter of known accuracy is available, the whole procedure is very much simplified, as it is only necessary to arrange the circuit to indicate 5, 20, 100 and 250 mA on the meter, and arrange shunts across your own meter to give a corresponding reading in each case.

There is a slight disadvantage in adjusting shunts as first indicated above, and that is that meters are liable to be somewhat inaccurate near the ends of their scale. In making a calibration as outlined above, you would be using the unshunted meter at the top of its scale, and then the shunted instrument fairly near the bottom. There are thus two possible sources of error, which may be cumulative or, on the other hand, they may cancel each other out. If a multi-range milliammeter is available for comparison, therefore, it is advisable to take readings in the middle of the scale.

	Range	Switch A Setting	Switch B Setting
D.C. VOLTS ..	5 volts	2	1
	10 volts	3	
	100 volts	4	
	250 volts	5	
	500 volts	6	
	1,000 volts	7	
	5,000 volts	8	
D.C. CURRENT ..	1 mA	1	1
	5 mA		2
	20 mA		3
	100 mA		4
	250 mA		5
	5 Amperes		6
OHMS	0—100,000	9	10
A.C. VOLTS ..	10 volts	10	7
	100 volts		8
	500 volts		9
WATTS	1 watt*	10	8
	25 watts*	10	9
DECIBELS ..	—14 dB*	10	8

* See text.

A.C. Volts

In order to calculate the values of the series resistances required for different ranges of A.C. volts, measured by the 1 mA D.C. meter in conjunction with a Westinghouse 1 mA instrument type rectifier, it is necessary to know firstly the voltage drop across the A.C. terminals of the rectifier, and secondly the current consumption of the complete instrument movement and rectifier at full-scale deflection. This is given by the makers of the rectifier as 1.11 times the full scale meter current, so that readings of 1 mA on the meter, when reading A.C. current, indicate that a current of 1.11 mA is passing. The total voltage to be measured at full scale deflection of the meter is the sum of the A.C. voltage across the A.C. terminals of the rectifier, and the voltage to be dropped by the series resistance. The value of this resistance is easily worked out, therefore, by subtacting the rectifier voltage drop from the full-scale voltage to

(*Continued on next page.*)

THE MULTUMETER TEST SET

(*Continued from previous page.*)

be measured, and dividing the remainder by 1.11 times the meter full-scale current in amperes. Unfortunately the voltage drop across the rectifier does not change linearly with current, so that if it is an appreciable fraction of the total voltage the readings would be very inaccurate. Our lowest voltage range is 10, and it is sufficiently accurate to assume that the voltage drop across the rectifier and meter movement at full-scale current is 0.85 volts, and across the meter movement 0.15 volts. The distortion of scale shape which occurs on this range can be neglected when using the instrument as a general purpose test set (for which it is intended), and, of course, the distortion on the two higher ranges provided is obviously negligible. The resistances required, therefore, are :—

10 volts A.C.	..	8,250 ohms.
100 volts A.C.	..	9,0000 ohms.
500 volts A.C.	..	450,000 ohms.

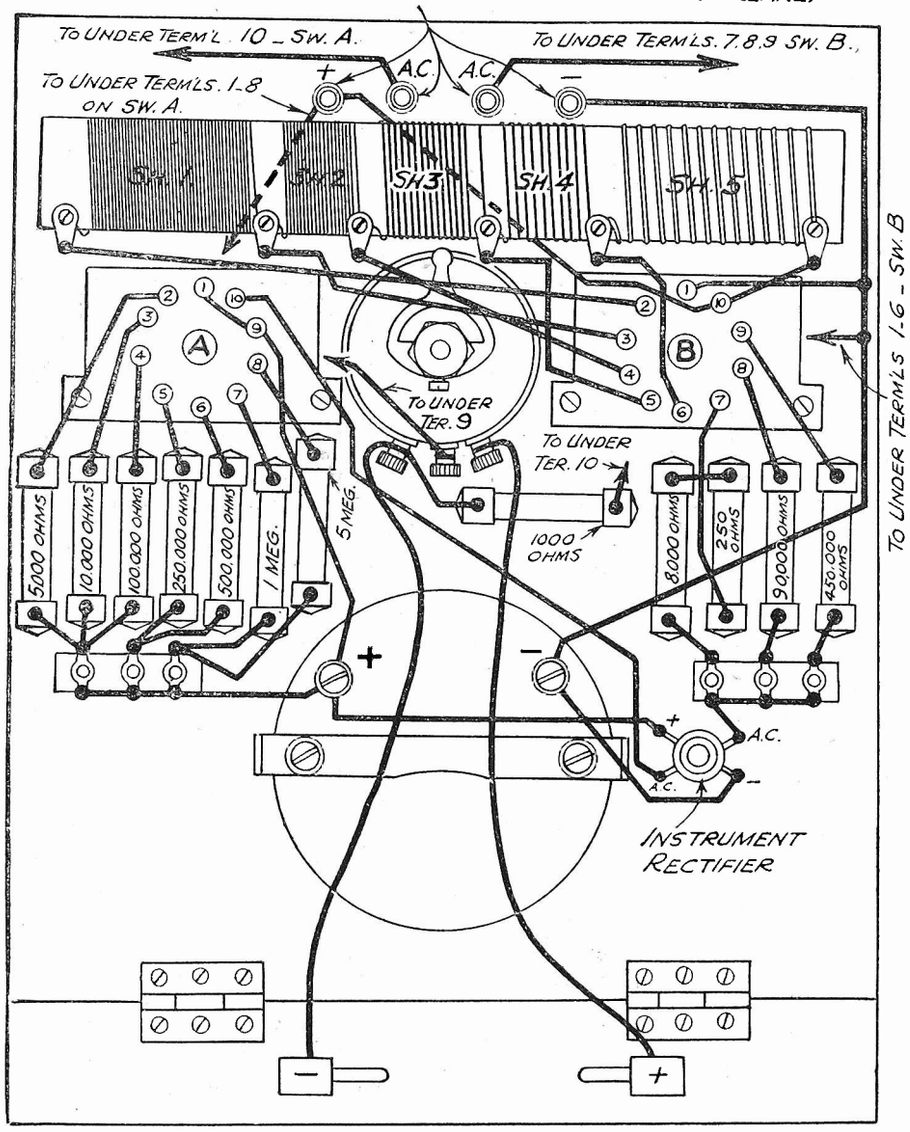
and the circuit is satisfactory for use even up to frequencies of more than 100 k/cs per second.

Resistance Measurement

The circuit used for resistance measurements comprises a low value potentiometer across a battery, with a wander-plug to break the circuit when not in use, and a series resistance of 1,000 ohms. The principle of the circuit is as follows: The potentiometer is adjusted so that 1 volt is applied to the series resistance, thus producing a current flow through the meter with the D.C. output terminals connected together of 1 mA. The potentiometer is therefore adjusted in each case so that, with the output leads connected together, a meter reading of 1 mA is obtained. If a resistance of 1,000 ohms is now connected across the output terminals, the total effective resistance in series will be 2,000 ohms and the current flow will be reduced to 0.5 mA. The scale is accordingly calibrated by dividing the value of the series resistance plus the resistance required to be measured into 1,000 (which is the voltage applied multiplied by 1,000, since the current measurements are in milliamps and not amperes). It is obvious that as the voltage of the battery drops, the adjustment of the potentiometer will mean that that portion of the potentiometer in series with the series resistance of 1,000 ohms will vary. By using a potentiometer of 50 ohms resistance, we ensure that this variation is so small as to make no difference to the calibration.

WIRING DIAGRAM OF THE "MULTUMETER" TEST SET

NOTE:—THESE SOCKETS ARE ACTUALLY UNDER SHUNT STRIP AND ARE ONLY INDICATED IN POSITION BELOW TO SHOW WIRING CLEARLY



SHUNT VALUES :-

SH. 1 = 5 MA. SH. 2 = 20 MA. SH. 3 = 100 M.A SH. 4 250 M A. SH 5. 5 AMPS.

Output Meter

To measure the frequency response of an L.F. amplifier, or for trimming a radio receiver, the A.C. terminals of the meter are connected to the primary of the output transformer of the loudspeaker (one through a 4 mfd. condenser, the other direct) with the meter set for 100 volts A.C. If it is desired to carry out the tests with the loudspeaker disconnected, a dummy load equivalent to the impedance of the output valve should be connected directly across the A.C. output terminals. The watts indicated by the meter will vary according to the impedance of the output valve. Using the 100 volts scale, the watts output for a reading of 0.6 mA would be as follows :—

Valve impedance.	Watts output.
10,000 ohms.	0.36
7,500 ohms.	0.48
5,000 ohms.	0.72
2,000 ohms.	1.8

The scale is calibrated to show the watts output for the most common impedance values of output valves in use, when using the instrument for 100 volts full scale deflection.

When using the 500 volt range with an impedance of 10,000 ohms, the full-scale deflection indicates 25 watts, and the watts output for different values of impedance may be readily calculated by multiplying the value given on the scale for the 100 volts range by 25. Thus a reading of 0.6 mA on the 500 volt range with an impedance of 5,000 ohms would indicate a wattage of 18.

Sometimes it is desirable to have the scale calibrated in decibels, the scale marking being in terms of plus or minus so many dB above or below a standard output of, say, 1 watt. Using the 1 watt range (that is, 100 volts with an impedance of 10,000 ohms), the calibration shown on our scale is obtained. If the same calibration is employed for other values of impedance, the direct gain or loss in dB will still be correct, but the zero level, instead of being 1 watt, will become the full scale value given for that impedance on our scale.

Such an instrument as described here will not be of first-grade accuracy, of course, but it is a very satisfactory meter, and has been found to be quite capable by the author of giving good results when used in servicing both mains and battery receivers. Readers should have no difficulty in making it up from the information and diagrams given.

Dynamic Characteristics of a Valve

Load Line, A.C. Output, and Five Per Cent. Distortion are Explained in This Article by "Radio Engineer"

I HAVE already explained how to prepare and read simple anode current/anode volts and grid volts/anode current curves (June 19th issue, page 315) but, unfortunately, such curves do not convey all the information required when one is designing a receiver, amplifier or component.

The curves are known as *static curves*. They do not, for example, give any indication of the valve's performance during actual operating conditions. It will be remembered that they were plotted by taking several readings at different D.C. values, i.e., grid or anode volts.

What is really required are curves showing the characteristics of a valve under operating conditions—when a *load* is in its anode circuit—and when its anode current and anode voltage are dependent on the value of the load and, in turn, on the grid voltage.

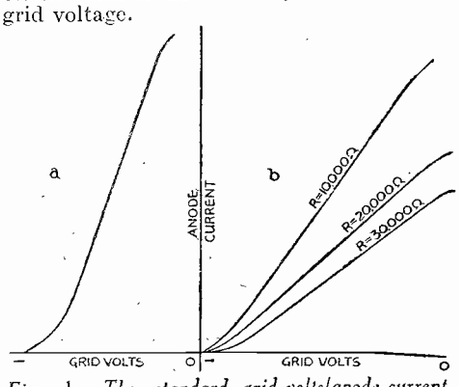


Fig. 1.—The standard grid-volts/anode-current curve, and the effect of varying loads shown graphically.

All these details are most intimately related to each other and, what is even more important, the efficiency of the work of the valve is governed by the ultimate selection of the operating values.

Most constructors have had actual proof of this, especially with L.F. amplifiers, when something has been wrong with the setting of the bias or H.T., or when trying various components or loudspeakers.

Load Effect

Before proceeding further, it is essential that the load effect is understood clearly, therefore, once again must I refer to one of the static curves and refresh your memory about Ohm's Law.

The curve "a" in Fig. 1 will be recognised as a simple grid volts/anode current curve, but those marked "b" will, no doubt, be new to many readers. They represent the effect on the anode current of various loads in the anode circuit, the H.T. being constant. It will be noted that the curves ("b") become less steep as their resistance is increased. In other words, less anode current flows, the reason for this being connected with Ohm's Law as mentioned below.

From the Law it will be remembered that I (current) equals E (voltage) divided by R (the resistance of the circuit), therefore, rearranging the formula, we get E equals I multiplied by R. From this, it will be obvious that the voltage dropped across a resistance depends not only on the value of the resistance but also on the current flowing.

Referring to the curves "b." As the bias is increased, or the grid made more negative, less anode current flows; likewise there is less voltage drop across the resistance but, as the bias is reduced, the anode current increases—the voltage drop becomes greater and, therefore, less effective H.T. reaches the anode, the result being, a flattening out of the curve compared to those of "A."

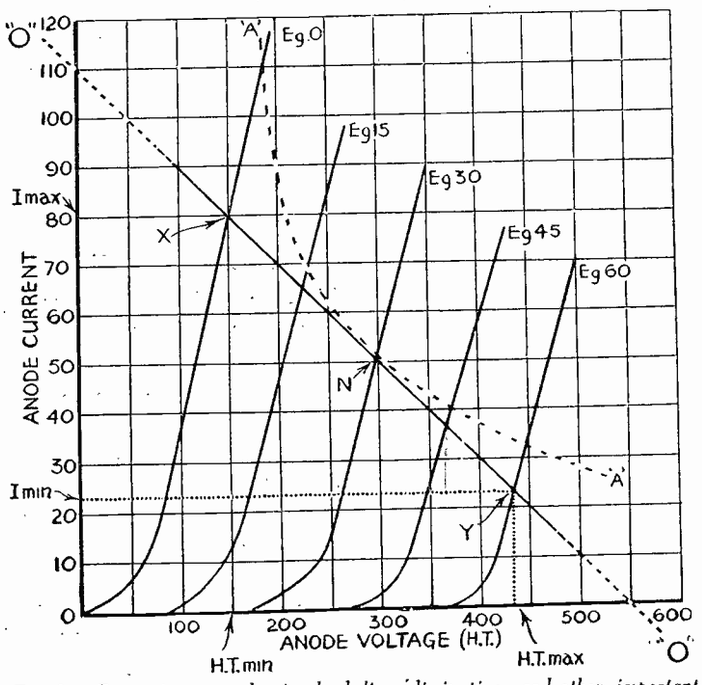


Fig. 2.—Dynamic curve, showing load line, dissipation, and other important working data.

Grid Voltage Values

It is now necessary to draw a series of fresh curves, but with these it is intended to plot anode current against anode voltage at different *fixed* values of the grid bias.

The curves thus formed are shown in Fig. 2. In appearance, they are very similar to the simple curves of "a," but, by plotting a series or *family* of them for different values of grid voltage, it is possible to determine several important items vitally connected with the efficient operation of the valve concerned. The theoretical circuit of the valve arrangement is shown in Fig. 3.

It is usual for the H.T. supply "E b" to be sufficient to supply the anode with its specified operating voltage at the normal anode current. For example, if the valve is rated at about 200 volts (maximum) on the anode, its normal operating current is, say, 20 milliamps, and the load is equivalent to 5,000 ohms, then the voltage dropped across the load will be 5,000 multiplied by .02 amps (20 milliamps), which is equal to 100 volts. This, therefore, necessitates "E b" being capable of supplying a voltage of 200 (required by the anode) plus 100 dropped across the load or, in other words, 300 volts.

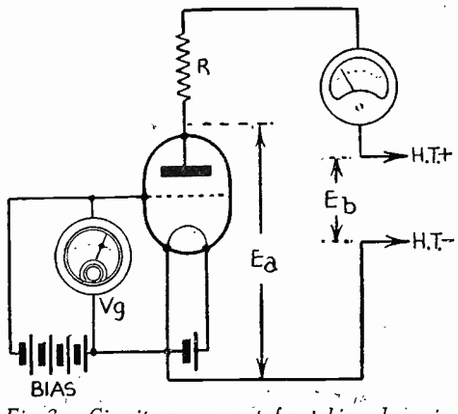


Fig. 3.—Circuit arrangement for taking dynamic curves or other valve data.

The bias values can be taken through the voltage range applicable to the valve under consideration, the limits being, of course, set by the cut-off point, i.e., no anode current, and the saturation point.

Maximum Anode Dissipation

The next thing to consider is the maximum anode dissipation of the valve concerned, as it is essential for the operating conditions to be kept within that limit, otherwise the life of the valve will be reduced.

Assuming that the anode dissipation is 12 watts, it should be noted that that figure represents anode dissipation, and not A.C. or undistorted output, which is a very different item. The anode dissipation is the product of the applied H.T., and the D.C. anode current for that H.T. value. For example, if 250 volts is the maximum anode voltage suggested by the makers, it will be safe to allow an anode current of 48 milliamps to flow, 250 multiplied by .048 (48 mA) equals 12 watts.

To obtain a graphical indication of the permissible dissipation at the various grid and anode voltages of the curves shown, the dotted curve "A" "A" is produced. Its position on any one of the anode volts/anode current curves is determined by the product of the anode volts multiplied by the anode current which, of course, as the current is in milliamps, must be divided by 1,000, the normal operating current for the grid voltages concerned being obtained from the maker's specification, or the grid volts/anode current curve.

(Continued overleaf)

DYNAMIC CHARACTERISTICS OF A VALVE

(Continued from previous page)

Load Line

Now that the limits, so to speak, are set, the next thing is to plot the curve "O" "O," known as the *load line*, which allows the actual undistorted output to be calculated together with the value of load which will give maximum efficiency. The point "N," which represents the normal operating point of the valve, is used for one setting of the load line but, as the degree of slope is of some importance, it is necessary for another point to be fixed also, therefore, it is quite usual to determine the point of *minimum* H.T. volts, and set it off on the zero grid volt curve.

The value of minimum H.T. can be calculated from the impedance of the valve and the normal operating anode current, in the following manner.

Assuming that the ideal load is equal to twice the impedance of the valve—when considering triodes—the minimum H.T. will be equal to that load multiplied by the normal anode current divided by one thousand (if the anode current is in milliamps).

Having determined the H.T. value, a vertical line is then projected from that value until it intersects the zero grid volt curve, the point of intersection "X" forming the second bearing, so to speak, for the load line.

The line can then be drawn through "X" and "N" and continued until it cuts the curve which represents *twice* the *normal* grid bias voltage, point "Y." If, from that point, a line is dropped to the H.T. volt base, it will give the value of the maximum H.T., while the *minimum* anode current can be read off the vertical current scale by projecting the point "Y" to the left. If the load was in the nature of a pure resistance, i.e., no inductance, the line "O" "O" would be perfectly straight, and, if it was continued until it cut the anode current scale and the H.T. base, the H.T. voltage divided by the anode current—at the points of intersection—will give the impedance of the load. If a signal is applied to the grid having a peak voltage swing of, say, 15 volts about the operating point "N," it must be understood that the positive peak will be 30 *minus* 15, i.e., 15 volts, while the peak negative swing will be 30 *plus* 15, or 45 volts. If the values of H.T. and anode current are taken for those grid voltages, it will be seen that they are Eg — 15 = 65 mA at 220 v., and Eg—45 = 37 mA at 370 v. H.T.

Anode Current Swing

From these changes, it is possible to determine the H.T. and anode current swing for the signal in question, by the simple arrangement shown below.

H.T. voltage swing equals $\frac{370—220}{2}=75.$

It should be noted that the division by 2 is necessary as the changes have been produced by the positive and negative swing about the normal operating point, or, in other words, an alternating value is always obtained about its zero point.

The anode current swing is obtained in the same way, namely, it equals $\frac{65—37}{2}=14.$

One item which must be noted from the above example is, that the grid is 15 volts positive at the peak of that half cycle; a very undesirable state of affairs so far as L.F. amplification is concerned. It is, therefore, very essential for the valve to be fully loaded and, quoting the above case again, the maximum swing about "N" should be 30 volts in which case the grid voltage will not go beyond zero in the positive position.

Under these conditions the H.T. voltage and anode current swing would be Eg. "O" = 80 mA at 150 volts H.T. and Eg. 60 = 23 mA at 430 volts H.T., the anode current swing being $\frac{80—24}{2}=28$ at the H.T. swing $=\frac{430—150}{2}=140.$

From these values, the output of the valve can be calculated by applying the formula: Output Watts = (1 max.—1 min.) multiplied by (H.T. max.—H.T. min.), the result being divided by 8.

To avoid confusion, I would mention that 1 *max.* equals the higher value of the anode current, while 1 *min.* equals the minimum or lower value. The expressions concerning H.T. max. and min. apply in the same manner.

Second Harmonic Distortion

It will be appreciated that if distortion (harmonic) is allowed, it will be possible to obtain a greater output for a given valve, therefore, it is necessary to set some limit to the amount of distortion permissible, when carrying out output calculations. With triodes, it has been found that the ear can tolerate 5 per cent. second harmonic distortion without any disagreeable effects, so it is usual to allow that amount and arrange matters accordingly. Without going into minute details, it can be taken that 5 per cent. second harmonic distortion is obtained when the distance "N" "X" is $\frac{11}{9}$ of the distance "N" "Y."

Regarding the slope of the load line and its relation to the value of the external load, the desirable resistance "R1" can be determined from

$$R1=\frac{\text{H.T. max—H.T. min.}}{\text{1 max.—1 min.}}\ \text{(in ohms).}$$

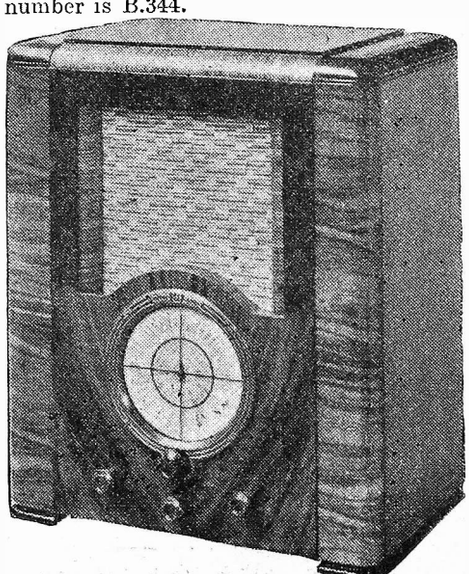
In all the above calculations, it should be noted that "I" is in amperes and H.T. in volts.

NEW PILOT BATTERY RECEIVER

THE latest Pilot receiver to be released is a battery-operated all-wave superhet, incorporating the latest type high-efficiency octal base valves. This is a 4-valve model employing a push-pull output stage, with the usual frequency-changer, intermediate frequency stage, and second detector. This valve also provides A.V.C. There are three wavebands covered, namely, 16 to 52 metres, 168 to 555 metres, and 750 to 2,200 metres, the special large (5½in.) Compass Dial being provided as shown in the illustration, and the separate sections of the dial are illuminated when the wave-change switch is operated.

Amongst the other interesting features included in this receiver may be mentioned the quiescent push-pull stage which delivers to the 8in. high-fidelity permanent magnet moving-coil speaker an output rated at 2 watts undistorted. In addition, provision is made for the use of a gramophone pick-up.

The drive is of the dual-type, providing a ratio of 12½ to 1 for the medium and long waves and 95 to 1 for the short waves, the control knob being pulled out for the change to the higher range. The addition of a variable tone control on the panel enables the user to adjust the output to suit any particular individual taste. The receiver is sold exclusive of the batteries, but the makers recommend a 135-volt medium-power type for the H.T., with a 10½-volt grid-bias battery. For the low-tension any good 2-volt accumulator may be used. The total consumption on the L.T. side is ½ amp. and on the H.T. side the nominal rating is 10 to 12 mA. The price of this model is 11½ guineas, and the model number is B.344.



A front view of the new Pilot battery receiver showing the large tuning dial and attractive cabinet.

PROGRAMME NOTES

B.B.C. Scottish Orchestra

ON July 14th, the B.B.C. Scottish Orchestra, conducted by Guy Warrack, will play: Overture "Cosi fan tutte"—Mozart; Suite, "In Fairyland"—Cowen, which includes (1) Wood Nymphs, (2) March of the Giants, (3) Flower Fairies, (4) Dance of the Gnomes, (5) Moonbeam Fairies, and (6) Dance of the Witches; and Three Hungarian Dances, arranged by Brahms.

Organ Recital from Glasgow

AT the organ of the Regal Cinema, Glasgow, on July 15th, Allan Kennedy will play: "More Irish Memories," arranged by Allan Kennedy; "Chanson," by Friml; and "Waltz-time," No. 2, arranged by Allan Kennedy.

A Circus on the Move

SOMETHING new in circus broadcasts will be given on July 21st, in a recorded outside broadcast feature entitled "The Big Top," which will reveal to Northern listeners many of the wonders performed by the workers who belong to a great travelling show. This programme will come from the Bertram Mills Tenting Circus, and with sound impressions and interviews will give a good idea of the tasks of construction and transport necessary in an organisation whose summer tour means, as a rule, only about three days in any one place.

Practical Television

July 17th, 1937. Vol. 3 No. 59.

Television at Radiolympia

IT has been made known that the plans for showing television at this year's Radiolympia exhibition are now well advanced, and so differ in many respects from those which were made last year. In 1936 the whole scheme was a last-minute effort, each picture shown was shrouded in secrecy as to the company responsible, while members of the public filed through each booth at such a rate that they saw very little of the actual transmission. This year each of fourteen firms (Baird, Cossor, G.E.C., Ekco, R.G.D., H.M.V., Marconi, Philips, Ferranti, Ediswan, Pye, Halcyon, Ultra and K.B.) will have their own demonstration room, with accommodation for a certain number of people to watch each of the nine daily performances. This is certainly a much better arrangement, and it will be interesting to see how the results compare with those shown on the eight cathode-ray tube sets working at the Science Museum, South Kensington, for the two exhibitions overlap. At the last named the sets run for three hours or more daily with but little attention; film pictures from a local scanner being fed to the sets at modulation frequency for every period except when the Alexandra Palace service is in operation in the afternoon, when, of course, the receivers operate from the carrier frequency signal. Every effort is to be made at Olympia to ensure that viewers see the pictures on the commercial receivers for a long enough period to be able to form a correct impression of performance under conditions which will simulate those found in the average home. This, coupled with the special programme arrangements that are being planned by the B.B.C. for the ten days of the show, will bring about a better assessment of television's entertainment value than has hitherto been possible.

A Camera Note

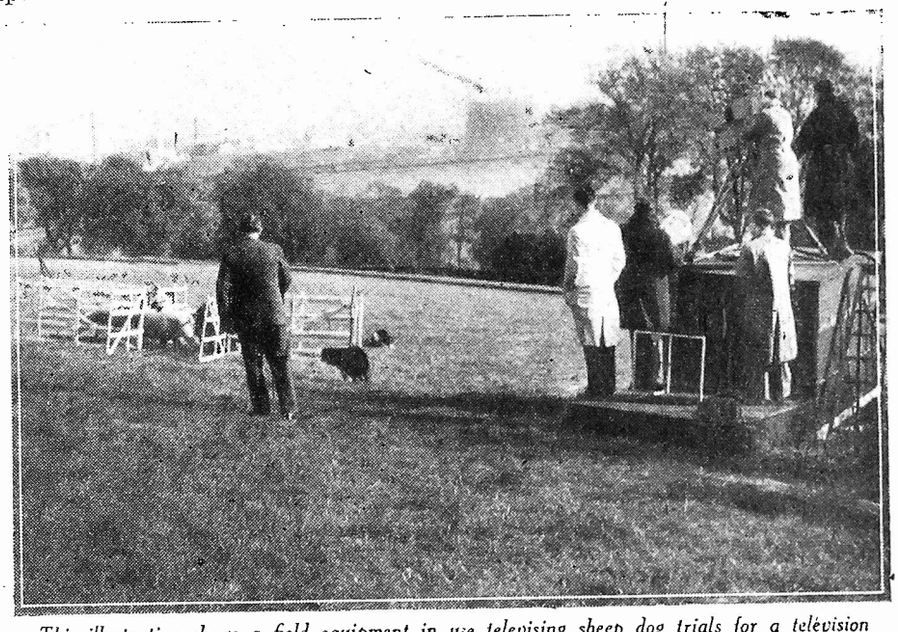
IN the simple explanation of the operation of the Inconoscope camera it is shown that the elements of the mosaic are charged to varying potentials as a result of the photo-electric emission caused by the focusing of the optical picture to be televised on to the signal plate. The electrons so lost by this action are restored by the electrons in the scanning beam during part of the time that the beam is incident on any one element. The restoration of the element to its original equilibrium potential occurs in a minute fraction of time, and careful investigators have raised the question of what happens during the remainder of the period of beam incidence after the element's charge has been restored. The secondary emission current which can be furnished by the mosaic is much greater than the beam current, but since the beam current for the camera's correct functioning must restore every element's equilibrium, it is easy to see that the secondary emission does not work near saturation conditions at all, and in consequence the full value of the camera's potentialities are not realised. Again, the condition of photo-electric emission does not approach saturation point, for approximately the same collector element voltage is required for saturation in both secondary and photo-electric emission. Due to this apparent inability to operate near the condition of saturation, sudden changes of light value or brightness, as are common in film transmissions, tend to cause a measure of momentary fogging because of the relatively slow dispersion of the locally increased space charge over the surface of the mosaic plate.

Avoiding Stray Fields

SINCE the functioning of a cathode-ray tube television receiver depends upon a beam of electrons obeying exactly the modulation and deflecting forces produced in the appropriate sections of the set, it is clear that any stray external electric or magnetic fields of force are liable to upset the carefully preconceived conditions of equilibrium. Adequate shielding precautions are therefore undertaken when designing the set to ensure that as far as is possible any outside field of force will have its prospective deleterious effects nullified. For example, in many cases Mumetal cylinders surround the bottom section of the cathode-ray tube neck where the electrode assembly is accommodated. Steps are even taken to counteract the effects of the earth's magnetic field by a careful setting up of the set on the site it is proposed to work in practice. Proper bonding or earthing between separate chassis is studied, while of recent date a scheme has been propounded to prevent stray external fields from affecting the electron stream in the cathode-ray tube while it is passing through the horizontal and vertical deflector plates of an electrostatically operated tube. Normally, these consist of two open pairs of plates, but in Germany it has been proposed that the edges of the plates are closed by thin sheets of high resistance material. The electron beam is thereby given a free passage through what resemble open ended boxes.

Big Screen Brightness

ONE of the fundamental necessities for big screen television is to secure sufficient picture brilliance so that the images can be watched without any trace of eye-strain. This is not a simple problem, no matter what system is in use. The early experiments on the modulated are definitely solved it, but, unfortunately, it was found that high powers were required to give adequate modulation, while there was a frequency limit which precluded its use for high-definition pictures. The screen employed for the back projection of these pictures makes a material difference to intrinsic brilliance of the picture, and two conflicting points arise in this connection. A simple ground-glass screen, while losing a certain degree of the light available, gives a bright picture but is rather directional in character. That is to say, the angle of vision is narrow, and while suitable for a narrow hall, when it is shown in a wide hall the picture is quite indistinct to people seated at the sides of the stalls or circle. In providing a dispersive screen to enable large audiences in any shaped hall to view the picture in comfort in any part of the seating accommodation, a proportion of the light is lost. When comparing large screen television pictures of different systems, therefore, this important factor must be taken into full consideration or a false assessment of values will be obtained.



This illustration shows a field equipment in use televising sheep dog trials for a television programme broadcast from the Alexandra Palace.

"THE RAFT"

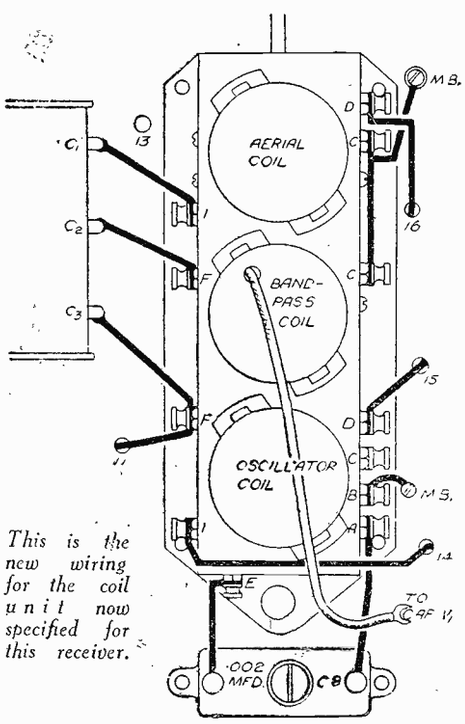
The first Stephen Leacock play to be adapted for television will be transmitted in the evening programme on July 15th, when "The Raft" will be presented by Jan Bussell. "The Raft" is a burlesque sea adventure in which the hero and heroine are discovered adrift in the Caribbean Sea. The carpenter's shop at Alexandra Palace is now busy on the raft.

Another Leacock play, from "Behind the Beyond," will be televised shortly.

Constructional Details of "Practical Wireless" Receivers—9

This Article Deals with the Modernising of the A.C. Version of the Popular £5 Superhet Three Receiver

THIS receiver is the mains (A.C.) model of the popular three-valve receiver which was described in 1934, and many readers still prefer this simple type of superhet in spite of the absence of A.V.C. and other features now met with in the modern superhet receiver. As will be seen from the circuit diagram below, a pentagrid frequency changer is employed, followed by an H.F. pentode employed as an I.F. amplifier. This feeds a Westector as second detector, which is coupled to an output pentode by an auto-transformer. Pick-up connections are provided, although the amplification given by the single L.F. stage may not prove sufficient if a weak or insensitive pick-up is employed. In the circuit diagram the mains section is shown separately, but this is only for convenience in the drawing, and in the complete receiver the mains transformer and metal rectifier are mounted on the same chassis upon which the receiver is assembled, thus making the receiver entirely self-contained in a single unit.



This is the new wiring for the coil unit now specified for this receiver.

Modern Components

From the components which were previously specified for this receiver, the only items which are no longer available are the tuning coils, and thus very little modification is required in order to bring this receiver up to date. A Varley BP.111 unit is therefore now specified, and the modified connections to this are shown in the accompanying illustration. It will be noted that the home-made coupling condenser originally specified is not required, as the coils incorporate a special coupling winding and therefore hole number 13 is not used.

Operation

The receiver is ganged in the usual way, adjusting the three trimmers on C1, C2 and C3, together with those on the I.F. transformers, for maximum response. If a calibrated oscillator is not available, trial and error is the only method of carrying out these adjustments. Care is necessary, as a wrong I.F. adjustment will result in stations being received only at one part of the dial. The pre-set condenser C8 behind the coil unit is employed only for the long waves, and consequently, when switching over to this part of the waveband, no further adjustments should be made to the I.F. transformers or the ganged condenser trimmers. Merely adjust C8 for maximum response, and as this condenser is short-circuited on the medium waves, the previous trimming adjustments will not be affected.

The set is reasonably silent in operation, the merest trace of hum being discernible with no signal. The selectivity is adequate for all normal requirements, and the aerial should not be too large, especially if the set is used close to a powerful B.B.C. station, as this may result in some difficulty either from whistle interference or from other forms of interference. In most cases a short wire from 20 to 30ft. in length will bring in all that is required for normal entertainment purposes, and to ensure stability a really sound earth connection should be employed.

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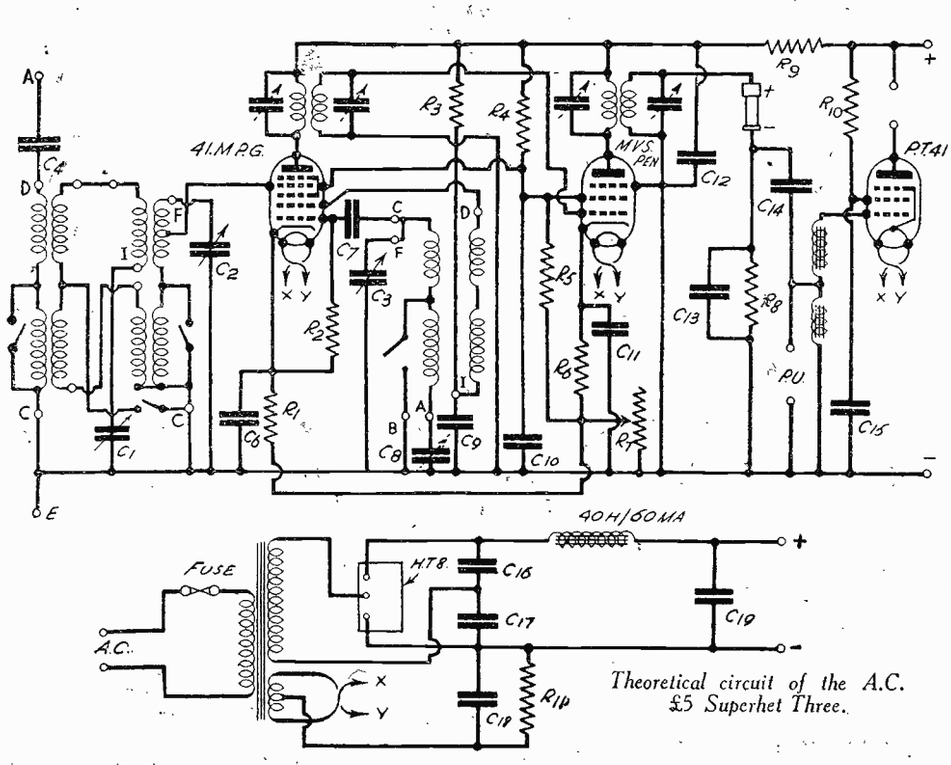
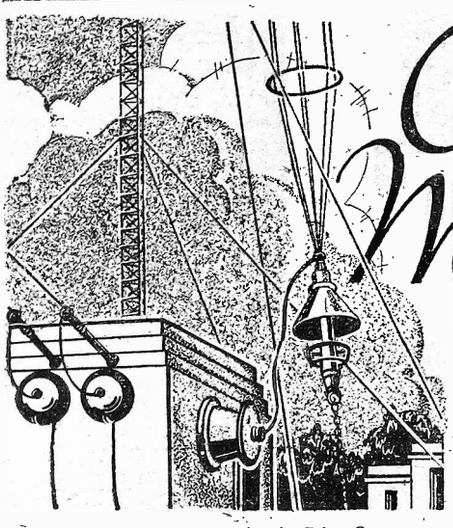


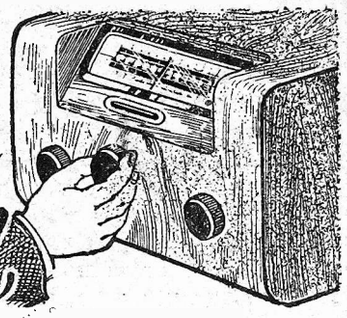
Theoretical circuit of the A.C. £5 Superhet Three.

LIST OF COMPONENTS.

One Coil Unit, type BP.111 (Varley).
One 3-gang Superhet Midget Variable Condenser (C1, C2, C3), type 2124B, and Disc Drive (J.B.).
Two "Practical Wireless" I.F. Transformers (110 kc/s) (Varley).
One 3.5 -1 L.F. Transformer (B.T.S.).
One .002 mfd. Formodenser, type H (C.8) (Formo).
One 2,500 ohm Potentiometer (R.7) (Varley).
Twelve Fixed Condensers, .0003 mfd., type M (C.4); .0001 mfd. (C7), type M; .0001 mfd., type M (C13); Four .1 mfd., type 250 (C6, C9, C10 C11),; .5 mfd., type 50 (C14); 2 mfd., type 84 (C15); 1 mfd., type 84 (C12); 4 mfd., type 84 (C19); 25 mfd., electrolytic type 511 (C18) (T.C.C.).
One L.F. Choke, 40 hy. 60 mA. (B.T.S.).
Seven 1-watt Fixed Resistances, 100,000 (R2), 20,000 (R3), 30,000 (R5), 20,000 (R4), 100,000 (R8), 5,000 (R10), 30,000 (R9) (Ferranti).
One 2-watt Fixed Resistance, 350 ohms (R11) (Dubilier).
Two 1-watt Fixed Resistances, 100 ohms (R1) and 150 ohms (R6) (Dubilier).
One Potentiometer Bracket (Peto-Scott).
One Westector, type W6 (Westinghouse).
One Mains On/off Switch (Becker or Bulgin).
One ½amp. fuse (Microfuse).
Two 7-pin Sub-baseboard Valveholders (Clix).
One 5-pin Sub-baseboard Valveholders (Clix).
One A/E Socket Strip (Clix).
One L.S. Socket Strip (Clix).
One Mains Unit, type P.P. (Heayberd), includes: Westinghouse H.T. Rectifier, Mains Transformer, two 4 mfd. Condensers (C16, C17).
One Metaplex Chassis (Peto-Scott).
Three Valves: 41 MPG, MVS-Pen., PT.41 (Cossor).
One PMS.1 Stentorian Senior Moving-coil Loudspeaker (W.B.).



On Your Wavelength



By Thermion

Are You On the Black List?

MY final notice to secretaries of delinquent clubs having expired, I have deleted from the published list of Radio Clubs and Societies all those known to be in existence but who have not responded to my request for the name and address of the secretary and other officials. You may take it, therefore, that the recent list in PRACTICAL AND AMATEUR WIRELESS, minus those without names and addresses of secretaries, represents the only complete and authoritative list of Radio Clubs and Societies. All others as far as our readers are concerned must be ignored, for it is obvious that members of those particular clubs do not read this journal, and as such must be behind the times. And if you are behind the times you have no place in the columns of PRACTICAL AND AMATEUR WIRELESS, the leading, most up-to-date, and only complete technical periodical and newspaper for all English-speaking countries.

Sets with Frills

IT was recently my painful duty to adjust a set for a friend of mine for which he had paid lashings of good guineas. It was complete with double diode triode, heptode, pentodes, and all the other odes, but I felt like anything but writing an ode about it. It was fitted with noise-suppression, tone control, volume control, reaction, and so on. It was attached to a most efficient aerial and earth system, but on the radiogram side it functioned like a one-valve set. As it was impossible to obtain reaction or oscillation on any of the wave-bands the noise and interference suppression controls were just a joke. The set received exactly three stations on the medium-wave band, and Droitwich on the long-wave band. The set was housed in a most ornate cabinet. I could do nothing for him short of changing the circuit. Purchaser very disgruntled; written fuming letter to makers, so far without satisfaction. Suggested that he should listen to my set, home-made. Said purchaser vowed never to buy another set, and has already purchased set of components. Many of the sets on the market bristle with sales points, but are singularly lacking in efficiency. The greatest joke of all is the elaborate tuning scales suitably inscribed with every station extant, whilst the sets to which they are fitted will not receive them. Loud laughter.

Black Lists

I BELIEVE that it is illegal for any industry to publish a black list of dealers known to abrogate the rules of decent trading, except in the way of privileged publications. There is nothing, however, to stop them publishing a White List of approved dealers. One firm has already promised to do this, and I hope that it will result in cleaning up the wireless trade. I hope particularly that it will expunge those members of the wireless trade who do not take the trouble to learn, but prefer to batten themselves like barnacles and parasites upon decent society. The radio trade is full of them; they know nothing of wireless, but pride themselves upon being able to sell anything. They usually do by dishonest means.

Cheap Batteries

THE battery war continues. A certain group of set manufacturers, unable to obtain what they want in the way of a cheap battery, have gone outside the ring and are now supplying one costing 5/-. I have not tested one of the latter products, and will reserve my judgment until I am afforded an opportunity of doing so. In the meantime, I shall continue to buy batteries round about 12s. or so.

The New Models

JUST in case we need a reminder of the proximity of Radiolympia, the new set releases are beginning to trickle through. The G.E.C. and Pye and Ferranti and H.M.V. have already announced new models, so have Milnes, whilst Marconi announce their release of International Valves, and Murphy their 34 series of radiograms.

Cossors announce new valves in the form of two output tetrodes; Decca announce their all-wave Portrolla radiogram, and Mullard their E series of valves for car radio. Between now and the middle of August the coming fashions will cast their shadows before them in the form of news promptly, and faithfully recorded in these columns.

The International Broadcasting Union

THE International Broadcasting Union has concluded its 1937 Summer Meeting at Ouchy, Lausanne (Switzerland). The Meeting comprised, as usual, meetings of the Assemblée Générale, the Council and the various committees. Monsieur Rambert (Switzerland) presided, and delegates attended from the broadcasting companies of twenty European nations, including the Vatican City, as well as a number of observers from European P.T.T. administrations, representatives of the National Association of Broadcasters (Washington), the Columbia Broadcasting System, the National Broadcasting Company (New York), the Radio Corporation of America, the P.T.T. Administration, and the Broadcasting Company of the Dutch East Indies (N.I.R.O.M.). In addition, observers were present from the office of the International Telecommunications Union at Berne, the International Organisations of Intellectual Co-operation, and the League of Nations (communications and transit section).

It was decided to invite the Commonwealth of Australia to arrange the fourth Inter-Continental Concert, to be broadcast next spring.

The programme committee's agenda included suggestions for

studies of an international scope, or work connected with programmes. It drafted recommendations which were later adopted by the Council, in connection with a plan for a "Travellers' Exchange," by which travellers to foreign countries will make known to the public of their own country the life of those countries. The committee also made suggestions as regards new ways of extending the use of programme sources which members of the Union have at their disposal, and drafted suggestions which were later adopted by the Council with a view to regular meetings of representatives of the different programme departments of its member broadcasting organisations.

Investigations were also made into the possibility of an exchange of gramophone records of historical interest for broadcasting.

Interference Problems

THE technical committee again considered aspects of many problems affecting the operation of European long and medium-wave and of short-wave stations. It reaffirmed that it had not been possible to solve the several serious cases of interference in the long-wave band by the Lucerne Plan or by arrangements with other radio services. In the medium-wave band, a higher stability of certain transmitters could make it possible to reduce interferences now existing. With a view to the Cairo Meeting, the technical committee continued its study of the short-wave bands, where the situation is steadily becoming more serious, owing to the number of stations in bands too narrow to contain them. At the request of an Inter-Continental meeting, recently held at Bucharest by the U.I.R., the technical committee prepared a programme of tests involving the close collaboration of American stations. These tests will take place within the next few months, so that the results obtained may be used by the Cairo Conference in the preparation of a world plan for the distribution of short waves. Bearing in mind future improvements in the European bands, the technical committee has confirmed the advantage resulting from the adoption of synchronised transmitters for national systems, as compared with the system of waves shared between different countries. In addition, the committee has continued its regular studies regarding microphones, studio acoustics, and anti-interference campaigns in co-operation with the "Comité International spécial des perturbations radiophoniques."

Notes from the Test Bench

Ganging Trouble

IT is sometimes found that optimum results cannot be obtained on both wavebands of a receiver unless the gang-condenser trimmers are readjusted after changing over from one band to the other. This is a very common trouble if the coils have been home-constructed and is due to incorrect matching of the coil windings. If the aerial is tapped on to the grid winding, it can also be due to the aerial-earth capacity effect being greater on one band than on the other. We received a query from a reader just recently concerning this trouble. He complained that the trimmer of the gang-condenser section connected across the H.F. coil had to be screwed in two turns after changing over from the medium to the long-wave band in order to obtain good long-wave reception. The easiest way to remedy this fault, in most cases, is to connect a low capacity preset trimmer condenser across the long-wave winding of the coil. The circuits can then be correctly trimmed for medium-wave reception and the extra trimmer adjusted afterwards to obtain correct matching on the long-wave band.

Parallel-feed Transformers

WE are often asked whether a straight transformer can be used in place of a special parallel-feed type. Generally, the latter type can be replaced by the straight two-winding type by connecting the coupling condenser to the P terminal and the H.T. terminal to H.T.—. It is unsafe to use the parallel-feed type in a straight circuit, however. Some of these special types have only one winding, tapped to provide a primary and a secondary section, and therefore if one of these were used in a straight circuit the H.T. would be shorted to the grid of the succeeding valve. Even if two windings are fitted it is generally found that results deteriorate if a current in excess of about 1mA is passed through the primary winding, and therefore it is only in special cases that a transformer designed for parallel coupling can be recommended for use in a straight-coupled circuit.

Coil for Experimenters' One-valver

SEVERAL readers who are interested in the one-valver described by the Experimenters want to know whether a commercial coil can be used in this receiver in place of the home-made coil specified. Any reliable coil having primary, grid, and reaction windings may be used, provided it is wired in accordance with the manufacturer's instructions—the Varley B.P.80 is quite suitable.

The juridical commission continued the study of questions normally on its agenda, in particular, problems regarding copyright, the revision of the Berne Convention, the wrongful use of transmissions, etc. The committee also studied the various juridical problems which the development of television brings into being.

African Chief and the Gramophone

WE are informed that for the first time in history an African Chief utilised modern Western methods for making a speech to his subjects when the Alake of Abeokuta visited the "His Master's Voice" factories at Hayes, Middlesex, recently.

The Alake and his party, which included one of his chieftains and his umbrella man (a personal servant who always accompanies the Alake carrying the Umbrella of State), were received by Sir Louis Sterling, Managing Director of "His Master's Voice," and shown many of the interesting processes involved in the manufacture of H.M.V. radio and records.

An amusing incident occurred in the assembly factory when the Alake refused to have a photograph taken without the State Umbrella being in position above his head. As soon as this was opened it called forth peals of laughter from the girl workers in this section of the factory. When the Alake arrived in the record factory he pressed a record by Paul Robeson, and subsequently recorded a speech to his subjects in their native tongue. Arrangements have been made for copies of this record to be sent out to Abeokuta. At the conclusion of his visit the Directors of "His Master's Voice" presented the Alake with a portable gramophone for his personal use in Nigeria. An illustration showing the Alake at the H.M.V. factory appears elsewhere in this issue.

Waxes Rushed to Hayes

THE waxes of the King's recent speech were numbered and packed up as they came off recording machines to avoid delay, so that at the end only the last few waxes remained to be dealt with. A van rapidly transported these waxes to Hayes, where special arrangements had been made to process the recording and to have the samples available at the earliest possible moment. Arrangements were made with the police to enable this van to get through the crowds to the factory.

For the recording of H.M. The King's speech during the evening a similar procedure was adopted, using the same number of machines and staff.

The Advantages of Headphones

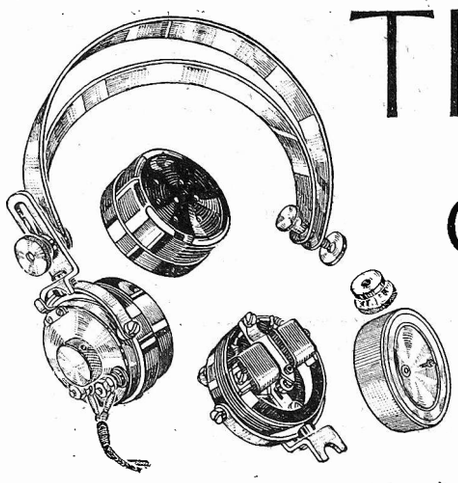


Fig. 1.—A complete earpiece and details of the reed type headphones made by S. G. Brown and Co.

The Various Characteristics and Uses of Modern Headphones, Particularly with Regard to Short-wave Work, are Briefly Explained in this Article

THE extensive and ever-growing demands for headphones in the numerous branches of radio have become more evident over the past few years with the unprecedented experimenting by short-wave enthusiasts, it being now more generally acknowledged that the only way of obtaining a response over a wide frequency range is in the employment of this method of reproduction, even in cases where the receiver is capable of driving a loudspeaker.

There are numerous reasons for this; for example, when searching for a particular station it is not always desirable to "scan" the whole waveband at the full volume necessary for locating the very weak transmissions, and consequently the simple expedient of "plugging-in" a pair of headphones, and reducing the volume of the receiver, enables the station to be located prior to switching over to the loudspeaker.

Owing to the very close proximity of the vibrating medium to the human ear, all emanating sounds will be immediately accepted by the ear without the intermediate losses usually occasioned when using a loudspeaker; for example, there is the effect of the resistance of the air and the directional relationship of the ear to the sound waves. This will be more clearly understood if one considers the effect of a passing automobile with its hooter on; as the car approaches, the note of the hooter appears to become about a semi-tone higher, and then diminishes to its original tone as the car draws away. This effect is due to the absorption of the potential velocity of the sound-waves over the intervening space. It will be appreciated that any extraneous noises will tend to mar reception if the earpieces are not carefully designed and fitted, and the greater degree of concentration—particularly necessary for DX work—will not be possible.

Now, concerning the movements, it will be realised that the degree of mechanical movement necessary to respond to a very sensitive signal which would be perceptibly transmitted to the ear is small; consequently, mechanical resonance is minimised with the reduction in metal, the sensitivity being increased somewhat by the critical adjustment necessary for such a small movement to respond over a wide frequency range. It will readily be understood that in a badly designed unit parasitic noises and resonant frequencies may be generated and superimposed upon certain frequencies.

From these observations it can safely be said that the nearest approach to true reproduction can only be obtained by the use of good-class headphones, and some of the products on the market today embody the essence of years of research in an effort to attain true quality with "critical" sensitivity.

Types of Movement

The original disc diaphragm type, although still widely used, has been superseded by two other designs, namely, the "Reed" type, and the moving coil, and Fig. 1 shows the essential features of the reed type earpiece as manufactured by S. G. Brown and Co. This is known as the type "A" adjustable reed headphone, and was invented by Mr. S. G. Brown as far back as 1908. It will be seen that the improvement lies in the employment of a diaphragm spun in conical form from aluminium (.002in. thick), the effect being to give extreme lightness with great rigidity. This diaphragm is actuated by an armature to which it is affixed by a small screw. The movement is tuned to a frequency of 900 cycles per second, and with this reed type armature held in extremely sensitive suspension between the influence of a very powerful magnet—of 35 per cent. cobalt steel—and its own tension, minutest changes in the coils will bring about a decided response in the diaphragm.

Fig. 2.—Lightweigh headphones made by Ediswan Electric Co., Ltd.

Other features in this very well-known model are the incorporation of laminated pole pieces, as against the more usual solid type to be found in the ordinary diaphragm movements. The adjustment of the pole-piece-to-armature air gap is effected by a knurled screw, the thread of which is cut at 80 turns to the inch, thus enabling the adjustment to be easily and steadily controlled. These headphones are light in weight and constructed from the finest materials obtainable.

With their world-wide reputation for overall efficiency these 'phones are marketed at 50s. per pair, and they are considered to be the finest and most sensitive procurable.

The type "F" headphones manufactured by the same company constitute another fine example of combined efficiency and economy. These employ a flat stalloy diaphragm, and weighing only 6oz., they are particularly comfortable, and suitable for ladies. This model is priced at 20s. per pair, and, as with type "A," any resistance value may be obtained when purchasing either of the models, without extra charge.

Fig. 2 illustrates another pair of lightweight headphones manufactured by the Ediswan Electric Co., Ltd. These are fitted with special hygienic featherweight earcaps, highly sensitive earpieces, and provision is made for universal adjustment. The chromium headbands are particularly comfortable by reason of their lightness.

Each earpiece has a resistance value of 2,000 ohms, making a total resistance of 4,000 ohms, and these headphones are listed at 14s. 6d. per pair.

Moving-coil Model

Amongst the moving-coil class are two models which have some particularly outstanding features, and these are the "Voluphone" types manufactured by the Wharfdale Wireless Company, of Bradford. These units are actually miniature moving-coil speakers, and may be used as such, but the provision of a volume control permits individual listening, for which, of course, they are intended. The body of each unit is constructed from light but strong aluminium and is finished in a shade of rich brown enamel.

"Alnico," the most effective magnet metal in use to-day, owing to its combined extreme lightness and high state of sensitivity, is used as the magnetising agent, and the cone and coil assembly is so designed that the required response over a wide frequency range is attained.

The only difference between the "Standard" model and the type "98" lies in their respective coil characteristics, the "Standard" working from 1½ to 4 ohms extension points, whilst the "98" matches any receiver with 6 to 10 ohms speaker points, from which it will be seen that the majority of well-known receivers are suited, but when required for use with a receiver having a high-resistance output, a transformer will be necessary.

Every consideration for invalids and those

(Continued on the next page)

THE ADVANTAGES OF HEADPHONES

(*Continued from previous page*)

hard of hearing has influenced the unique design of the "Voluphone," and whilst those suffering from any degree of deafness may adjust the volume control to their requirements and appreciate every note and word in the broadcast, invalids requiring as little disturbance and noise as possible will find reproduction more enjoyable by similarly controlling the output, without any reduction in clarity and quality.

The employment of a "Voluphone" as a microphone will be the means of providing further amusement at parties, and a transformer is all that is necessary, the primary being connected to the pick-up terminals and the secondary to the "Voluphone." The manufacturer's output transformer, listed at 7s. 6d., is suitable and should be wired close to the receiver.

Further particulars of the "Voluphone" are as follow: Acoustic output, 5,000 to 9,000 cycles; diameter of head-piece, 4¼in.; height, 6in.; weight, 18oz. Prices: "Standard," 39s. 6d.; type "98," 39s. 6d.

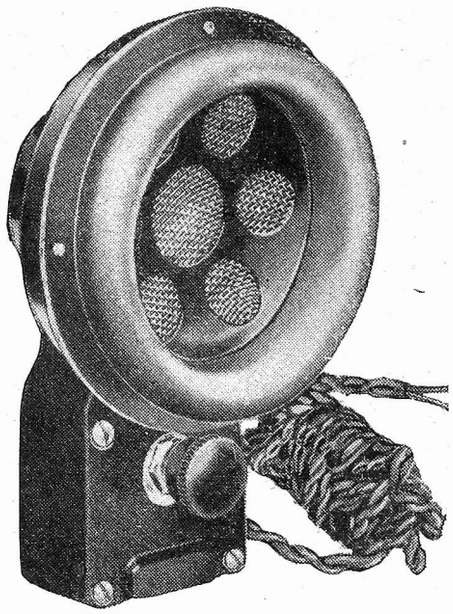


Fig. 3.—The Voluphone speaker unit.

Important Broadcasts of the Week

NATIONAL

Wednesday, July 14th.—Cinema Variety programme from the Union Cinema, Kingston.

Thursday, July 15th.—Concert Party programme.

Friday, July 16th.—Chamber Music.

Saturday, July 17th.—Commentaries on the Davis Cup Interzone, from Wimbledon; The King's Prize, from Bisley, and the A.A.A. Championships from White City.

REGIONAL

Wednesday, July 14th.—Hay Fever, a play by Noel Coward.

Thursday, July 15th.—Micah Clarke, a radio play by John Holloway.

Friday, July 16th.—What is Grassland? Experts Talking, an informal discussion from the Fourth International Grassland Congress, Aberystwyth, 1937.

Saturday, July 17th.—Bruckner Festival Concert, from the Festival Hall, Linz (Upper Austria).

MIDLAND

Wednesday, July 14th.—Two Crime Plays: The Vagaries of Spring, by D. C. M. Pens, and Chance is No Artist, a detective play by Ben Pomerance.

Thursday, July 15th.—Variety from the Hippodrome, Coventry.

Friday, July 16th.—English Song Writers, Julius Harrison: vocal programme.

Saturday, July 17th.—The International Six Days Motor cycle Trial; a commentary from Donington Park.

NORTHERN

Wednesday, July 14th.—The Great Yorkshire: Yorkshire Agricultural Society's Centenary Show, recorded interviews with interesting personalities, followed by Variety from the Stockmen's Concert.

Thursday, July 15th.—Morecambe Night's Entertainment: Dance Band from the Winter Gardens Ballroom, etc.

Friday, July 16th.—Chamber Music.

Saturday, July 17th.—Water Polo: Lancashire v. Yorkshire, a running commentary from the Beverley Road Baths, Hull.

WESTERN

Wednesday, July 14th.—A Variety programme from the stage of the Prince's Theatre, Bristol.

Thursday, July 15th.—Micah Clarke, a radio play by John Holloway.

Friday, July 16th.—As sung with Enthusiastic Applause, being a reconstruction of one of the celebrated Bath concerts (Circa, 1820).

Saturday, July 17th.—Yachts at Plymouth, an account of the racing that has been taking place during the Plymouth Yachting Week.

WELSH

Wednesday, July 14th.—The Royal Visit to Wales: The arrival of The King and Queen at the City Hall, Cardiff, and eye-witness accounts of the proceedings at Newport, Cardiff and Swansea.

Thursday, July 15th.—The Royal Visit to Wales: The Opening of the extension to the National Library of Wales at Aberystwyth, by The King.

Friday, July 16th.—Cyngherdd o Faledi, a ballad concert.

Saturday, July 17th.—Banjo, Mandoline and Guitar Band programme.

SCOTTISH

Wednesday, July 14th.—Co Chruinneachadh nan Ceilteach Ceilidh (Celtic Congress Ceilidh).

Thursday, July 15th.—Aikey Fair, an impression in sound of the Origins, Rise and Decline of a famous market from 1661 to 1937.

Friday, July 16th.—Celtic Congress: Part of a concert from the Music-hall, Edinburgh.

Saturday, July 17th.—Variety programme.

NORTHERN IRELAND

Wednesday, July 14th.—Stop Dancing: Programme of very light music.

Thursday, July 15th.—Light Orchestral programme, from the Chalet, Crawfordsburn.

Friday, July 16th.—What is Grassland? As Regional.

Saturday, July 17th.—The Ulster Derby, a running commentary from the Maze Racecourse, near Lisburn.

TELEVIEWS

An Installation Problem

ALTHOUGH the conversion of D.C. mains to alternating current working is taking place at a reasonable rate, there are still many districts where television receivers are installed and D.C. mains are the only source of electrical supply. This is a problem which has to be faced by the television engineer, and in many cases the difficulty has been met by using a motor alternator suitably smoothed and free from commutator sparking troubles which are liable to show as distributed light patches on the C.R. tube screen. Naturally, this adds to the expense of the equipment as also does the alternative of gas-discharge rectifiers. Apart from the elaborate smoothing, good regulation is essential to counteract the effects of any violent mains voltage fluctuation. Another suggestion which has been put forward is that the D.C. mains can be connected to a back-coupled valve which is made to generate high-frequency oscillations. These are fed to the primary winding of a step-up transformer, rectified and then used for the high-voltage supply for the anodes of the cathode-ray tube. By locking the valve oscillator through the medium of the synchronising pulses incalcate in the radiated television signal, it is claimed that the degree of smoothing necessary with a device of this character is very much simplified.

In Germany

IN anticipation of this year's Berlin radio exhibition, which for the first time opens several days before our own Radiolympia, the television firms of that country are making strenuous efforts to stage demonstrations and displays which will show a marked improvement on those of last year. Readers will remember that on that occasion pictures were shown having a higher definition than those now being radiated by the B.B.C., but these were in "short circuit;" that is, fed by line. So far no apparent attempt has been made to provide the German public with a regularly scheduled service comparable with that in this country. The experimental pictures radiated in Berlin are still only of 180-line definition, 25 pictures per second, scanned sequentially. Mechanical disc scanning at the transmitting end is still employed for the spotlight, intermediate film and telecine pictures. This, no doubt, is due to the fact that all electron camera development work is carried out under the jurisdiction of the Government and only rumour gives any criterion as to the degree of progress made. Telefunken are known to be keen on the Iconoscope, while Fernseh A.G. have tried both this camera and the image dissector tube, the principles of which were first propounded by Farnsworth in America. If only some common picture standard could be agreed upon by the various American and European television interests so that an interchange of receivers could take place, there is no doubt that the rate of television's progress would be increased. Possibly this situation will materialise in due course, but it is gratifying to know that up to the present this country has collected most of the bouquets for having shown quite openly what an excellent service can be provided with first-class equipment at both the transmitting and receiving ends.

BRIEF RADIO BIOGRAPHIES—15

By RUTH MASCHWITZ

Tommy Handley

TOMMY HANDLEY was born in Liverpool. He told me that after leaving school he entered a corn merchant's office where he learned to flick corn with incredible accuracy at adjacent office windows. He became a commercial traveller by day and an entertainer by night. Fired by ambition to become a stage star he threw over the corn business and went to London where he managed to get into the chorus at Daly's and understudy the comedian's part. When the latter was "off" he played the part and subsequently went on tour in it.

During the War he served with the Kite Balloon Section of the R.N.A.S., and after demobilisation played in several musical comedies. He joined the firm of Walls and Henson when it first started with Bobby Howes, and went on tour with his famous music-hall sketch "The Disorderly Room." This had a Command Performance at the Coliseum in 1925.

A year later while playing in the Palladium Revue "The Whirl of the World" he was offered his first radio engagement and has broadcast ever since—in revue, vaudeville, operetta, pantomime and surprise items. He has also written many radio shows of his own including "Handley's Manœuvre," "Hot Pot Pourri," "Tommy's Tours," etc.

Tommy Handley is here seen with his wife.

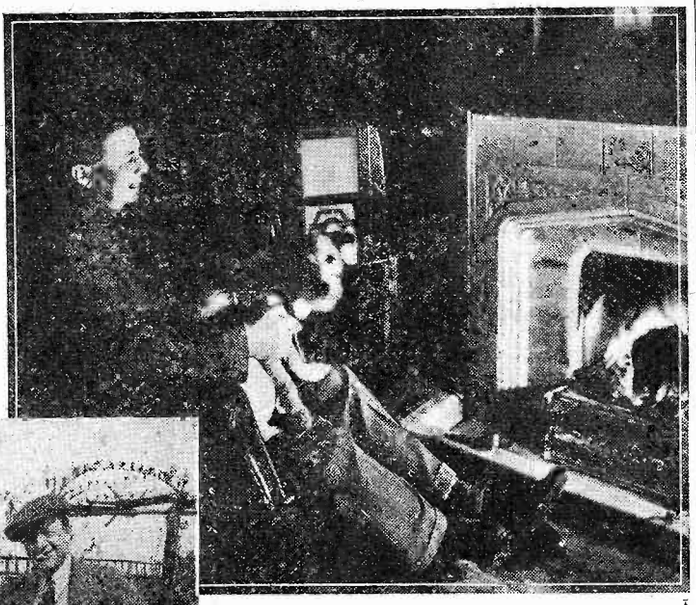
Jean Allistone appeared in several of his shows, and one day during a lull in the conversation he proposed to her. "Greatly to my astonishment," he told me, "she accepted me, and greatly to her astonishment I married her!"

In the early days of radio at Savoy Hill, Tommy inadvertently cut short a broadcast in a most unexpected manner. When an artist in the studio had finished his number he pressed a bell fixed to a table nearby to indicate to the engineers that he had finished. One evening a revue was in full swing when suddenly the door burst open and a distraught engineer dashed into the room.

"What on earth has happened?" he stammered. In surprise the artistes stopped in the middle of a song. Tommy, who was taking a well-earned rest, was sitting on the bell!

Norman Long

NORMAN LONG has the distinction of being the first entertainer ever to broadcast. He appeared at Marconi House in 1922 and again at the opening night of the Savoy Hill studios. In the early days there was very little formality and red tape, and one evening two autograph hunters managed to find their way to the studio. Norman met them as he was going out. One of the girls approached him eagerly, and asked him if he would sign his name in her book. He did so and she thanked him prettily, but when she saw his signature her face fell.



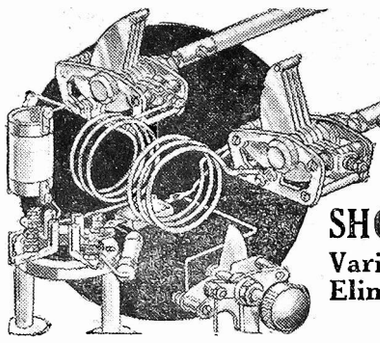
"A dog, a fire, and a radio" is Norman Long's idea of a happy evening at home. The set is the new Ekco Model 37.

"What's the matter?" asked Norman.

"Nothing—well, as a matter of fact, I thought you were the announcer." Then her face brightened. "Never mind, I can tear that page out!"

Norman was born in Deal in 1893. He showed great interest in music and studied the piano and violin from the age of ten, but after leaving school he went into an insurance office, where he stayed until he was twenty-one. In 1914 he joined a concert party, but the War cut short his new profession, and he served in the infantry and Air Force. Incidentally, he had plenty of opportunity to gain experience singing songs at the piano. After the Armistice he went back to concert parties, and then decided to strike out on his own as an entertainer.

Norman is still a bachelor, plays golf, with a steady handicap of 24, is fond of riding and amateur cinematography.



Short Wave Section

SHORT-WAVE RECEIVER TROUBLES

Various Snags, the Reason for Them, and Their Elimination, are Discussed in this Article by A. W. MANN

THE importance of layout, disposition of wiring, and choice of components, is realised by all short-wave experimenters, and rightly regarded as major considerations. Other things, however, of equal importance in contributing to the whole are apt to be overlooked in many instances, and it is well to remember that the apparent little things count, and if neglected or taken for granted, may cause no end of trouble.

The average home-constructed short-wave receiver incorporates either a triple range or similar coil-switching system, or plug-in coils. The latter, due to their combined efficiency and adaptability, appear to be the most popular arrangement, and by means of additional coils, the tuning range can be increased according to individual requirements.

Extending the Tuning Range

At some time or other the keen experimenter feels a desire to extend the tuning range in order to find out exactly what there is to be heard on the higher wavelengths. Interest usually centres above 100 metres, and includes the trawler 'phones 163.3 m., 120 m., 149.1 m., etc., together with the 160-m. amateur bands.

It may be simply a matter of plugging-in suitable coils and going ahead with the listening. On the other hand, it may not be quite so simple.

Snags may be experienced which will baffle the inexperienced amateur who may condemn the particular circuit used as unsuitable, which, of course, is altogether wrong.

H.F. Choking Problems

Let us first of all consider the high-frequency choking arrangements. The modern H.F. choke is usually a soundly-designed, and highly efficient, product, but how many, using modern components know the limits of choking efficiency of their devices? How many when buying one, have an eye to probable future developments and requirements? How many take this component for granted as a dependable unit, and consequently forget about it when trouble is experienced.

I ask those questions because I imagine they have applied to most of us at some time or other, and it is quite possible that beginners who have fitted additional coils and obtained unsatisfactory results, have been bewildered and at a loss to account for such a state of affairs.

For example, when tuning between 94 and 170 metres, everything is found to be satisfactory for a few degrees on the tuning-dial; in some instances, perhaps over half the scale. A particular point is reached where the set breaks into uncontrollable oscillation, which even the most drastic reduction of plate voltage will not cure.

In addition, any attempt to decrease the capacity of the reaction condenser makes matters worse, as it is found that a double reaction effect, i.e., normal and reverse, is in evidence. Attempts to cure the trouble by fitting by-pass condensers, etc., prove to be fruitless.

These symptoms signify that the H.F. choke is unsuitable. Not inefficient by the way, because it is being used for a purpose other than originally intended by the manufacturer.

Resonance

The trouble is due to resonance. The frequency to be suppressed equals the natural frequency of the H.F. choke, thus the circuit will oscillate at that frequency.

This can be proved in a very simple manner. For example, in order to tune a coil we shunt a variable condenser across it, i.e., parallel tuning. An absorption wavemeter is a good example. By means of the variable condenser we can alter the resonant frequency of the tuned circuit within definite limits at will.

Now let us apply this principle in modified form to the H.F. choke. Various capacity fixed condensers being to hand, our purpose is to alter the resonant frequency, and it is found that when a .0005 mfd. fixed condenser is shunted across the H.F. choke terminals, the howl is eliminated and normal reaction obtained so far as this coil is concerned. Now this idea is suggested as a test and not as a permanent cure.

Aerial Pointers

In order to effect a permanent cure and as a further test, a standard broadcast H.F. choke may be coupled in series with the existing S.W. choke. It is, however, much more satisfactory to replace the existing S.W. choke with one of the all-wave totally screened type, and thus assure efficient choking over all bands.

Apart from H.F. choking problems, there are others which should, in the interests of efficiency, be taken into consideration in order to obtain satisfactory reception on the higher wavelengths.

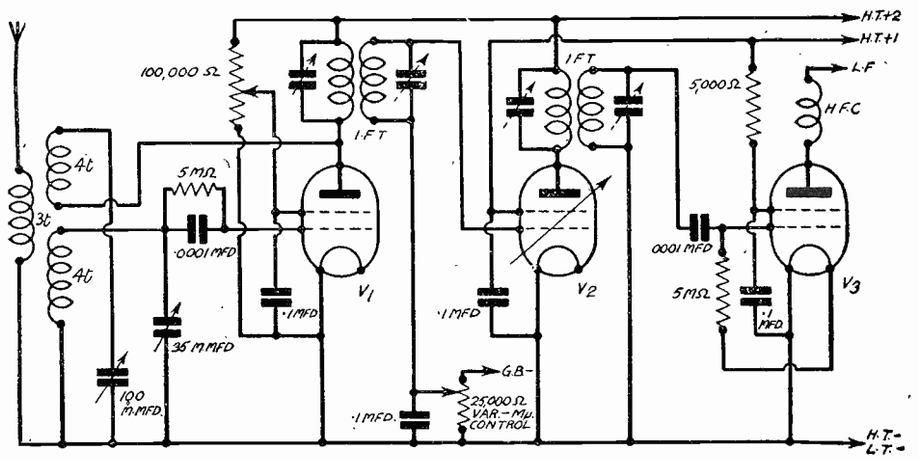
A long aerial for top-band reception is sound practice; that is, an aerial specially designed for the purpose. On the other hand, few have the necessary space available, or for that matter wish to specialise. We must, therefore, view the subject from the point of view of aerials of average length, such as half-wave twenty metres.

Impressions when first listening on the higher wavebands using a two- or three-valve receiver are apt to be erroneous. Conditions and location certainly play a part, especially in the case of the amateur band, but we are, so far as this article is concerned, discussing the technical side of the matter, and it is more than likely that a little attention to the aerial coupling arrangement will prove worth while.

For instance, if four-pin-type plug-in coils are used in conjunction with a series aerial condenser, the operator should try cutting this condenser out of circuit, and couple the aerial directly to the top end of the grid coil. Alternatively, by connecting another condenser in series with that already in the aerial will improve results, as for example, .0001 mfd. in series with a .00005 mfd.

Aerial Coupling

Sometimes when using six-pin coils it is necessary between 16-94 metres, according to the aerial used, to include a series aerial condenser in addition to the primary or aperiodic winding in order to overcome damping. On the higher wavelengths, however, it will usually be found that this condenser can be eliminated, and that by using inductive or aperiodic coupling alone better results with smoother reaction will be obtained.



For reception on the ultra-short wavelengths a circuit of this type will prove trouble-free in operation, provided it is properly installed.

Parallel-fed Transformers

Now that some measure of high frequency amplification is obtainable on short waves the low frequency side is apt to be neglected to a certain extent, experimenters favouring a transformer coupled stage, and not in general troubling much about L.F. problems.

There is, however, much to be learnt from a series of experiments relative to the various methods of L.F. amplification and their practical application.

Take, for example, the parallel-feed

(Continued on facing page)

SHORT-WAVE SECTION

(Continued from previous page)

method. Possibly there are many who have not yet given this system a trial.

It is quite possible to apply parallel feed to some of the low-priced standard L.F. transformers and obtain a much improved response, but there is, however, little to be gained by parallel feeding the more expensive types.

Technical considerations relative to this system of L.F. amplification have been fully explained in this journal. It should, nevertheless, be realised that the specially designed transformers available utilise special alloy core of high permeability. Thus, excellent performance and small physical dimensions are combined, and these components are an effective safeguard against threshold howl, in addition to other advantages.

Whilst the average experimenter is thorough and methodical in many respects he sometimes fails in others, and this may be due to over-confidence, or because he follows the practice of some pseudo expert with whom he came in contact during his early days when new to short-wave experimental work.

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.

Wirral Amateur Transmitting and Short-wave Club

APPLICATIONS of the electronic oscillator to detection in straight short-wave receivers was the subject of an address by Mr. W. Rogers (G8OC) at the monthly club meeting at the King's Square Café, Birkenhead. A complete three-valve receiver embodying this principle was described and diagrams and coil specifications for all amateur bands were given. It was stated that the newly licensed transmitters in the club were all active. A visit by the members to a local telephone exchange is being arranged.

Meetings are held on the last Wednesday evening in each month at Birkenhead. The secretary, Mr. J. R. Williamson, 49, Neville Road, Bromborough, Birkenhead, is open to receive applications for membership.

Thames Estuary Radio Society

A NEW radio society under the above heading is now being formed and has vacancies for new members. For particulars apply to Mr. F. S. A. JENKINS, R.N.W.A.R., "Cranleigh," Spencer Close, Rochford, Essex.

Leicester Amateur Radio Society

THE summer programme of this society is as follows:

July 18th: 160 m. direction-finding field day. Start Bishop Street 2 p.m. Bring tea and come even if you haven't a receiver.

July 24th or 25th: Provided that permission can be obtained there will be a visit to the Borough Hill Radio Station on one of the above dates, preferably the 24th.

August 22nd: Members are requested to bring their womenfolk to a Social Tea-party at some place of beauty (or otherwise). Details to follow.

September 5th: Visit to the Television Exhibition at the South Kensington Science Museum.

September 7th: Meeting at the Turkey Café for purpose of checking apparatus and making final arrangements for field day.

September 12th: 160 m. field day with portable transmitter. Details later.

Members proposing to attend the various outings are requested to notify the hon. secretary at least four days in advance.—Hon. sec., Talbot Cribb, 55, Knighton Drive, Leicester.

REPLIES IN BRIEF

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

J. A. (Arbour Hill). Disconnect the earth lead from the variometer and connect the coil holder between these two points.

D. M. (Stornoway). Connect the two ends to aerial and earth terminals. Horizontal portion should be 30 or 60 feet.

G. W. J. (Leigh-on-Sea). The name does not indicate for certain the type of coil, but probably the details given on a similar coil in our issue dated March 13th last would be of use to you.

J. A. T. (Tiverton). It is impossible to give the details without knowing the H.T. available and the individual types of valve. We cannot identify the coil.

L. E. (Chingford). We are not aware of a circuit of the type you mention. Probably some confusion exists between the crystal used for detection and the type of crystal used in a transmitter.

T. W. D. (Fallowfield). It is in order to use the L.T. winding only. It is not generally satisfactory to use the auto-bias arrangement, owing to the fluctuating current of the type of amplifier mentioned.

J. P. D. (Rutland). You can use the C.20 coil and the makers will supply a circuit diagram with it. Any good modern moving-coil speaker may be used.

W. B. S. (Glasgow). The coils are still available, although more modern types could be employed if desired.

A. H. B. (Nottingham). Have you reversed the connections to the coil base, as mentioned in our issue dated April 18th, 1936? If not, this would account for your trouble.

R. C. W. (Tunbridge Wells). We regret that we cannot supply a blueprint of the type mentioned.

J. P. (Staines). Although a valve could be used it does not fulfil the same purpose. We cannot give all the details you require and refer you to the various articles on transmitting which have been given in our pages.

R. J. T. (Pontycymmer). We have no details of the Regentone unit mentioned. The combination of the transformer and rectifier is not correct, and the input to the rectifier should be 200 volts. We cannot, therefore, solve your output problem, but suggest that you measure it with a good meter.

F. J. H. (Clapham Junction). By including the 'phones as you suggest you could use the adapter as a 1-valve receiver. The high-gain valve might produce instability in some circuits, but is otherwise interchangeable. You could use the valve you mentioned in that particular circuit.

H. N. (Burnage). We cannot supply a blueprint of the type mentioned. We have no details of the valves in question and suggest you communicate with the makers.

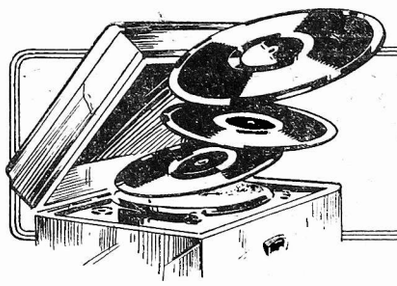
TRANSMITTING TOPICS

(Continued from page 422)

certain adjustments are made with care. For example, the screen voltage, while not being critical, must not be made too high. Keep it below, say, 100 volts, and the anode at about 300 volts.

The output or anode circuit must not be tuned to the fundamental frequency of the crystal, otherwise comparatively large R.F. currents will appear across it, causing overloading or overheating. The cathode circuit also calls for care in adjustment. As strange as it may seem, it must not be tuned to the frequency of the crystal; in fact, it should never be tuned lower than the second harmonic, for reasons similar to those given for the anode circuit.

Apart from the good harmonic output of the Tritet, it is very satisfactory in operation, it is a consistent oscillator, and, due no doubt to the electron-coupling between crystal and output circuits providing a "buffer" action, the crystal is hardly affected by changes in loading or, in other words, it is very stable as regards frequency.



Impressions on the Wax

RECORDINGS by the original stars from C. B. Cochran's new production, "Paganini" are featured in the July Parlophone supplement. An extremely fine duet between Richard Tauber and Evelyn Laye appears on *Parlophone RO* 20339—"Nobody Could Love You More" and "Love Never Comes Too Late." This is followed with Evelyn Laye singing "Love, Live for Ever," and "My Nicolo" on *Parlophone R* 2347.

In their 12-in. classic series we have Joseph Schmidt, the famous tenor, with orchestra personally conducted by Richard Tauber, singing "My Beautiful Dream" and "You Mean the World to Me" (from the operetta "The Singing Dream") on *Parlophone R* 2348. Also on *Parlophone R* 2350 is a fine recording of "Musical Memories of Franz Lehar," a potpourri in two parts, sung in German by Elisa Illiard, soprano, and Hans Tidesser, tenor.

Leslie A. Hutchinson, more popularly known as "Hutch," sings two new songs this month on *Parlophone F* 819. They are "Carelessly" and "September in the Rain," sung as only he can sing them.

If you like medleys, Robinson Cleaver obliges on the organ of the Regal Cinema, Bexley Heath, with a two-part medley on *Parlophone F* 827. He introduces "Ca C'est Paris," "Harbour Lights," "Massed Bands of the Guards," "Boo-hoo," "Little Old Lady of Poverty Street," finally finishing with "Red, White and Blue."

Harry Roy and his band have chosen titles from Fred Astaire's new film, "Shall We Dance," for their latest recordings. The six titles appear on *Parlophone F* 804-5-6.

Decca

THE one and only Gracie Fields presents a grand version of the "Coronation Waltz" this month on *Decca F* 6403. It is coupled with that very popular tune, "Goodnight My Love."

I would draw your attention to *Decca F* 6405, which is the second of a series of Charlie Kunz selection of tunes popular in days gone by. His other record, *Decca F* 6412, introduces some of the popular tunes of the moment. Donald Thorne, the well-known cinema organist makes his first appearance for the Decca Company this month on *Decca F* 6413. This record was made on the organ of the Granada Theatre, Willesden. Donald Thorne has chosen what he calls "The Hit Parade," which, as the title suggests, includes a lot of the tunes that are being performed everywhere to-day.

Brunswick

IF you enjoy a good hill-billy tune you should certainly hear "My Little Buckaroo" sung by Bing Crosby on *Brunswick O* 2413. He has coupled it with that old favourite, "The Shadow Waltz."

Fred Astaire has made three Brunswick records this month of the principal tunes from his latest film, "Shall We Dance." They are: "Slap that Bass" and "I've got Beginner's Luck"—*Brunswick O* 2424, "Let's Call the Whole Thing Off" and "Shall We Dance"—*Brunswick O* 2425, and "They Can't Take That Away From Me," and "They All Laughed"—*Brunswick O* 2426. I am sure you will enjoy the film, so why not the records?

The Aldershot Tattoo

H.M.V. are issuing six double-sided discs of this year's tattoo, which were actually made in the arena. Of these, three are of set pieces by the Massed Bands of the Aldershot and Eastern Commands, one by the Massed Cavalry Bands, and the remainder are "composites" made up of selected incidents during the performance. There are over a thousand musicians taking part, making a wonderful souvenir in sound of this greatest of annual pageants. They are as follows: Massed Bands: "Coronation March" (le Prophète) and "March of the King's Men"—*H.M.V. B* 8584; "Coronation Tattoo," a quick march, and "Royal Cavalcade," a Coronation march—*H.M.V. B* 8585; "Hallelujah Chorus" (Messiah) and "Keepers of the King's Peace" a march—*H.M.V. C* 2912. Massed Cavalry Bands: "Golden Spurs," a slow march, and "Crown and Commonwealth," a quick march—*H.M.V. B* 8589. The composite records give fanfares, marches, music and commands of the Physical Training Display, the Epilogue spoken by Robert Speaight, drums and fifes, and a host of other memories.

Swing Music

DEVOTEES of "swing" will appreciate the record by Lionel Hampton and his orchestra of "Buzzin' Round with the Bee" and "Wha Babe," both fox-trots. A well-known authority who has heard them gives his opinion that they are one of the greatest examples of real swing rhythm that have been put on to wax.—*H.M.V. B* 8581.

The H.M.V. list also includes swing arrangements of Liszt's "Liebestraum" and Rubinstein's "Melody in F" by Tommy Dorsey on *H.M.V. B* 8578. Meade "Lux" Lewis has two swing piano solos—"Honky Tonk Tram Blues" and "Whistlin' Blues"—*H.M.V. B* 8579. Another novelty is "A Jam Session;" that is, extempore playing, the soloists being Tommy Dorsey (trombone), Bunny Berigan (trumpet), and George Wettling (drums). The numbers are "Honeysuckle Rose" and "Blues."—*H.M.V. B* 850.

From the Films

A FILM star, Lilli Palmer, who was recently presented to Her Majesty at the première of "The Great Barrier," gives songs from two of her new films: "Head Over Heels in Love," from "Head over Heels," and "Baby, watcha gonna do To-night," from "Good Morning, Boys," on *H.M.V. B* 8544. Max Miller is as audacious as ever in "Impshe" and "Backscratcher"—*H.M.V. BD* 408, while Carson Robison, the famous Hill-Billies singer, now in America, sings "Texas Dan" and "Happy-go-Lucky" on *H.M.V. BD* 407.

Letters from Readers

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

Signal Surges

SIR,—With regard to the query of R. G. T., Norfolk, in the July 3rd issue of PRACTICAL AND AMATEUR WIRELESS, my opinion is that with certain types of receiver the breaking of the bias circuit can cause the effect mentioned. I am referring to the type of set using one or more variable-mu valves in which the on-off switch breaks the bias return circuit in addition to the L.T. circuit—the switch being of the three-point type.

The set in question was a Cossor model, and the switch was combined with the volume control. This control was of such a type that the set was switched off with the volume control in the *full in* position. This is contrary to modern practice and it is, of course, probable that R. G. T.'s set does not employ a circuit of the type mentioned. Again, it is possible that the effect I noticed was due to one or both of the causes you mention in your reply, but I must add that if the G.B. negative plug controlling the bias to the variable-mu valve was pulled out whilst the set was working, the same rise in volume was noticed. Thus I think I can safely say that the surge in *my* case was due to the bias. In addition, on the medium-wave band, if the reaction was set near the oscillating point, the set burst momentarily into oscillation when switched off.—R. S. PACE (Penrith).

SIR,—With reference to the point raised by R. G. T., of Norfolk (in the July 3rd issue), I experience a similar effect to that mentioned by this reader in the case of the £4 Superhet 4 (battery).

In this case, a three-point switch switches off both L.T. and the grid-bias of the H.F. valves, and my conclusion is that the momentary increase in signal strength when switching off is due to the fact that the grid-bias voltage is entirely cut off from these valves before the filaments have cooled, causing maximum signal strength for a fraction of a second, followed by fading away as the filaments cool.—S. C. BLACKSHAW (Wolverhampton).

Heard on Our Simplest Short-waver

SIR,—Six months ago I built your "Simplest Short-waver," and have obtained excellent results with it. I replaced the home-made coil with a commercial triple-range coil. Perhaps other readers who have built this set would be interested in my log, which is as follows:

On 40 metres: 130 G stations: also ON4TH, 4AW, 4YL, 4AK, 4BG, F3NA, 3JC, 8FN, 8AH, 3DE, 3FA.

On 31 metres: DJN, GSB, OLR3A, CT1AA, GSC, PRF5, W1XK, EAQ, PCJ and HBL.

On 25 metres: DJD, GSD, RW59, 2RO, OER2, OLR4A and W1XAL.

On 20 metres: 50 W stations; also VE1CR, VE2CA, CT1AY, CT1PW, FN5YS, FD4AN, CT1CU, CL8AM, HA8N and GY1BF.

On 19 metres: W2XE, W2XAD, W8XK, TPA2, GSI, GSO, GSP, GSF, DJQ, DJR, DJB and LZA.—C. D. S. WINTLE (Berkhamsted).

Station VK3LR

SIR,—It may interest your readers to know that from 07.30-08.30 on July 2nd VK3LR, Lyndhurst, gave a special programme dedicated to the British Short-wave League. Reception was excellent at the start, but soon Zeesen took command of the situation, and the Australian station was unfortunately swamped. Perhaps other readers of your excellent paper had better reception than I did.—S. J. A. NICHOLL (Dartmouth).

Transmissions from Kuala Lumpur

SIR,—It may interest other readers to know that we have opened up a radio link with London. We carry out tests with London on Mondays, Thursdays, and Saturdays, all the other days being utilised for broadcast on 48.9 and 110 metres; the station names are ZGB (48.9 m.) and ZGE (110 m.) respectively.

The weather in this country is hot. One does not rely on a barometer here—as at any moment it may rain!—S. GUNARATNUM, Wireless Station, Kuala Lumpur.

CUT THIS OUT EACH WEEK

Do you know

—THAT complete all-wave coil units are obtainable for incorporation by a constructor in various types of receiver.
—THAT losses must be reduced to a minimum in padding or tracking-condenser wiring.
—THAT when the fixed coupling between band-pass coil units is suspected to be faulty, an external coupling may be employed at either end of the tuning coils.
—THAT a mains aerial device should not be fitted to a D.C. or Universal Mains receiver without very special precautions.
—THAT there are many reasons why it is not advisable to utilise a tree for an aerial support.
—THAT when using screened I.F. transformers it is also essential to guard against coupling between the wiring to these components.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2*

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Leaves from a Short-wave Log

A Call from Panama

Try for HP5L, a new transmitter which was recently opened at David, in the province of Chiriqui, Republic of Panama. This station is testing on 25.53 m. (11.75 mc/s) and gives out its call in both Spanish and English, with the request that reports on reception should be sent to P.O. Box (Apartado Postal), 129, in that city.

Flying Doctors on the Air

The Central Australian Mission at Alice Springs, Northern Territory, Australia, is said to have installed a 200-watt transmitter at Port Hedland with the call-letters VK8AC, for the Australian Medical Service in this sparsely inhabited portion of the continent. Tests are being carried out on 43.10 m. (6.96 mc/s) almost daily between G.M.T. 09.30-10.15.

A New Peruvian

Lima, OAX4Z (or J ?) is now on 49.24 m. (6.092 mc/s) with a power of 2 kilowatts, and relays the programme of the medium-wave studio, OAX4I. The call heard is: *This is the National Broadcasting station of Peru, at Lima (South America).* Address given: Radio Internaçional, S.A., Avenida Abançay, 915, Lima (Peru).

Latest Advertised Schedule of CRCX

The new programme times of CRCX, Bowmanville (Ontario), Canada, on 49.26 m. (6.09 mc/s), are now established as follows: G.M.T. 17.00-01.00 on week-days, except Saturdays; on Sundays broadcasts are made from G.M.T. 04.00-05.00 and from G.M.T. 16.00-01.00. The station relays the C.R.C. radio entertainments both from CRCT, Toronto, and from Montreal.

GST Daventry

Listeners report having logged tests (speech and music) between G.M.T. 14.00-17.00 from the Daventry Empire transmitter GST operating on 13.92 m. (21.55 mc/s).

The Voice of Dominica

HIN, Ciudad Trujillo (Trujillo City), is now working on its half-wave, namely, 24.25 m. (12.37 mc/s), and during the summer months is heard better than on its original channel. The station is on the ether daily between G.M.T. 17.30-19.00, and from midnight to 03.30. Interval signal: 3-note chimes. The call in English: HIN (N, as in Nebraska), followed by *La Voz del Meridiano* (The land that Columbus loved), or alternately *La Voz del Partido Dominicana.*

Radio Philco, Saigon

An experimental station giving the above call has been installed at Saigon (French Indo-China). It would appear to be working between G.M.T. 10.30-14.00 daily and opens its transmission with a rendering of the French military *Marche Lorraine.* The wavelength is not yet definitely fixed, and has fluctuated between 25.30m. and 25.62 m, but it is expected that 25.58 m. (11.73 mc/s) will be adopted for future broadcasts.

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are drawn full size.

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

Issues of Practical Wireless .. .. 4d. Post paid
Amateur Wireless .. .. 4d. " "
Practical Mechanics .. 7½d. " "
Wireless Magazine .. .. 1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM to *Wireless Magazine*.

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

PRACTICAL WIRELESS

	Date of issue.	No. of Blueprint.
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW55
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF) Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))..	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW4
Fury Four (2 SG, D, Pen) ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B.)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)..	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)..	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ..	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)..	17.7.37	PW43
D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF, Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen) ..	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM398
Certainty Three (SG, D, Pen) ..	—	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2SG, D. Pen)	—	AW421
Crusaders' A.V.C.4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each) ..	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C. ..	—	AW383
S.G. Three (SG, D, Pen) A.C. ..	—	AW390
A.C. Triodyne (SG, D. Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-Valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen) ..	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	—	AW429
Heptode Super Three A.C. ..	*May* '34	WM356
"W.M." Radiogram Super A.C.	—	WM365
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans) ..	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)—		AW329
S.W. One-valve for America ..	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen) ..	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	*Jan* 19 '35	AW463
The Carrier Short-waver(SG,D,P.)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-Wave World-Beater (HF, Pen, D. R.C, Trans) ..	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)..	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super ..	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter ..	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C. ..	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v). for WM392 ..	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New-Style Short-Wave Adapter (1/-)	*June* '35	WM388
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Short-Wave Adapter (1/-) ..	*Dec.* 1, '34	AW456
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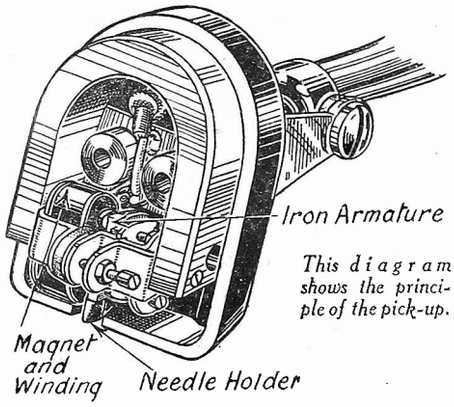
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

How a Pick-up Works

"I have only been interested in the hobby for a short time and am puzzled to know how the gramophone pick-up produces the music from the record through the wireless receiver. Is it possible to explain this briefly as I cannot find anyone who seems to understand the details?"—J. F. (Peterboro').

THE principle is really quite simple and may be regarded as just the opposite to the headphone or loudspeaker. In these items a current flows through a wire wound round a magnet, and as the current varies so does the magnetism. This attracts the diaphragm and the current fluctuations therefore give rise to fluctuations in the diaphragm, moving the air and so reproducing the sound. In a pick-up, a good



This diagram shows the principle of the pick-up.

example of which is shown here, the magnet has usually two poles, and the needle is inserted into a holder which is extended and rests between the two poles. As the needle is moved by the sound grooves on the record, the armature moves, and this varies the magnetic field causing a varying current to flow in the windings. This current variation is applied to a valve, just as in the case of wireless signals, and so produces the signal.

H.F. Chokes

"The why and wherefore of H.F. chokes has always roused my curiosity. In most sets I have made they do not seem to make any difference to the set, whether I leave them out or put them in. Could you tell me what difference H.F.C.'s are supposed to make? Another thing is, short-wave H.F.C.'s. Why do they make some with 100 turns of wire on a ½in. former and others nearly as long as standard H.F.C.'s and call them all-wave H.F.C.'s? In my own short-wave set I use one with 112 turns of wire on a ¾in. former. What difference would it make if I used a standard H.F.C.?"—J. F. M. (Hackney).

YOUR experience is by no means uncommon, but the various points are easily answered. Firstly, the choke is generally employed for reaction purposes, where it is included in the anode circuit to choke back the H.F. so that this may be used for reaction purposes. Usually some component follows it such as a resistance, transformer primary or headphones, and these are generally of such a nature that they act as chokes as far as reaction arrangements are concerned. You would probably find, however, that there is sufficient leakage to result in distortion when L.F. stages are added, or in instability due to the H.F. leakage. In a short-wave set we are dealing with very high frequencies and consequently the self-capacity of the choke must be kept low or the H.F. will leak through the capacity formed between adjacent turns of wire. Therefore, we use a few turns wound side by side rather than a pile winding as in the broadcast choke. An all-wave choke generally has the winding divided so that a small portion is used for the short waves. If you included a normal broadcast choke in your short-waver you would probably find that reaction would not be so easily obtained, and when wearing headphones hand capacity effects would be much more noticeable.

Parvo Frame Aerial

"I am making the Midget Parvo receiver and wish to wind the aerial in 24 D.C.C. on a former 8in. by 6in. How many turns should I make?"—T. K. J. (St. Annes-on-the-Sea.

THE gauge of the wire will not affect the number of turns, and as the dimensions you are adopting are only very slightly larger than the original, you can wind to the original data. If, however, you are desirous of tuning to a very low wavelength station, and find that your aerial will have a minimum above that desired, one turn could be stripped off. Presumably, however, you will rely mostly upon the North Regional station, and thus the additional wire will be advantageous rather than a drawback.

RULES

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

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

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

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

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

Blue Glow

"While working a 3-valve short-wave set (Det., L.F., Pen.) in the dark, I noticed that the output pentode was emitting a bluish-green glow. The glow filled the space between the anode and the filament, but did not extend further. However, it could be moved by putting a strong magnetic field by the valve. Could you tell me if this is due to softness or hardness of the valve, or if the valve is wrongly biased?"—J. O. (West Bromwich).

AS the glow was inside the electrode assembly the indication is no doubt that the valve is soft. A glow extending from electrode assembly to the glass sometimes indicates that the valve is being over-run (excess H.T. or inadequate bias). You will see from the note on page 364 of our issue dated July 3rd, however, that a fluorescence which occurs inside the bulb and can be moved by a moderate magnetic field indicates a hard valve and is quite usual in some modern types. If you wish to make quite certain regarding the condition of the valve, take it to a modern dealer who is equipped with one of the modern instantaneous valve-testers of the type recently mentioned in our pages.

Open Grid Circuit

"My home-made receiver is behaving erratically lately and the trouble takes the form of interrupted signals. All is well for a short time and then with a plop signals cease. If I do not touch the receiver they sometimes return after a few seconds and sometimes after as long as a minute and a half. If I touch the G.B. terminal on the L.F. transformer, however, signals come back at once, and I have found that if I keep my finger on that point the signals do not stop. Does this show that the transformer has broken down?"—T. R. E. (Brighton).

IF you are using the standard transformer connections the test would certainly not indicate that the transformer is faulty. What it does indicate is that the circuit from the terminal to earth (via the grid bias battery if one is used) is incomplete, and the grid chokes. When you touch the terminal, you earth the transformer secondary and thus complete the grid circuit. The fault will therefore be found in the lead from the terminal in question and this may be found to be a faulty connection to the grid bias wander plug (due to the covering of the wire not having been removed sufficiently) or a discharged G.B. battery. The lead from the G.B. positive socket to earth should also be checked if this comes within the circuit referred to.

Television Invention

"I have evolved a novel arrangement for improving the reception of television pictures without the cathode-ray tube and should be glad if you could tell me the best way to dispose of my invention. What firms should I send the idea to in order to obtain most benefit?"—G. Y. (Bath).

WHENEVER an idea is experimented with and some invention results, the first step should be to take the precaution of obtaining a Provisional Patent Specification. This costs £1 and will prevent anyone from making use of the idea without your permission. You can then send copies of the provisional specification to the various firms who are interested in television with a view to some subsequent negotiation. If you do not obtain the provisional protection, the firms in question may have already experimented with a similar idea and you might thereby be liable to assume that they had made use of your idea. If you put the matter in the hands of a good Patent Agent it would cost you a little more, but he would be able to advise whether the idea was original and whether or not it was worth proceeding with it.

The coupon on page 432 must be attached to every query.

Miscellaneous Advertisements

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

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

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This coupon is available until July 24th, 1937, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 17/7/37.

NOVEL TUNING DIALS—SEE PAGE 231

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. IX. No. 215. November 7th, 1936.

ROUND *the* WORLD *of* WIRELESS

An Automatic Radio Transmitter

A BALLOON equipped with recording gear and an automatic radio transmitter has been developed by the Franklin Institute to provide data of cosmic rays at extreme heights.

Bombay Police Radio

THE Bombay City Police are to be provided with radio for use in times of disturbance. A wireless transmitter and associated equipment is to be installed at Police Headquarters, and two mobile receivers are to form the initial installation.

U.S.S.R. Television

IT is reported that the high-definition television transmitter will be ready for service in Moscow at the beginning of next year. The present test transmissions are stated to be satisfactory, and a regular service is now being planned.

American Wind Charger

AN American company has placed on the market a battery charger operated by the wind. A fan turns under the influence of the slightest breeze and generates 7 amps, under average wind velocities.

Czechoslovakian S.W. Station

A NEW S.W. transmitter is nearly ready for use at Podibrad. Test transmissions are at present being carried out on 10.06, 25.51 and 49.05 metres.

K.B. Sets in the Air

SIX of the aeroplanes owned by Plane Advertising, Ltd., have been fitted with Kolster Brandes receivers so that the pilots may pick up the weather reports as soon as they are sent out.

Queer Fault

FROM Dublin we hear that a Cossor receiver, which was sent for servicing, was found to contain a dead mouse with the H.T. leads in its mouth. When removed the set still refused to function, but a further test showed that the speaker (which was enclosed in a dust bag) had half the cone eaten away and was filled with pieces of newspaper shredded up. It had served as the nest for the mouse!

Marconiphone-Arsenal P.A.

THE newly-installed public address equipment at the Arsenal Stadium is a great success. This is the largest equipment ever fitted in a football ground. The microphones are used for addressing the crowd from the directors' boxes and by the police for crowd control, stand packing, and S O S purposes. There are 17 loud-speakers.

Town Planning

"BELFAST—An Industrial Capital" is the sub-title of the second in the series of talks on Town Planning to be broadcast by E. Maxwell Fry in the Northern Ireland programme on November 10th. He will deal with such questions as how Belfast as a city has developed, and how its future development should be controlled so as to secure wise planning, healthy buildings and congenial conditions for the citizens, and he will deal with both the artistic and economic aspects of town planning in a large industrial city.

Radio Pie

FOR the last six months the Two Leslies, Leslie Sarony and Leslie Holmes, have allotted considerable time to the preparation of their first radio revue, christened "Radio Pie." Many listeners do not realise how many hours' preparation these top-of-the-bill artists have to give to a radio production. As far as they are concerned, it must be successful, so no pains or effort are spared to obtain a laugh or a telling point in every line.

At the moment the Leslies are feeling confident over a new song, "Long Live the King," which they have written for their Coronation Palladium appearance. In "Radio Pie," "Long Live the King" will be heard for the first time, and the chorus will be sung by Steffani and his Twenty Singing Scholars and the B.B.C. Revue Chorus.

"Radio Pie" will be a fast-moving revue, having a strong cast including the Two Leslies, Tommy Handley and Mario de Pietro. Incidentally, this will be the first time Mario de Pietro has spoken over the air. A discovery of considerable interest is the "Singing Porter." Recently, while the Leslies were having tea in a large Manchester store, the Entertainments Manager told them they had a singing porter and brought him up, complete in uniform, to sing with the orchestra. He was so good that the Leslies are bringing him south for "Radio Pie." Other members of the cast of "Radio Pie" are Tessie O'Shea, whose first appearance this will be since her return from New York, Hugo, and Anne Ziegler, the well-known radio artist. The broadcast takes place from the London Regional on November 5th.

Another Broadcaster of War News

EDZ-EAH, Madrid-Vallecas (Spain), a 15-kilowatt station previously solely used for commercial telegraphy and telephony with the Argentine Republic, has now been appropriated twice daily by the Madrid Government for the transmission of news bulletins in Spanish and other languages at G.M.T. 12.00 and 20.00. The wavelength is 31.65 m. (9,480 kc/s).

From the Canary Islands

EHZ, el Tablero, on 28.93 m. (10,370 kc/s), which serves as the official mouthpiece of the Radio Club de Tenerife, can be readily identified by the fact that nightly at G.M.T. 20.40 it closes its broadcast by playing the two German National Anthems (*Deutschland ueber Alles* and the *Horst Wessel March*), followed by the Italian Fascist hymn (*Giovinezza*) and two Spanish patriotic marches.

More Power for Ruysselede

TO increase the range of the Brussels broadcasts on 29.04 m. (10,330 kc/s), the Belgian Government is erecting at Ruysselede (near Bruges) a 40-kilowatt transmitter to take the place of the 9-kW station at present used for the transmission of the daily French and Flemish programmes.

ON OTHER PAGES

THE PICK of the PROGRAMMES

"Laburnum Grove"

J. B. PRIESTLEY'S comedy of suburban life, which enjoyed a successful run at the Duchess Theatre two years ago, should prove ideal material for adaptation as a broadcast play. It will be heard on the London Regional on November 3rd, and from the National on November 5th.

MAKE THESE DATES WITH YOUR RADIO

with ages ranging from twelve to sixteen. Having received further auditions at the studios, half-a-dozen of the more talented of these juveniles are to broadcast a special

MUSIC HATH CHARMS

It is to be hoped that McMichael lived up to their slogan "Never lets you down," when this portable was demonstrated at Bertram Mills's circus by a McMichael dealer in Truro recently.

A Flying Lesson

IN the Midland Children's Hour series, "How and Why," a programme entitled "How an Aeroplane Flies," will be broadcast on November 11. The B.B.C. Mobile Unit has visited Castle Bromwich aerodrome to take recordings which will assist in building up an impression of a flying lesson. Flying Officer J. K. Rotherham, of 605 (County of Warwick) Bomber Squadron of the Auxiliary Air Force, will be the speaker in the studio, and will link up the recorded material. The Squadron has a distinguished record; it won, and still holds, the Esher Cup.

Variety from Cheltenham

THE first broadcast of a variety bill from the Opera House, Cheltenham, on November 10th (Midland) will include Leon Cortez and his Stage Band. David Gretton is the commentator for these outside broadcasts. The Opera House was opened in 1891. Cheltenham was a notable dramatic centre over a hundred years ago, and was visited regularly by Sarah Siddons, the Kembles, and the Keens.

The Younger Generation

DURING September, Francis Bolton, the B.B.C.'s variety talent-spotter, made a tour of the North Region, giving auditions in ten big Northern towns to people from the surrounding districts. Over a thousand men, women and children availed themselves of the opportunity. There was a large proportion of children—or, at least, of juveniles, that is to say, boys and girls

variety programme from Manchester on November 13. Further details are not yet available.

Melody and Mirth

ON November 9th Archie Campbell compères a Midland programme entitled "Accent on Melody with a Break for Mirth." The melody is provided by Vincent Ladbrooke and his augmented dance band, known as The Cosmopolitan Orchestra. Mr. Ladbrooke only entered the dance band business a little over two years ago, and now controls seven or eight bands in the Midlands. The mirth makers are Elsie and Doris Waters, who come to Birmingham as guest artists.

Variety from Chester

THE Western Brothers—"Kenneth" and "George"—will be heard by Northern listeners when variety is broadcast from the Royalty Theatre, Chester, on November 12th. The remainder of the bill, from which excerpts will be chosen, will include: Arthur Pond (comedian); Helen Mitchell and Dad; The Brennans (comedians); Elsie Sterndale (Lancashire comedienne); Fisher and Ariana (solo violin and Italian prima donna); and Adrian et Audrée (comedy speciality act).

"Aïda" from Leeds

A CONCERT version of Verdi's opera "Aïda," as performed by the Leeds Choral Union, will be broadcast from the Town Hall, Leeds, on November 10th. The Northern Philharmonic Chorus and Orchestra will be conducted by Norman Strafford and the soloists will include Ina Souez (soprano), Constance Willis (contralto), Alec John (tenor) and William Parsons (baritone). F. H. Shera, Rossiter Hoyle Professor in the University of Sheffield, will give the "During the Interval" talk.

Eve of Armistice Day

ON November 10th an Armistice Commemoration will be broadcast from the Scottish National War Memorial, Edinburgh. The programme is the same as that broadcast a year ago, which was then said to be one of the most moving programmes heard in the Scottish Region. As listeners may remember, it consists of appropriate dialogue, readings and music.

Ulverston Hiring Fair

ULVERSTON Martinmas Hiring Fair begins on November 14, and on the preceding night some of the people who frequent it are going to the Northern microphone to tell listeners all about the fair. Ulverston is in Furness, Lancashire, and the fair is one at which farmers find farm servants, and at which farm servants get jobs. The speakers will include a farmer, a farm labourer, the secretary of the local branch of the National Union of Farmers, and a local parson. One of the speakers will tell of the fair as it was some forty years ago, when the workhouse master used to bring down often boys from the workhouse and hire them out to the fair.

"Question Time"

THE second of the series of monthly broadcasts in which Leslie Heward, with the B.B.C. Midland Orchestra, answers questions which have been sent in by listeners regarding orchestral matters, will be given on November 9th. A number of the questions received concerned the contribution which certain instruments made to the whole. Some of these have already been answered but others relating to the brass section have yet to be dealt with. Henry Riddell, Announcer, represents the average listener.

SOLVE THIS!

PROBLEM No. 216.

Ellison's receiver suddenly stopped functioning, and when voltage tests were made it was found that no voltage was registered at the anode of the triode detector valve. Further tests indicated that there was continuity between the detector anode and H.T.+, and the resistances in this circuit had the correct value. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo, Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 216 in the bottom left-hand corner, and must be posted to reach this office not later than the first post on Monday, November 9th, 1936.

Solution to Problem No. 215.

Webster had forgotten to wire the centre socket of the pentode valve-holder and therefore no voltage was being applied to the priming grid.

The following three readers successfully solved Problem No. 214, and books are accordingly being forwarded to them: R. Cabell, Higher Sea Lane, Charmouth, Dorset; L. M. Gordon, Harlington, Milford-on-Sea, Hants; F. H. V. Feuillade, 23, Overbury Street, Clapton, E.5.

Novel Tuning Dials

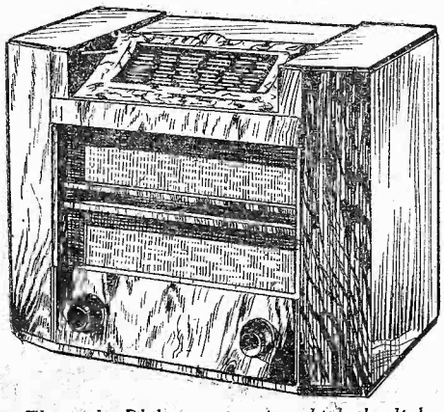
Details of the Most Common Types of Commercial Tuning Indicator with Special Modifications and Details for Home Constructed Dials. By G. V. COLLE

BEARING in mind that every set maker endeavours to interpret the exact requirements of the listener, it is interesting to consider some of the main ideas embodied in commercial tuning dials.

Backlash, one of the main snags of accurate and fine tuning adjustment, has largely been obviated by careful attention to the fit, alignment, and the automatic "taking up" of wear on the various spindles employed. The usual friction action of the tuning control knob directly driving the main dial on the edge of an inside slot on the latter has largely been superseded by more ambitious schemes.

Owing to the inclusion of short-wave features in receivers of the all-wave type the necessity for a slow-motion movement, in addition to the reduction drive for medium and long waves, has also led to engineering practice much sounder than hitherto applied.

The tendency is towards larger and more accurately calibrated dials. Commencing years ago with small aperture inspection dials fitted with arbitrary scales, it may be said that designs have covered the whole gamut of shapes and sizes. A present tendency is towards full-vision scales, sectionalised for the number of wavebands covered, calibrated mostly in units of 10 kilocycles and with the names of the



This is the Philips receiver in which the dial is hinged, and may be set at various angles without affecting the indicating mechanism.

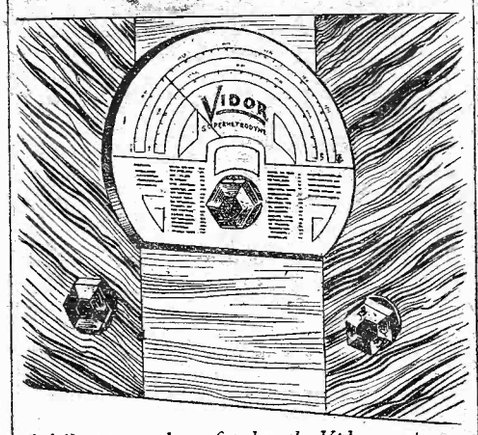
principal broadcasting stations opposite. Ease of inspection is assured by diffused back lighting and is invariably simplified by colouring the translucent dial different shades for each waveband or by masking those not in use.

Parallax errors of vision are avoided by keeping the knife-edge or hair-line cursor "finger" close to the calibrated dial.

Cord Drives

Similar dials, remote controlled, are also employed and are actuated by means of cords and drums similar to winches. Contraction and stretching of the cord due to wear and changes of atmospheric humidity are taken up by contraction springs fitted in the main drum and at the ends of the cord. Even so, it is not possible to guarantee really accurate maintenance of calibration with this system. The difficulty has been overcome by making the dial extremely large since by providing a "space" rather than a "line" for each station the error due to the cord is then insufficient to be noticeable.

One desirable feature which set makers have endeavoured to embody in the design of their tuning dials is that of making them fully visible to the operator whether he



A full-vision scale as fitted to the Vidor receivers.

be standing or sitting for the purpose. One arrangement now common to a few makes is to arrange the full vision dial on central or bottom pivots like a mirror and to fix the pilot bulbs illuminating the scale so that they move with it. By controlling the pointer or cursor on the cord-and-drum principle, mechanical considerations of action do not arise. These dials are fully visible when the operator is immediately facing the receiver, but are not capable of clear inspection from an acute side angle. So far no scheme has been devised for providing additionally a vertical pivot to give the complete dial a universal joint action. It is doubtful whether any manufacturer would consider the latter kind, since apart from its expense, a simple full-vision scale of a vertical type with a cursor moving up and down such as found on a number of sets would seem to meet this desirability.

Remote Control Dials

Wherever a tuning dial cannot be inspected closely during the process of operating it, it must be remembered that an accurate setting can be achieved merely by watching the usual tuning indicator. The scale or movement of the latter is usually arbitrary, but even at arm's length it is sufficiently clear to inform one when the set is tuned to resonance.

For those listeners who are reluctant to leave the comforts of a favourite arm-chair even when it is desired to listen to a particularly good programme, there is at least one commercially-made set which in addition to allowing normal full-vision tuning, is also arranged for remote control. The main operating controls, including the tuning scale, are literally duplicated on the faceplate of a small box which can be mounted on the arm of the chair. A multi-way cable connects the control box to the receiver, the action being purely electrical between the two.

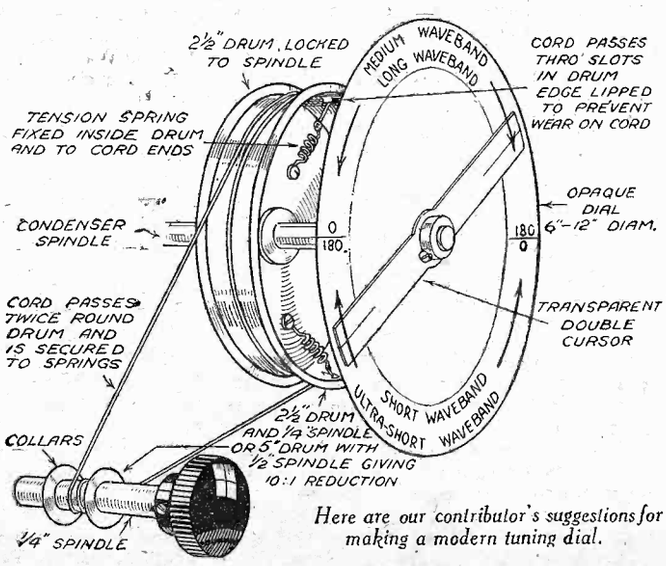
With regard to accuracy of calibration, it must be remembered that nearly all scales are printed to carefully prepared standards taken from what might be termed final production laboratory receiver models. Whether the sets on the factory production line maintain the same accuracy depends on the severity of the earlier tests conducted on the coils for inductance matching, the tuning condensers for balanced capacity changes per degree rotation and similar factors of lesser importance. Slight irregularities in the tuning circuit constants are invariably corrected by small trimmer capacitors which are adjusted and then sealed by the set maker. Even so, it will be found that considerable errors do occur, the percentage of inaccuracy normally becoming less the more expensive the receiver.

Hand Calibration

A suggestion recently put forward that prospective owners of expensive radiograms should have the option of paying five guineas extra for hand-calibrated tuning scales at least gives one a clear idea of how the cost of a set can be raised in this respect, since the calibration would need to be the same whatever the initial outlay.

A recently issued patent granted to a well-known company covered the construction of a full-vision rectangular horizontal dial which incorporated a most ingenious system for correcting errors of calibration. The patent assumed the use of a printed scale, a cord and drum control,

(*Continued overleaf*)



Here are our contributor's suggestions for making a modern tuning dial.

NOVEL TUNING DIALS

(*Continued from previous page*)

and coil and condenser constants to the usual inexpensive receiver standards. At certain settings of the cursor or pointer it was found that the scale lagged and at other settings was in advance of the actual transmissions for which it was marked. The control knob actuating the drum, cord and cursor, which in the normal manner transmits an equal movement to the latter, is allowed to do so also in this case, but the cursor, instead of travelling on level supports, is made to ride on a spring which can be distorted to produce troughs and hills by means of numerous grub screws or stops pressing on to it.

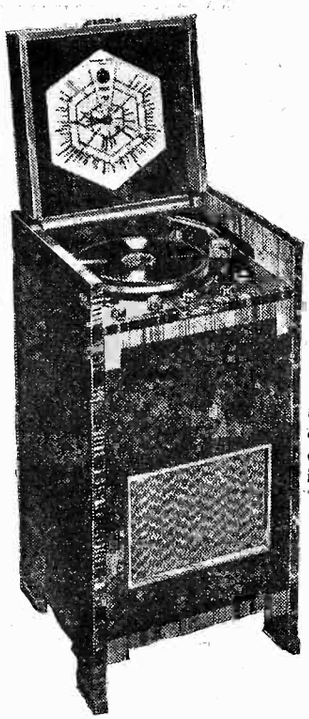
On the test bench in the factory and by creating the usual artificial signals, the operator undertaking the calibration can quickly ascertain whether the calibration is in advance of the cursor, in which case a "hill" is provided at that point. On the other hand, where the cursor itself is in advance of the appropriate calibration, the former can be retarded by a trough and so on.

Making Your Own Dial

Those readers of PRACTICAL AND AMATEUR WIRELESS who are sufficiently keen to construct their own tuning dials should find enough material from the foregoing descriptions to evolve designs which embody all the salient features of each type mentioned.

Unless a reliable wave-meter is available, it will be necessary to start with a "blank canvas," which can be marked with an arbitrary scale and later filled in with the names of known stations under operating conditions. The most simple and satisfactory arrangement is to provide a circular dial at least six inches in diameter, although preferably larger. An opaque celluloid material can be employed so that the calibration may be illuminated by two or three flashlamp bulbs mounted in small clip-on holders, the bulbs being connected in parallel with the L.T. or 4v. A.C. heater supply.

Where a full 360 degree scale for each wave range is required, the cursor will need to be geared 2 to 1 to the main tuning condenser spindle, as the latter normally only moves through 180 degrees. A better scheme is to employ a *direct* drive by clamping a double-ended cursor or pointer very firmly on the main spindle and using 180 degrees only for each wave range. The top half of the dial can then be used for, say, medium and long waves (one scale being under the other) and the bottom half of the dial for two short wavebands.



Simplified tuning is provided in this McMichael receiver by the Giant Tuning Dial fitted inside the lid, and which is operated by the normal controls

Parallax errors can be avoided by making the double pointer from a transparent and fairly thick celluloid and marking hair lines at each end, the lines to be on the surface of the pointer, which is to be nearly touching the actual scale, or in other words, the thickness of the pointer material must not intervene.

Marking the Scale

Rigid and central mounting of the opaque scale is essential, but it should preferably be detachable, as it can be calibrated with a sharp but soft pencil in position on the set and later removed for permanent marking with indelible ink. A material having fine eggshell surface finish is required, because a glazed celluloid transparency will not easily mark.

The mechanical operation can be on the cord and drum principle, especially as errors cannot occur due to the direct cursor coupling. A 10 to 1 reduction for broadcast wavelengths is ample, and can be obtained by coupling a control knob working a ¼in. diameter spindle to a 2½in. diameter drum mounted on the main condenser spindle behind the dial plate. The cord should be of woven silk or similar material, and it must be wound around the ¼in. spindle at least twice to ensure a proper purchase. Constant tension can be assured by bringing the cord ends inside the 2½in. drum and attaching them to contraction springs (initially drawn out). Collars or lips on both spindle and drum will guard against the driving cord slipping off.

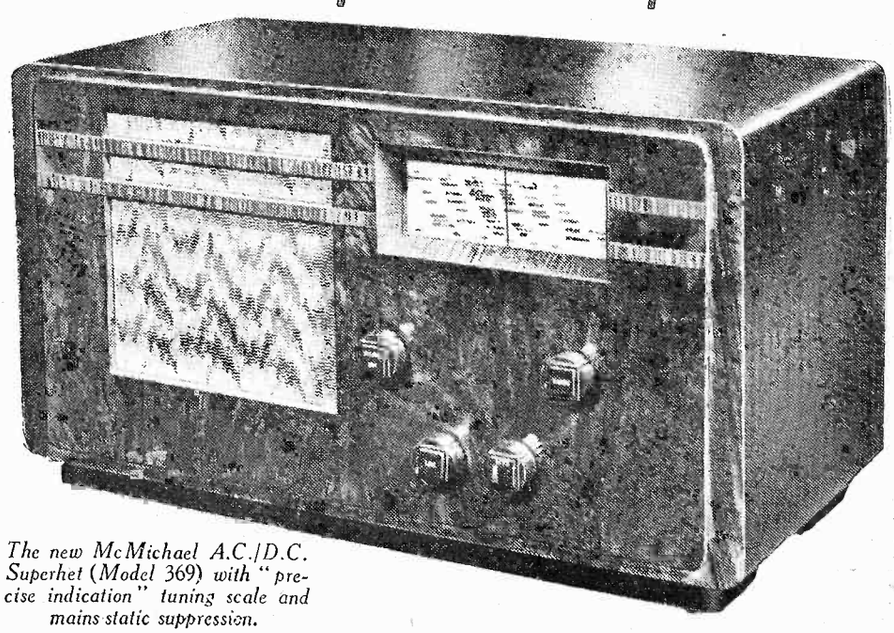
For short-wave purposes a reduction drive of 100 to 1 is desirable, and is best obtained by providing a further 10 to 1 reduction scheme on the control knob itself. It can take the form of a friction gear, the short-wave knob being mounted on control knob. Alternatively, an entirely separate "S.W." knob can be provided and worked by a friction drum on the main control, on an extension of the spindle beyond the point where the cord grips.

New McMichael A.C./D.C. Superhet

McMICHAEL RADIO have just introduced a popularly priced A.C./D.C. superhet, thus completing their current range with a total of eleven different models covering every possible requirement.

The new superhet is to be known as Model 369, and will retail at 12½ guineas. The five-valve (including rectifier) seven-stage circuit is contained in a horizontal type of inlaid walnut cabinet.

The general performance of Model 369 is notable for exceptionally quiet background, resulting from the use of an elaborate mains filter in each lead, with high sensitivity, and 2 watts undistorted output. Interesting features of this new model include the "precise-indication" scale used on previous McMichael models, in which the intersection of a vertical knife-edge pointer with a diagonal line appearing behind the station names when the scale is illuminated gives the exact tuning position, the low power consumption of only 60 watts, a special constant-gain aerial coupling circuit, a very complete cooling system, and provision for extra speakers with full switching control. The price is 12½ gns. for A.C./D.C. mains.



The new McMichael A.C./D.C. Superhet (Model 369) with "precise indication" tuning scale and mains static suppression.

Fitting the Set in its Cabinet

Methods of Drilling the Cabinet, of Using a Separate Panel, and of Fitting a New Set into an Old Drilled Cabinet

By FRANK PRESTON

MORE cabinets than one have been spoiled due to carelessness in drilling for the control spindles, or due to lack of knowledge of the proper procedure to adopt in carrying out the work. It is usual to-day to dispense with a panel as part of the receiver unit, since the front of the cabinet replaces it, and although this is excellent in many respects it is inclined to cause certain difficulties. When dealing with a receiver of which constructional details have been given in this journal, the drilling of the cabinet should be a fairly straightforward job, due to the fact that front-of-set dimensions are always given. In consequence, it should be possible simply to make a paper template from the dimensioned drawing and to use this for marking out the cabinet. The first trouble arises, however, due to slight inaccuracies in construction, which throw the dimensions slightly "out."

A Template

One simple method of overcoming any such trouble is by first marking out the positions from the front elevation (a typical one is shown in Fig. 1) on a sheet of stout paper or thin card, and then making holes one at a time to fit the spindles. The procedure is first to pierce the paper at the point corresponding to the position of the longest spindle. Slip the card over that spindle, and then pierce for the second longest, and so on until all the spindles have been passed through the card. Make quite certain that the template is perfectly flat at this stage, and also see that its lower edge is parallel to the baseboard or bottom of the chassis. The template thus made can be lightly glued to the inside of the cabinet in the correct position and $\frac{1}{16}$in. holes drilled through the centres of the various holes. These holes are best made with a small twist drill held in a mechanic's brace, but they can be made with a very fine bradawl, or with an archimedean drill of the type used for fretwork. Care must be taken that the drill is not forced, for that might cause the front facing of the plywood (which is generally used to-day) to be split or cracked.

Drilling the Holes

The next step should be to drill the holes partly through the wood from the outside. For all holes over $\frac{1}{4}$in. the best tool is a centre-bit held in a joiner's brace (Fig. 2), whilst for smaller holes a twist drill can be used in a mechanic's brace. Best results can be obtained with the centre bit when it is applied to the front face only until the bounding circle of the hole has been traced and the surface fibres cut through. After that the cabinet can be laid on a flat, smooth board of soft wood until the holes are completed from the inside. Where the cabinet is too large to be laid down in this manner, a block of wood should be held firmly against it by an assistant. In making the smaller holes with a twist drill, go about half-way through from the front and then finish from the inside.

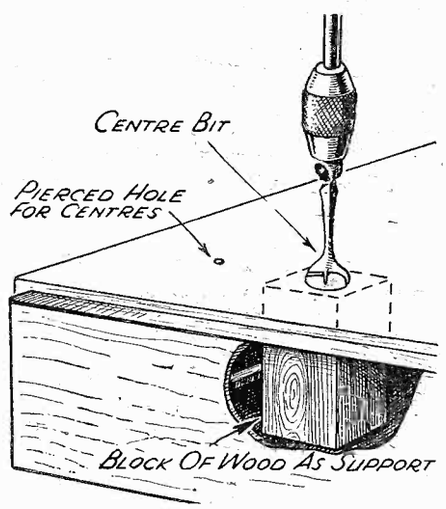


Fig. 2.—After making small centre holes from the inside of the cabinet full size holes should be traced out on the front, using a centre bit.

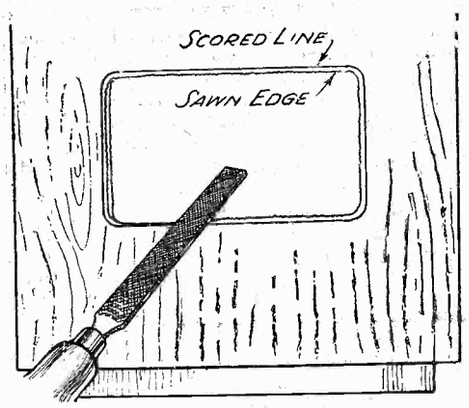


Fig. 4.—How the opening in the cabinet is finished off. The file is inclined.

With regard to the size of the holes, it is always a good plan to make them slightly larger than the diameters of the spindles, provided that the knobs are large enough to cover them. The reason for this is two-fold; it allows for slight inaccuracies of workmanship, and also prevents the spindle from being a tight fit. If they are at all tight the controls are more difficult to operate, and vibration from the speaker is more readily transmitted to the set, where it might cause a certain amount of microphony. Still further to assist in this direction, it is a good plan to allow the chassis or baseboard to stand on a piece of felt or baize, or even to glue small strips of soft rubber to the corners. This might appear to be unnecessary with modern valves, but it should be remembered that when tuning is extremely sharp, vibration of the connecting wires, coils, and condenser vanes can be a serious matter. Examination of commercial sets will show that many manufacturers adopt this course!

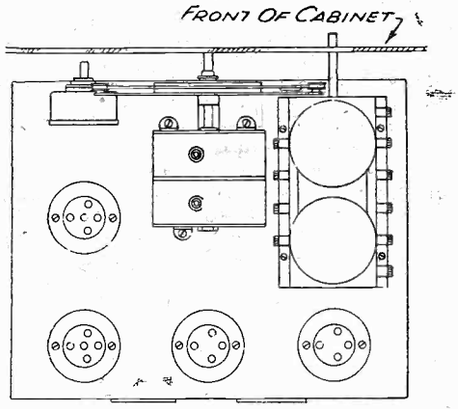


Fig. 3.—The set can be used as its own template by first making a hole for the longest spindle, and then marking the positions of the others, and drilling the holes in turn.

Marking Out from the Set

When a template cannot well be used, a similar method to that described above can still be followed, although the work takes up rather more time. The idea is to place the set approximately in position in the cabinet, push it against the front, and carefully mark the position of the tip of the longest spindle. A small hole can then be made at this point and afterwards

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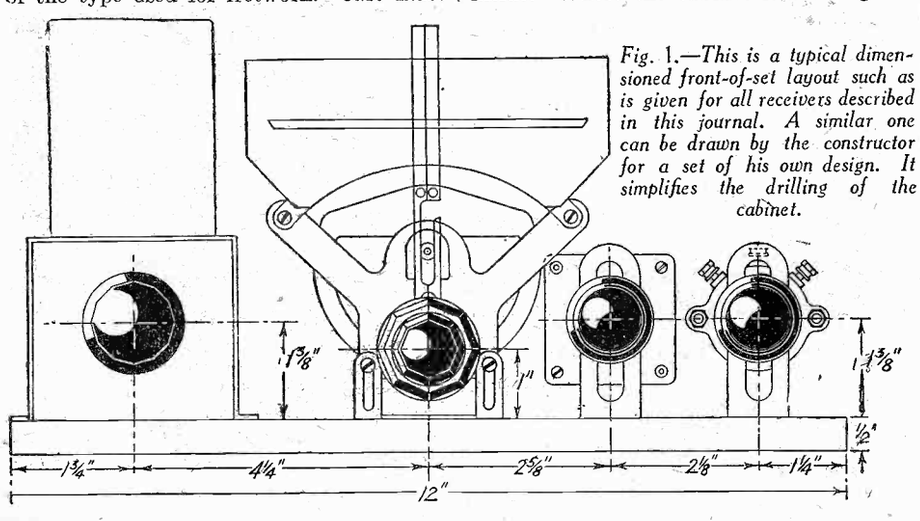


Fig. 1.—This is a typical dimensioned front-of-set layout such as is given for all receivers described in this journal. A similar one can be drawn by the constructor for a set of his own design. It simplifies the drilling of the cabinet.

FITTING THE SET IN ITS CABINET

(*Continued from previous page*)

enlarged so that the spindle will slip through. The centre of the next-longest spindle can then be marked and the hole drilled in similar manner (see Fig. 3); the process can be continued until all of the holes have been made. In this way absolute accuracy should be ensured.

In every case, however, care should be taken not to apply too much pressure to the drill, and to see that the drill or bit is perfectly sharp. It is also wise to have a firm support behind the hole which is being drilled, so that there can be no danger of splitting the wood or splintering the edges of the holes.

Experimental Receivers

When the set is an experimental one and might be modified or replaced, it is always better to employ a panel—either plywood, metal, or ebonite—and to cut an opening in the cabinet to accommodate the controls (see Fig. 5). The opening can be made most satisfactorily by first drawing the shape on a sheet of paper and then lightly gluing this to the inside of the cabinet, and drilling holes near the corners. These should first be run through with a small drill and then enlarged to half-inch in the manner described above. After that, the holes can be joined up by means of a pad-saw, or key-hole saw, as it is sometimes called. In sawing, keep about eighth-inch away from the outside lines, and for preference work from the outside of the cabinet. Another point is that care should be taken to put all the pressure on the forward stroke of the saw; if this is not done the edges of the cut are almost sure to splinter. After cutting out the unwanted portion, lightly score the outside lines on the front of the cabinet and file down to them, using a medium-cut file. Again, care must be taken to avoid splintering, and it is best to tilt the file, as shown in Fig. 4, and to go right down to the line on the outside. Do the same on the inside, always applying the pressure on the forward stroke only, and finally remove the rounded ridge by filing from the outside and holding the file at a sharp angle to the edge which is being filed. It should then be possible to make a perfect finish by means of fine glass-paper, which should be held on a steel rule or flat stick. The final finish is best obtained by running the glass-paper from end to end of the edge. Incidentally, the same method can be followed in making the opening for the tuning-dial escutcheon plate.

Finishing the Edges

If the cabinet is polished, as it probably will be, the next problem concerns the method of colouring and polishing the raw edge which is left. An attempt to match the colour and finish of the cabinet will generally result in failure, but if the edge is blackened with good black japan a good job can be made of it. The japan can be applied

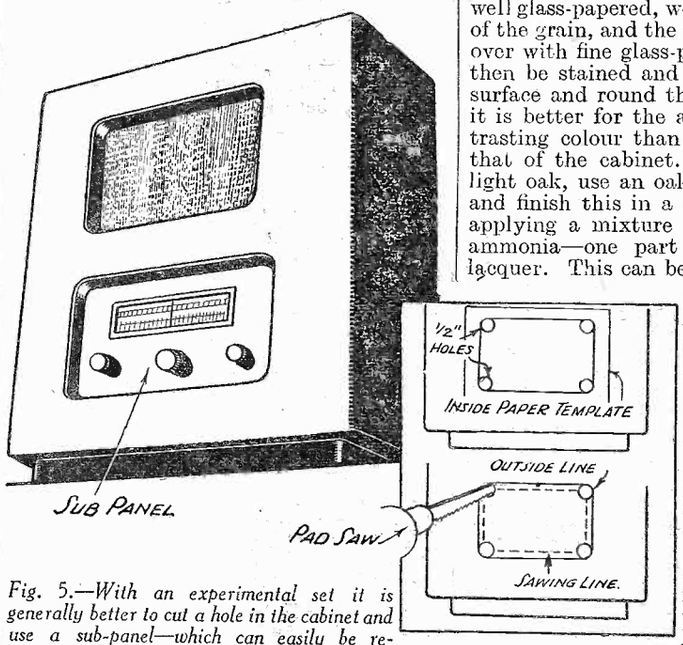


Fig. 5.—With an experimental set it is generally better to cut a hole in the cabinet and use a sub-panel—which can easily be replaced. Methods of making the hole are shown inset.

with a linen rag or with a brush, but the former is generally easier to use, because with a brush there is a tendency to over-run the edge. This can be prevented by lightly sticking a length of gummed paper against the edge of the hole on the outside of the cabinet; the excess of japan will then go on this, and the paper can be stripped off when the colour is dry.

Preparing An Extra Panel

If a cabinet has already been drilled and it is wished to fit a new set with different control positions, the method just described can still be followed. Another one is to fit a plywood panel over the front of the cabinet. Before adopting this method, however, make sure that the spindles are long enough to pass through this as well as through the cabinet front with sufficient length to spare to permit of the knobs being fitted. The new panel can first be drilled—before polishing—by one of the methods described above. After that the surface should be well glass-papered, working in the direction of the grain, and the edges slightly rounded over with fine glass-paper. This panel can then be stained and polished on the front surface and round the edges. Here again, it is better for the amateur to use a contrasting colour than to attempt to match that of the cabinet. If the cabinet is of light oak, use an oak-faced plywood panel and finish this in a dark-brown colour by applying a mixture of black lacquer and ammonia—one part ammonia to two of lacquer. This can be applied with a brush and then rubbed over with a non-fluffy rag. Incidentally, the application should be made where there is a good draught of air, because ammonia fumes are far from pleasant! A final polish with prepared wax or linseed oil will give the desired effect.

When the cabinet is of dark oak or walnut it will be found better to leave the panel a light shade. It can be simply well rubbed down with glass-paper and waxed, or it might be given a couple of coats of shellac varnish, well glass-papering between the two.

Use this panel as a template, and attach it to the front of the cabinet with neat screws (chromium plated or bronzed), and then drill the holes through the cabinet front. A modern finish may be obtained by blackening the panel and fitting chromium control knobs or a white panel with black controls.

Practical Television

November 7th, 1936. Vol. 3. No. 23.

Things to Come

THE title chosen by H. G. Wells for the wonderful film which has been shown at the cinemas during the last few weeks is very appropriate insofar as television is concerned. In the film itself a wonderful picture is painted of how television will be dovetailed into everyday life as a service of far reaching importance, not only as an entertainment in the home, but as a means of appealing to the masses when an important decision has to be made. Blind oratory does not sway a crowd as much as actually watching the speaker and hearing his voice at the same time, and this is an incident so well portrayed in the film itself. Wells is outstanding as a writer with a vivid imagination, but we have often wondered how much of the television side of "Things to Come" was a direct outcome of conversations between Baird and Wells in 1931. These two men met on a liner on the way to America, as the accompanying illustration (Fig. 1) shows. On a trip of this nature (an eventful one as far as Mr. Baird was concerned, for he married in New York in the same year), many friendships are made, and the possibilities of television were no doubt outlined to good effect by these two outstanding personalities.

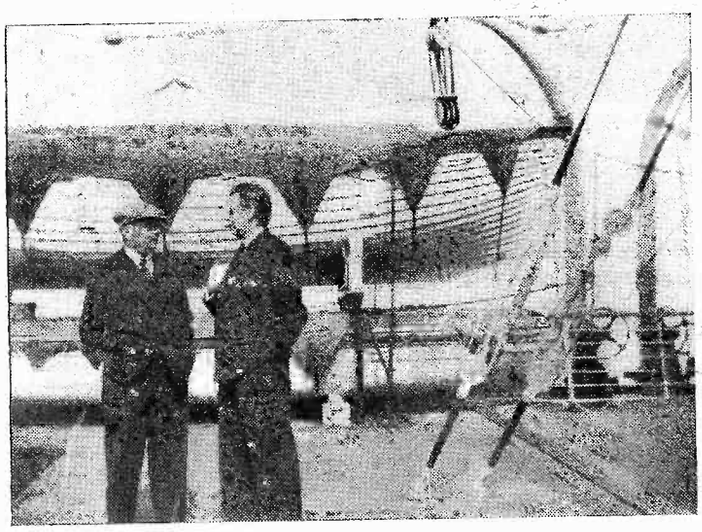


Fig. 1.—An informal chat between J. L. Baird and H. G. Wells in 1931, which may have had some bearing on "Things to Come."

A Reverse Process

The development of radio and television, although akin in many respects, can be regarded as starting in opposite categories. Radio started its career as a commercial proposition for the establishment of communication between distant places not linked by telegraphic means via a cable. It was only many years later that its benefits spread to the world of entertainment with the vast ramifications of the present day. Television, however, seems to be destined to start as a service providing a new entertainment medium. It is certain, however, that its use in commercial, naval and military life will very readily make itself manifest, but it is curious that the beginnings of the two subjects should be just opposite to one another.

A Common Mistake

A conversation was overheard the other day in which two people were discussing the subject of television. One was endeavouring to explain to his friend some of the problems associated with the provision of a public service, and stated that undoubtedly one of the most difficult things was to achieve synchronism between sound and vision, so that when a person was seen speaking on the receiver screen, voice and lip movement exactly coincided. To substantiate this remark the speaker went on to say that this was due to the widely differing speeds with which light and sound travelled through the air. The former was quoted as 186,000 miles per second, while the latter was given as 1,100 feet per second. Now while both these figures are correct the original statement is quite wrong, and it is surprising how many people make the same mistake. In radio telephony no actual sound is sent through space, but an electrical replica of the original sound waves, this being the modulating signal of the electromagnetic carrier wave. As readers know, this is reconverted into sound waves by the combination of radio receiver and loudspeaker. Similarly, with television, the scene to be radiated is converted electrically and optically into a somewhat similar modulating signal to be radiated by the electromagnetic carrier wave for reconversion at the receiving end by the picture reproducing device into a visual replica in miniature of the original scene televised. Both the sound and light conversion to electrical signals take place simultaneously and travel through space at identical rates. Synchronism between sound and vision is therefore quite automatic and needs no human agency to rectify it. The process bears no relation to seeing a lightning flash and hearing some seconds later the noise of this electrical discharge. With television neither light nor sound travels through the ether, but two quite separate, although synchronised, modulated electromagnetic ultra-short carrier waves.

Sport and Television

The B.B.C. seem to be fully alive to the possibilities of portraying nearly every phase of sport by means of television. Not only is it intended to see games of all types, but lessons of all the most popular forms will be featured. A taste of what is to come was given when Archie Compston demonstrated strokes and putting on a green quite close to the Alexandra Palace station, so that the Emitron camera could televise the scene in the usual manner. Compston himself was amazed at what he saw on the receiver screen when a man drove from the tee and made approaches to the green. He commented on the clearness of the picture and ventured to suggest that we were living in the age of miracles. Boxing has also been featured, and the whole work serves to recall some of the earlier television experiments, especially those in multi-zone television where the scheme was regarded as one solution to the provision of much higher definition than the thirty-line standard then being featured. In one case a three-zone experiment giving a total of

(*Continued overleaf*)

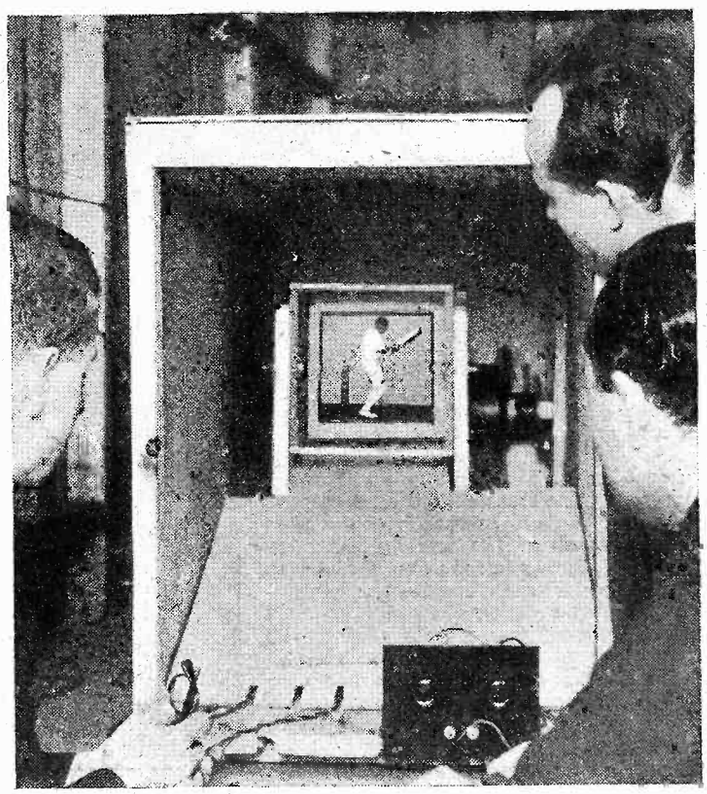


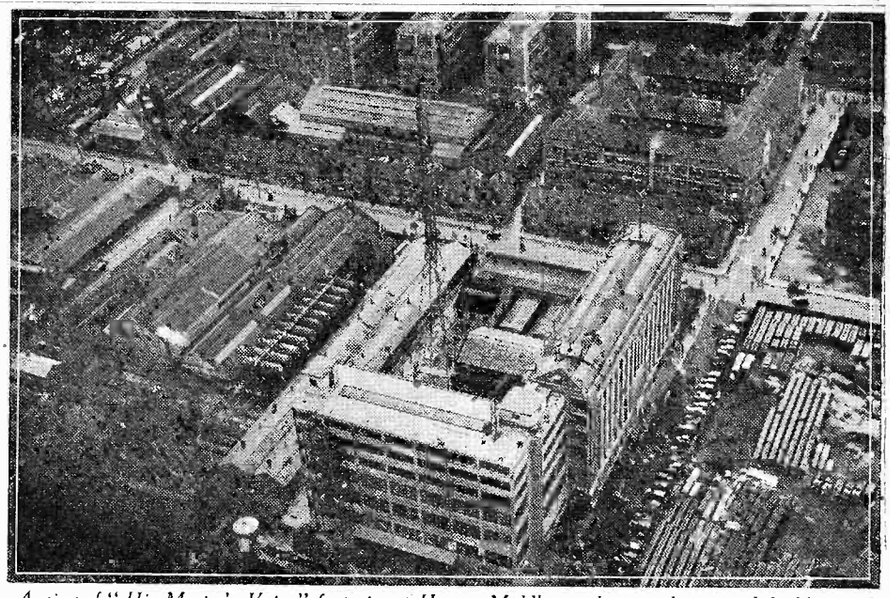
Fig. 2.—An early three zone ninety-line picture, portraying lessons in sport as now featured on high-definition B.B.C. television service.

(Continued from previous page)

ninety-line definition was used to portray cricket strokes and wicket-keeping by Strudwick, the well-known Surrey player. An idea of the receiver built up for this purpose is shown in Fig. 2. It was undertaken by Baird, and at the receiving end he used a single-mirror drum with three separately modulated point light-source type neon lamps. Each of these handled the signals of one zone, and by matching up the three zones the resultant picture was built up something in the manner shown in the photograph.

Television and Photography

During the last two or three years the Royal Photographic Society has included an exhibit showing the close relationship between photography and certain sections of the television processes. This year the results shown dealt with the actual recording of television pictures on standard 35 millimetre film by means of the intermediate-film projection receiver. A standard of 25 frames per second was employed with 240 line definition. In addition to films showing the good results that can be obtained selections were included to illustrate certain faults which have to be cured. One of these was the picture resulting from over modulation, while another demonstrated very clearly the effects of hum or mains ripple induced into the cathode-ray tube time base. In either case the quality of the picture is ruined, but both these defects can be rectified by a proper attention to equipment design and layout.



A view of "His Master's Voice" factories at Hayes, Middlesex, showing the research building and television mast.

Television Notes

Speed of Electron Beam

THE electron beam of a cathode-ray tube when receiving high-definition television, travels at an average speed of approximately 4,600 miles per hour, although during the fly back from one line to the next it attains a speed of more than 50,000 miles per hour.

Air Pressure Inside a Cathode-ray Tube

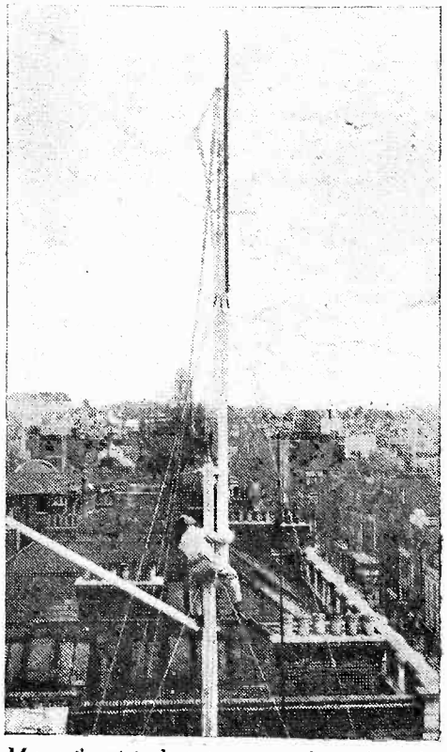
FOR all *mechanical* considerations the air pressure inside a cathode-ray tube may be considered negligible, which means that the screen of the 12in. variety is subjected to an atmospheric pressure of some three tons, while the atmospheric pressure on the whole tube is anything between ten and fifteen tons, according to its shape.

The Television Film, November 2nd

"TELEVISION comes to London," the new B.B.C. film, had its première in the evening transmission from Alexandra Palace on November 2nd. Produced by Gerald Cock, Director of Television, and Dallas Bower, this film gave a vivid picture of the establishment of the television service, dealing first with the reconstruction of the East Corner and Tower of Alexandra Palace. It showed also how the transmitting apparatus was constructed and tested in the laboratories of the Marconi-E.M.I. Company and the Baird Company. The scene shifted once more to Alexandra Palace, and televiewers were given glimpses of the tower under construction. Incidentally, these shots were taken at considerable risk to the cameramen who were swung aloft in a bo'sun's chair. Drawing towards its climax, the film portrayed the "Station in Being." Various departments were seen at work; the announcers in the make-up room; a typical programme being presented in the studios; Adele Dixon singing "Television" in her first television performance, and, finally, the Television Orchestra, playing in uniform, in a series of ingenious camera shots. The commentary to "Television Comes to London" was by Cecil Lewis, and the narrator was the television announcer, Leslie Mitchell. The photography has been carried out by Major L. G. Barbrook and James Carr.

Marconi's Original Mast

ON the roof of Radio House's, headquarters of Marconiphone, is now in position a 60 ft. mast consisting of main mast and topmast, and carrying a gaff with a Union Jack at the peak. This mast has a unique history, inasmuch as it is the original mast used by His Excellency the Marchese (then Signor) Marconi during his early experiments in the Isle of Wight.



Marconi's original mast, now on the roof of the Marconiphone headquarters in Tottenham Court Road, London.

It stood in the grounds of the Royal Needles Hotel, Alum Bay, Isle of Wight, and carried an aerial with which Marconi succeeded in establishing communication over a distance of several hundred yards. He increased this to two miles and then moved to Niton, eight miles away, taking the mast, which took two days to transport owing to its size and weight. He erected it in a field quite near to where St. Catherine's Lighthouse now stands, and established communication with the mainland after further experiments.

Altogether, Marconi used this mast for three years in the Isle of Wight, and at the end of that time he was convinced that the time had come for his big onslaught on the Atlantic. The mast (at that time 160 feet in length) was reduced to 60 ft.—its present length—and was used to carry a flag in the garden of a lady's house on the Island.

Last year it was bought by Marconiphone and shipped to England. It now carries the first Television aerial in the West End of London to be erected for the purpose of supplying programmes for public demonstration and experiment. Thus, the very old meets the very new with considerable benefit to everyone.

Some advance details of this mast were given in our issue dated Oct. 24th, and the accompanying illustration shows the mast being given a final overhaul after its installation on Radio House.

IMPORTANT TELEVISION EVENTS OF THE WEEK.

Mon.	Nov. 9.	Picture Page.
Tue.	„ 10.	Pageant reconstructing Lord Mayor's Show.
Wed.	„ 11.	Armistice Day Programme.
Thu.	„ 12.	International Poultry Show.
Fri.	„ 13.	Operatic excerpts.
Sat.	„ 14.	Veteran Cars Parade.

On Your Wavelength

By THERMION

"Knowledge of Music Not Essential"

SO many readers are expecting a weekly comment on jazz that I must not disappoint them. May I, therefore, direct their attention to the following advertisement which appeared in a South Wales newspaper :

"An amateur band in———— require instrumentalists, string or piano-accordion ; knowledge of music not essential. Apply————."

I am obliged to a reader for this cutting, which proves up to the hilt, without dubiety, beyond equivocation, and Q. E. D., that my remarks against jazz are more than justified. The reader says that he has taken a band of fourteen players, none of whom had ever performed or rehearsed with the others, and put over a full programme, not only without the public detecting that they had been unrehearsed, but with rapturous, cataclysmic, spontaneous, and resounding applause (cheers). He says that the only essential to jazz is a good general utility man, the remainder is and may well be "dirt." This epitomises modern music to perfection.

Now, my masters, what have you to say? Ye who support this aboriginal nigger nonsense—are you going to smite me hip and thigh? And will those ayes write and add to my bulging file in further support of my rhetorical, metaphorical, and calligraphical objurgations, execrations, and anathematized castigations of this parasitic barnacle-like appendage to modern entertainment. Play the game, you scugs, play the game !

Baseboards, Still More Baseboards

AND now to another hoary old subject. Baseboards *versus* chassis ! It is too early to assess the success of the "Record," so I must defer judgment. Two more readers want to have their say, and so they shall.

Here is E. P. R., of Royston, who says :—

"Dear Thermion, —May I have a word to say in this 'baseboard *versus* chassis' controversy? I have constructed a few circuits on the baseboard, and it has many advantages, being very easy to get at, and therefore different components may be changed with ease. But for neatness and compactness give me the chassis, which must be the better of the two, otherwise the best designers would not use it.

"I agree with S. T. P., of Bethnal Green, as to the ease of building up a circuit on the baseboard, but once you have your circuit, try it on a chassis and after a little shifting and changing about you will find it even better.

"I have not seen anything referring to the cycle radio lately, but I did try one set out on the wheel. It was a two-valver with a frame aerial mounted on the handlebars, but was not an entire success, owing to the directional properties of the aerial. I should like to hear of other readers' results in this line.

"Thank you for 'On Your Wavelength,' and I think you get more interesting as the weeks roll by."

Another reader contributes the following views to the problem :—

"Dear Thermion,—I have been a reader of your articles for a long time —they are always the first I turn to.

"I have been very interested in your remarks about the baseboard *v.* chassis controversy. Personally, I have always used the baseboard; in fact, the one I started with in 1929 is still doing yeoman service. Before I came here, eighteen months ago, into the country I was curate in one of the poor parishes in Sunderland. Most houses, of those of the unemployed, had some sort of wireless, and as I was interested, too, I had many conversations about it. I gathered that many men make up a set, using cheap parts to start with, and then, later on, they may be able to afford a better component or pick one up secondhand. Most of us have some of last year's valveholders, etc. One important point I don't think you have mentioned is this: I think the baseboard construction has a better educational value. I first made up sets from the pictorial diagrams, and then with the theoretical circuit in my hand have sat gazing at the set for a long time on many days, comparing the set with the circuit. I now find that I can read a theoretical diagram fairly well, and can build a simple set from one.

"Another curious result of constructing your own sets is the sentimental attachments to various components which are used and have done good service. I look at a coil or transformer, which has served me well and feel it a shame to put it in the junk box. I feel like framing it or crowning it with laurels and standing it on the mantelpiece ! Then a set becomes associated with important events in our lives, and it is difficult to put them on one side. The first set I made up was after I was ordained in 1929, and I felt it quite a wrench when I pulled it to pieces. In fact, I still use the same baseboard, panel, valveholders, condenser, etc.

"There is a romantic side to wireless besides the so-called romance of big business.

"I must finish by saying how much I enjoy the paper. I really look forward to it each week."—L. G. (Hovingham).

Back Numbers for Readers

MR. W. MORRIS, 5, Corser Street, Smethwick, Staffs, says that he has back numbers of this journal dating from September 28th, 1935. If any reader would like them he can have them for the price of postage. Remember—first come, first served.

"Where are the Clubs?"

I REALLY must find room, too, for the following epistle, missive, or letter :

"Dear Thermion,—In reply to

your query, 'Where are the Clubs?' I am writing you a long-threatened letter. I have read your article regularly, with approval or criticism, as the case merited. Crooners, I detest, but baseboards every time for short waves. To return to Clubs, we have been running ours nearly a year, and are getting healthier. Not a big cash balance, all money goes in gear. Tri-tet TX and regen. receiver under construction now, and besides this, the best crowd in the district all ready for a chin-wag. Mansfield started a club about a month ago, and both clubs are working with a view to co-operation in experimental transmissions. Stand by for reports in your club columns." —H. D. (Notts).

Television Public Address!

ON Thursday, October 22nd, the world's first Public Address Television job was carried out by Marconiphone.

The work was undertaken on behalf of the Society of Motor Manufacturers and Traders, and took place in the Exhibitor's Club at the Motor Show, Olympia. The occasion was the television broadcast by Sir Malcolm Campbell of a description of each of twelve cars selected by the S.M.M.T., and four Marconiphone "701" Television receivers were installed in the Exhibitors' Club to convey to a selected audience Sir Malcolm's gestures and remarks.

The S.M.M.T. invited members of the Press, the directorate of each of the firms whose cars formed the subject of Sir Malcolm's broadcast, the President and Executive of S.M.M.T., and other prominent members of the Motor Trade.

Altogether, about 120 people witnessed the reception, each of whom saw everything perfectly. This is the largest number of persons ever to witness a regular television programme.

New Home of the B.I.E.T.

I AM interested in the great strides which have been made by the B.I.E.T., which was originally located at Shakespeare House, Leicester Square, on the site now occupied by the Leicester Square Theatre. But a growing business demands space, and the Institute was moved to Shakespeare House, Oxford Street. It occupied one floor, but within one year a second floor was taken over; then a third; next a fourth; then the volume of business burst over the banks, so to speak, and additional accommodation was found in Soho Square. This proved inadequate, and finally, the Institute has settled down in the large building upon the corner site of Oxford Street and Stratford Place. This large building, the work of independent architects and the professional staff of the Institute, houses every modern efficiency device, and the new Shakespeare House is now as up-to-date as money and brains can make it. From the time an enquiry for a prospectus is received right through the process of advising and conducting the student's studies and piloting him through his selected examinations, an efficient organisation ensures the successful termination of his studies. They have an electrically-operated postal machine and a printing factory, and many publishers have placed commissions with the Tutors of the Institute for technical books. I wish the Institute well.

Notes from the Test Bench

Speaker Field Windings

WHEN a set is fitted with a permanent magnet speaker it is a fairly easy task to find a suitable substitute when a replacement is necessary. In most cases it is only necessary to find a speaker having the correct ratio output transformer attached, and, as most speakers of the permanent magnet type are fitted with multi-ratio transformers, no trouble need be experienced. When the speaker is of the energised type, however, substitution cannot be so easily effected—the field winding has now to be considered. Speaker field windings are made in several standard resistance values, the most common being 1,250 ohms, 2,500 ohms, and 6,500 ohms.

Importance of Resistance

THE first type is generally used in quality receivers having a high anode current consumption, the field winding being connected in the common H.T. lead, either in the positive or negative line. If this type of speaker were incorrectly replaced by a high resistance type, too great a voltage drop would occur across the winding, and the valve anodes would be starved. The 2,500 ohm type is commonly connected in the same manner as the 1,250 type, but in lower power receivers. If the low resistance type were fitted in this case, excessive voltage would be applied to the valve anodes. The 6,500 ohm speaker is generally energised direct from the 200-250 volt D.C. supply, or the field winding is connected across the rectifier output circuit. A low resistance winding connected in the latter position would become damaged, and, what is more serious, the rectifying valve would also be damaged.

Extension Speakers

THE addition of an extension speaker is also a matter which cannot be tackled haphazardly. The extension speaker sockets on some sets are connected to the speech coil of the set speaker. When this is the case the extension speaker should be of the low-resistance type (between 2 and 15 ohms approximately), and if a high-resistance type is used a step-up matching transformer should be connected between the extension sockets and the extra speaker.

The Post-War Generation

WHICH reminds me that never was it more necessary that youth should absorb in such easily-assimilable form the world's heritage of knowledge. Unfortunately, the War upset the mental balance of the world. Before the War, young men were trained in the arts and the professions; they had to serve an apprenticeship of from five to seven years; to start work at six o'clock in the morning, and to work for a modest wage. Moreover, they had to pay a premium before they could become indentured. At the end of their period of apprenticeship they put in a further year or so as improvers, and by that time were highly skilled. The apprenticeship system has completely broken down, and never has the need for skilled labour been greater. The very skill which created machinery has died off, and no one seems willing to become apprenticed. Youths to-day wish to start work at the age of seventeen or eighteen, and at once to command a man's wage. There is little wonder that there are 3,000,000 unemployed. The correct term for a large percentage is that they are unemployable. Some of them will tell you, somewhat tragically, that they are prepared to do anything, which is precisely what they cannot do. A man who says that he can do anything can usually do nothing. The radio trade is no exception. It does not take apprentices. How does it expect to get skilled labour? Does it think that individuals are *born* with specialists' knowledge?

Correspondence schools are performing a national useful work in bringing their country back to a knowledgeable state.

Feeding the Loudspeaker

Some Important Points Regarding the Output Stage are Explained in This Article and Some Doubtful Points Cleared Up.

By W. J. DELANEY

A NUMBER of listeners bemoan the fact that, although they are using a 2-watt valve in their output stage, the volume which they get is far less than one watt. Similarly, others who do not understand the meanings of the various valve terms, purchase a valve for the output stage which is of the L.F. type and of low price and then wonder why they cannot obtain more than a very weak signal without severe distortion. As a matter of fact it may rightly be stated that the output stage of a receiver is the most important, and should receive more care and attention in its design and in the voltages applied to it than any other part of the ordinary receiver. First of all it must be remembered that the loudspeaker can only deliver what is fed to it. It cannot amplify, although a poor speaker will not deliver the maximum signal voltage which is applied to it. Assuming, however, that the speaker is a good one of sound design, then it will deliver a faithful replica of the signal fed to it, and the makers will state the maximum signal which it will handle without distress. For the battery user this figure will not be of much importance as it is very unlikely that he will be able, with battery supplies, to obtain a sufficiently powerful signal to overload the speaker. In the case of a mains receiver, however, it may be possible under certain conditions to obtain a signal in excess of that which may be handled by the speaker and thus this point should be studied.

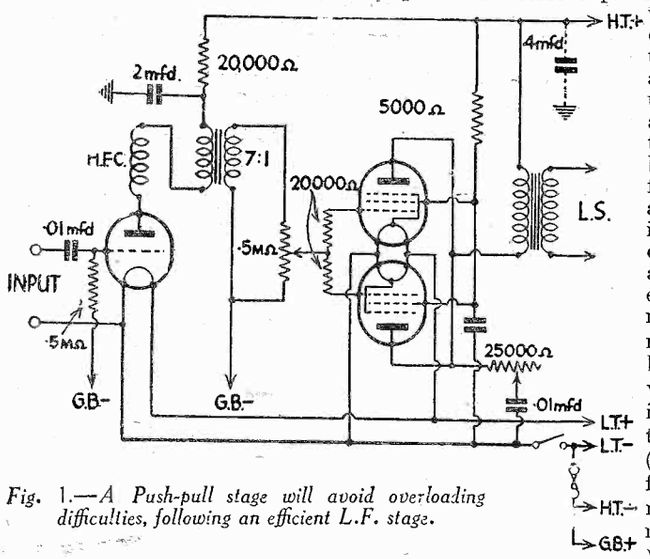


Fig. 1.—A Push-pull stage will avoid overloading difficulties, following an efficient L.F. stage.

Pentode or Triode?

Many listeners purchase a pentode valve on the understanding that it will deliver a greater volume than a simple power valve, and when the change is made in the receiver find that in some cases the volume is not so great as with the original valve. This may be due to two reasons—either the extra anode current taken by the pentode results in a loss of voltage to the remaining valves owing to the fact that the H.T. battery or mains unit will not deliver the extra current, or the input voltage is too great and the pentode is severely overloaded. Whilst the pentode valve has a higher amplification factor than a simple triode. it will not, in the majority of types, handle such a large input and therefore, the correct place to use the pentode is when insufficient amplification is afforded after the detector to provide adequate loudspeaker volume. It may be taken as a fairly general rule that a pentode should only be used immediately following a detector valve, and that if an L.F. stage is inserted between a detector and output stage a pentode should not be employed in view of the risk of overloading. This rule may, of course, be broken if a suitable L.F. volume control is included in the first L.F. stage, as then the loudest signals (such as may be obtained from the local station) may be sufficiently reduced to bring them within the range of the pentode valve, whilst weak signals will receive the benefit of the additional amplification and will afford better loudspeaker results.

Tone Correction

In most circuits the pentode must be used in conjunction with a tone correction circuit, as the reproduction is normally rather high-pitched. This tone corrector is required although the loudspeaker used with the receiver has a pair of terminals or other input arrangement marked "Pentode." Some amateurs appear to be under the impression that if the speaker is designed for use with a pentode no tone corrector is required, but the fact that the speaker will be suitable for use with a pentode concerns its impedance or resistance, and not its tone of reproduction.

In designing the output stage the maximum volume which is desired should be the first consideration, and one should then work backwards to the remainder of the circuit. For the battery user a maximum of 3 watts should be considered for normal circuits, but, of course, this will need a very efficient H.T. supply, and will be expensive to maintain. With a single valve a maximum of 1½ watts only is available The mains user, on the other hand, can obtain a single valve to deliver an output of 15 watts. Valves of this type are, however, in many cases, subject to the same limitations as the pentode valve; namely, their inability to handle a very large input. The amplification factor is high, and thus they need only a small input in order to deliver the maximum output. The range of the input signal may be ascertained from the grid bias figures. If a valve is rated for 3 volts grid bias it will only take half the signal that a valve requiring 6 volts grid bias will accommodate. Thus, if designing the output stage for a simple receiver without any L.F. amplification between it and the detector one would select a valve with the highest possible amplification factor, and with a low grid bias figure. On the other hand, if one is designing a very powerful receiver to use an output stage delivering 10 watts or so, one would select a low amplification factor output valve with a very high value of grid bias, and each intervening L.F. stage would have a higher amplification factor and lower grid bias.

Push-pull and Parallel

The push-pull stage will handle just slightly more than double the signal which the single valves will handle, and thus such a stage could be used where overloading takes place with the single valve. Obviously, however, the additional anode current and L.T. current drain must be considered at the same time, or the existing supplies may be found inadequate, with the result that the additional gain will not take place. The parallel stage, on the other hand, will not handle any more than the single valves, but the amplification will be greater. Assuming, therefore, that we have a receiver which provides very poor volume,

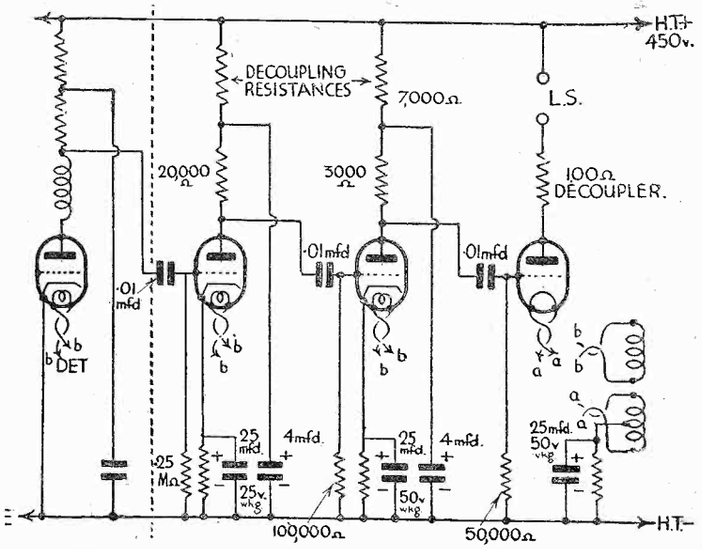


Fig. 2.—Where a succession of L.F. stages is employed, an efficient triode output valve should be used, and one with a large grid swing is necessary to avoid overloading.

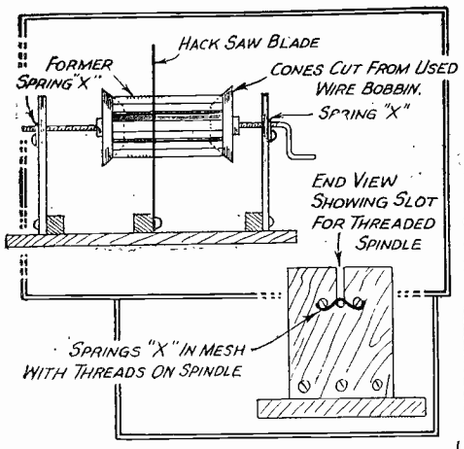
(Continued on page 252)

A PAGE OF PRACTICAL HINTS

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

Grooving Machine for Ribbed Formers

THIS simple machine can be made quite cheaply and can be used for cutting spiral grooves on any size of former. The pitch of the grooves depends on the number of threads per inch on the shaft.



A simple device for grooving ribbed formers.

The former is held on the threaded shaft by cones cut from spent wire bobbins and secured with locknuts. The spindle may be bent into a crank handle at one end.

The steel springs at each end engage with the thread of the spindle, and as it is rotated the spindle and coil-former moves forward. The hack-saw blade is held against the former with sufficient pressure to cut the grooves to the required depth.

This machine can also be used for space-winding coils by substituting a slotted feeder for the hack-saw blade.—J. SOMERS (Flixton).

Multi-purpose Testing Unit

NEEDING a multi-purpose testing unit, and not wishing to go in for an expensive commercial model, I utilised a good voltmeter of the pocket type which I had by me. This is mounted on a polished wood case, size about 5½in. by 4in. by 2¼in., so that the face is flush with the top, simply by cutting out a circular hole of sufficient diameter to hold the case firmly. The terminals of the meter are thus left inside the box. Eight sockets and an ordinary bulb holder are fitted as in the diagrams, and connections soldered up. Two flex leads connect to a 4½v. cell which clips inside the box for convenience. An ordinary flash-lamp bulb is screwed into the holder.

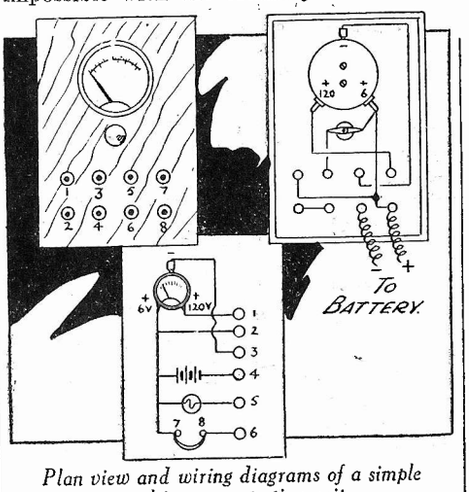
The unit will now test as follows, using two leads which plug into the sockets and which terminate in prods or clips as desired :—

Sockets	1	and	3	to test up to 120 volts.	
,,	2	,,	3	,, ,, ,,	6 ,,
,,	3	,,	4	,, circuits on meter.	
,,	4	,,	5	,, ,, ,,	,, lamp.
,,	4	,,	6	,, ,, ,,	,, 'phones.

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 lamp is sufficient for a rough circuit test, the meter being used for a more accurate one, while the use of 'phones enables one to test grid leaks and small condensers for break-downs, this being impossible with the ordinary meter.

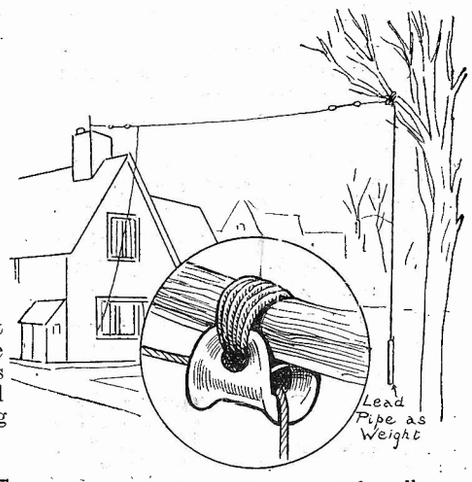


Plan view and wiring diagrams of a simple multi-purpose testing unit.

The sockets may be coloured if desired, but a numbered code as indicated is all that is necessary. Sockets are, of course, simpler and speedier than terminals.—W. C. ENGLISH (Newcastle-on-Tyne 4).

A Self-adjusting Aerial

THE accompanying sketches illustrate a method of self adjustment for tension of an aerial suspended from a tree that may swing in the wind. The lead pipe may be replaced by any other weighty object as counterweight, but the lead pipe looks the tidiest. This method is far more practical than springs, which are susceptible to the vagaries of the weather and there is also a limit to their movement, which, of course, does not apply in this case.—E. W. FURBANK (Bromley).

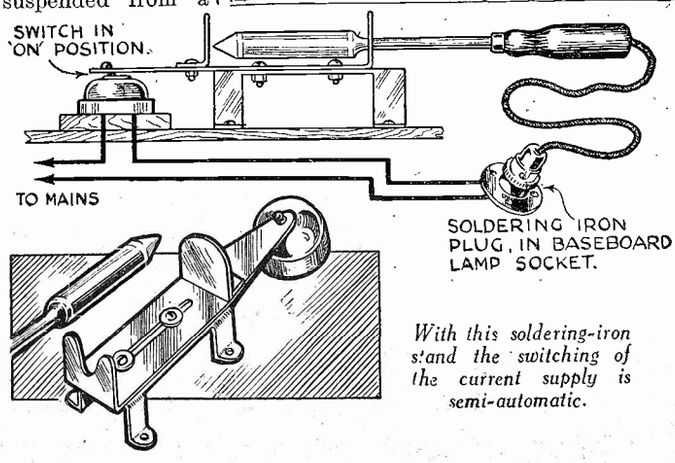


A method of suspending an aerial to allow for automatic adjustment.

A Switching Stand for a Soldering Iron

THE accompanying sketch shows a device which I have made and find most useful. It operates the switching of the current to my electric soldering iron simply by the removal or replacement of the iron itself.

It will be seen by the sketch that when the iron is replaced the point is pushed against the projecting plate and so switches on the electricity. If the operator desires to switch off, the iron itself engages in the "V" slot in the plate and by pulling same the switch is thrown in the off position. The device should be firmly mounted upon the soldering bench and the sliding plate well greased so as to ensure its easy action.—G. W. ARNOLD (Ilford).

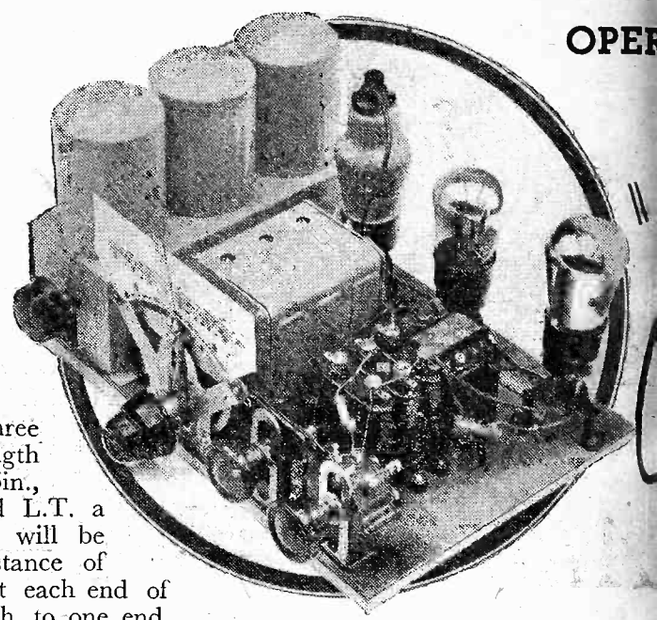


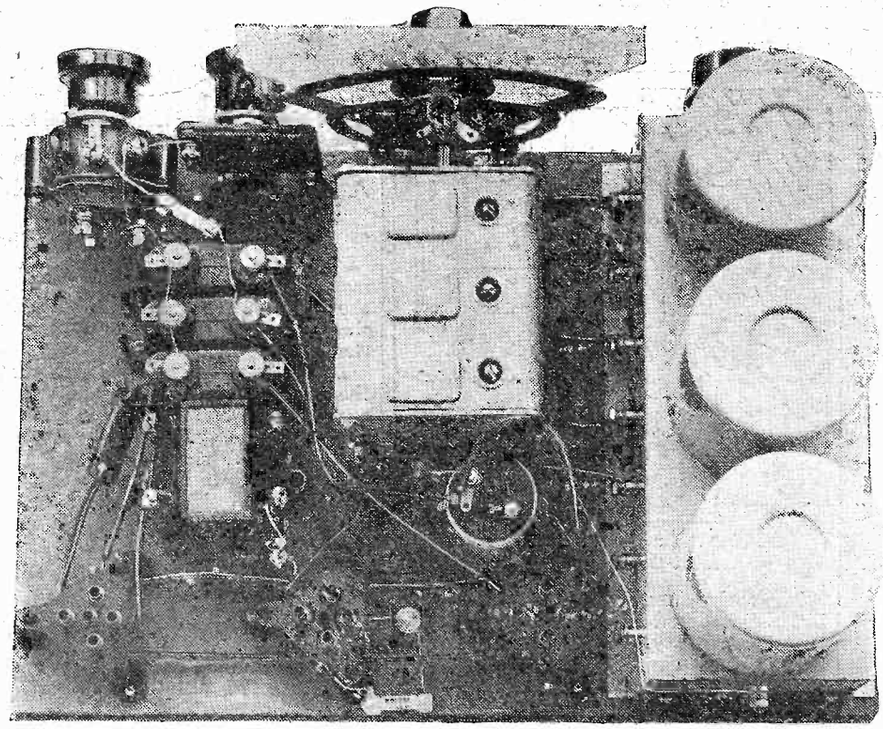
With this soldering-iron stand the switching of the current supply is semi-automatic.

THE instructions given last week terminated at the point where the wiring was completed with the exception of the battery leads. Included in these are the leads to the loudspeaker, and it will be seen from the latter three leads are required in this particular design in order to simplify the general receiver wiring In addition to the usual anode and H.T. positive lead to the speaker, the additional lead is employed in order to convey to the screen of the output pentode the necessary H.T. positive potential. No confusion should arise from this scheme, however, as in the blueprint the lead from the screening terminal on the output valveholder is marked L.S.1 and the lead from the anode L.S.2. These are both joined to the loudspeaker terminals in the usual way. The lead from condenser C11, marked L.S.1, is then connected to the loudspeaker terminal to which is also joined the lead from the screening-grid terminal on V3, and thus the two L.S.1 leads are joined together. This is therefore quite simple, but if for any reason the individual constructor desires to dispense with the third lead on the speaker he may join the lead marked L.S.1 on condenser C11 to the centre valve leg on V3, taking a lead from this point for connection to the loudspeaker.

The Battery Leads

There are nine battery leads, and lengths of ordinary flex may be used, or a nine-way battery cord may be purchased. For the three grid-bias leads the length of lead may be about 6in., but for the H.T. and L.T. a length of about 12in. will be required. Bare a distance of about half an inch at each end of these leads and attach to one end of each one of the Bowspring wander-plugs or spades. The lead marked L.T.+ should be joined to the filament socket on V3 furthest from the panel, and L.T.— to one of the switch contacts on the combined volume-control and on-off switch. To the remaining empty terminal on





All components are neatly arranged, and terminals are in convenient positions for voltage tests, etc.

The Completion of the B
Various Operating Adj
This

this switch the G.B.+ lead is attached. To the empty side terminal on the control the G.B.—2 lead is attached and G.B.—1 is attached to the terminal on the L.F. transformer which is marked G.B. H.T.— lead is joined to the right-hand terminal on C9, and H.T.+3 is joined to the left-hand terminal on C11, the remaining two leads being joined to the L.F. transformer and condenser C9, the latter H.T.+1 and the transformer lead H.T.+2.

The receiver is now ready for test,

LIST OF COMPONENTS FOR F. J.

1 All-wave Coil Unit
1 Three-gang condenser, Type K (.00025+.000
1 Slow-motion Drive (type 2135) including .0000
1 .0005 mfd. Reaction condenser (C5)
6 Fixed Condensers:
Three .1 mfd. type B.B. (C9, C10, C11)
One .005 mfd. type 4421/E (C12)
One .0001 mfd. type 670 (C8)
One .0002 mfd. type 670 (C7)
3 Half-watt resistors:
One 15,000 (R.3)
One 50,000 (R.1)
One 2 megohm (R.2)
1 Volume control potentiometer with switch, 50,
1 All-wave H.F. choke, type H.F.15
1 L.F. transformer, ratio 3.5 to 1, type Niclet
2 Component-mounting brackets
3 Baseboard-mounting Short-wave valveholders, V8)
7 Bowspring wander-plugs: H.T.–H.T.1, H.T.2, H.T.3, G.B.+, G.B.—1
2 Spades, L.T.+and L.T.—

1 Wooden baseboard, 12in. by 8in. (Metaplex)
23 No. 3 ¾in. round-head screws.
8 No. 3 ½in. ditto.
2 No. 4 ¾in. ditto.
2 Lengths insulated sleeving.
Quantity of tinned copper wire or insulated con

ACCE
Three valves, 210VPT, 210HF and 220 HPT
One W.B. Stentorian Speaker
One 120 volt Drydex Super-Life H.T. battery
One 9 volt G.B. battery, Type H.1001
One 2 volt L.T. accumulator, Type DMG-C
One "Record" Cabinet

NG AND ADJUSTING

F.J.CAMM'S "Record" All-wave Three

ng Instructions and the ents are Explained in cle

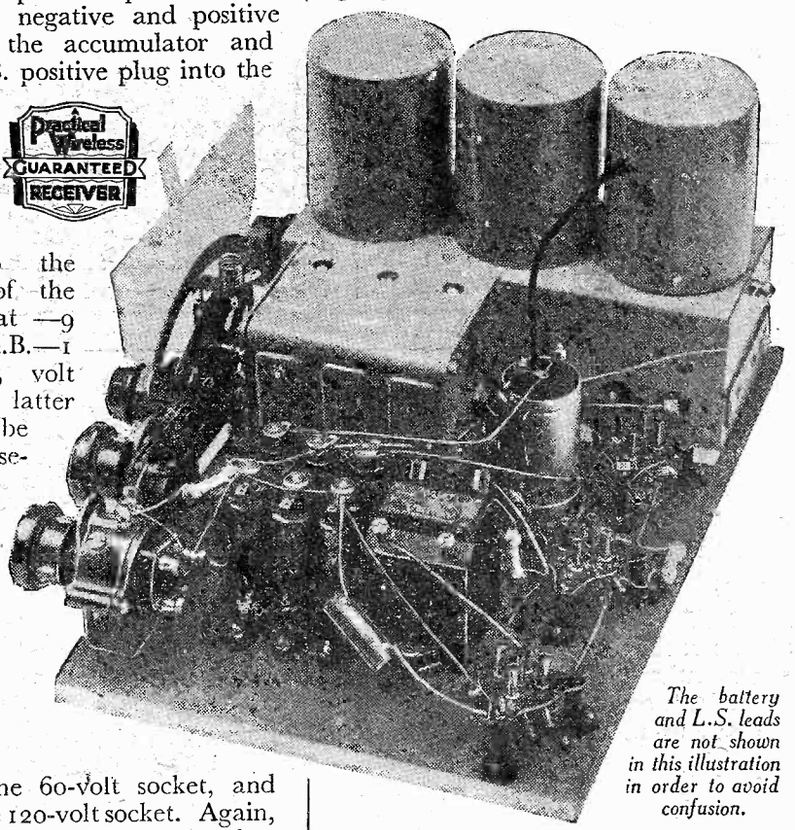
id before plugging in the valves the iring should be very carefully iecked by the blueprint. If you have meter it is advisable to make a)ltage test to ensure that the valves ill not be burnt out due to a mis-ken connection. For this purpose e H.T. and L.T. batteries should be)nnected up as described in the next ction and the switch placed to the on " position. The voltmeter should en be applied to the filament sockets the valveholders and the reading ould not be greater than 2 volts.

Preliminary Adjustments

If this is in order the valves may be inserted, the H.F. valve being plugged into the holder next to the coil unit, the detector valve in the centre holder and the pentode in the remaining holder. A short flexible lead should now be joined to the anode terminal on V1 and taken down and connected to the terminal on the H.F. choke to which is connected condenser C7 (.0002 mfd). Connect the L.T. negative and positive spades to the negative and positive terminals on the accumulator and insert the G.B. positive plug into the positive socket on the G.B. battery. G.B.—2 should be inserted into the other end of the G.B. battery at —9 volts, and G.B.—1 into the 4.5 volt socket. The latter voltage may be modified subsequently when the receiver has been put into correct working order. H.T.1 should be inserted into the 84-volt socket on the H.T. battery, H.T.2 into the 60-volt socket, and H.T.3 into the 120-volt socket. Again, it may be found subsequently that H.T.1 and H.T.2 may be modified in order to provide the maximum operating conditions.

Practical Wireless GUARANTEED RECEIVER

Connect the earth lead to the socket marked E on the rear of the coil unit and the aerial lead into the socket next to it, A2. Turn the reaction condenser to its maximum position in an anti-clockwise direction and set the control knob on the wave-change switch so that the orange-coloured spot is on top. This sets the coils to the medium-wave band from 200 to 550 metres. Turn the right-hand control slowly to its maximum position, and the receiver will then be in its most sensitive position and the local station should be heard. Turn the main tuning control until the signal is picked up, or until any signal is heard, and in the case of a listener situated in the London district, for instance, the London National should be heard at a setting about one-third of the way from the lower end of the tuning dial. To ensure that the minimum wavelength of 200 metres is tunable, the trimmers on the three-gang condenser must be correctly set.



The battery and L.S. leads are not shown in this illustration in order to avoid confusion.

The trimmer on the section furthest from the panel should be unscrewed to its minimum setting, and that on the next section should be set as near the minimum position as can be obtained, and this will be ascertained

(*Continued overleaf*)

M'S RECORD ALL-WAVE THREE.

	B.T.S. ..	25s. 0d.
5 mfd.) (C1, C3, C4)	J.B. ..	15s. 0d.
rimmer (C2)	J.B. ..	6s. 6d.
.. .. ..	Graham Farish	2s. 0d.
.. .. ..	Dubilier ..	5s. 6d.
.. .. ..	..	1s. 0d.
.. .. ..	..	1s. 0d.
.. .. ..	..	1s. 0d.
.. .. ..	Bulgin ..	6d.
.. .. ..	..	6d.
.. .. ..	..	6d.
s type VM.36 (R.4) ..	Bulgin ..	5s. 6d.
.. .. ..	Bulgin ..	5s. 0d.
.. .. ..	Varley	7s. 6d.
.. .. ..	Peto Scott	8d.
n and one 5-pin (type		
.. .. ..	Clix ..	5s. 6d.
.. .. ..	Belling Lee	10½d.
.. .. ..	Belling Lee	4d.

wire.	
S.	
.. .. ..	Cossor.
.. .. ..	Whiteley Electrical.
.. .. ..	Drydex.
.. .. ..	Drydex.
.. .. ..	Exide.
.. .. ..	Peto-Scott.

SIMPLE TO CONSTRUCT : EASY TO OPERATE
NO TRICKY TRIMMING ADJUSTMENTS
A TESTED AND PROVED CIRCUIT

THE "RECORD" ALL-WAVE THREE

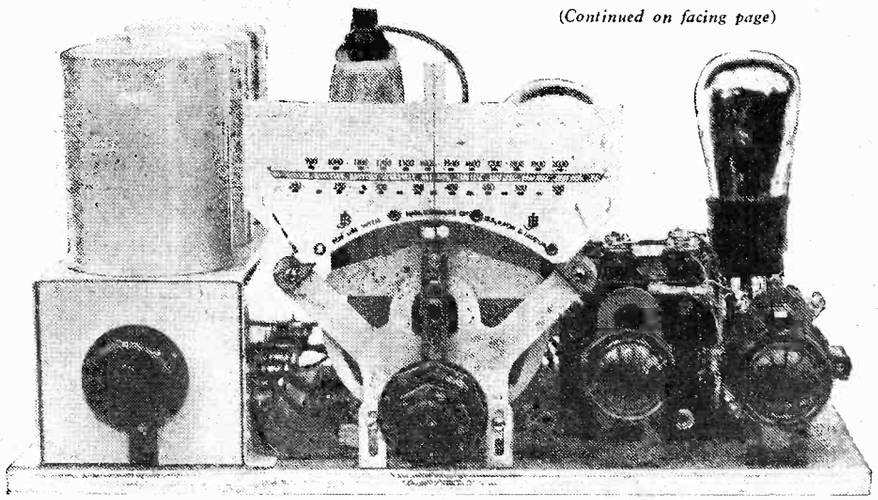
(*Continued from previous page*)

by the spread covered by the concentric trimmer on the slow-motion drive. When a station has been tuned, therefore, adjust the trimmers as near to the minimum setting as possible and swing the trimmer to make certain that no further improvement is obtained. Then turn to a position at the opposite end of the tuning scale, and again swing the trimmer to make certain that the correct band is covered.

The Short Waves

The reaction control should, of course, be adjusted to strengthen those stations which are not normally sufficiently powerful to provide adequate loudspeaker signals. The change from one waveband to another is carried out by means of the wave-change switch mounted on the coil unit, the colour of the spot which is uppermost showing the actual setting which is in use. The Green spot signifies the lowest waveband from approximately 14 to 30 metres, the Red spot the next short-wave band from 27 to 60 metres, the Orange spot the medium waves as above-mentioned, and the Blue spot the long waves from 850 to 2,100 metres. These ranges are, of course, only approximate, and will be modified according to the setting of the trimmers and to the aerial with which the receiver is employed. The modification of the aerial lead, by inserting it into either socket A1 or A2, will also modify the range and, furthermore, will be found essential to obtain smooth reaction on the short waves. The selectivity is best when terminal A1 is in use, but, naturally, a slight loss in signal strength is then obtained. When transferred to A2 the selectivity will be poorer, but better signal strength will be obtained. The adjustment of the volume control will also be found to modify slightly the selectivity as well as the sensitivity, and thus it will be necessary in some cases to make use of the transfer-aerial tapping, the volume control and the reaction condenser in order to obtain a signal free from interference. For instance, it may be found at some parts on the dial that a station may be heard at full volume with reaction at zero and with the volume control in

(*Continued on facing page*)



A neat control layout, with the principal controls conveniently disposed.

(Continued from facing page)

its maximum position. But there may be a background from some other more powerful station on an adjacent wavelength.

Selectivity Control

In such a case the following procedure would be adopted. Firstly, the aerial lead would be transferred to terminal A1 and the panel trimmer adjusted for correct tuning. If interference still continues, the H.F. input should be reduced by turning down the volume control, but signals should then be restored to the original strength by turning up the reaction control. A slight adjustment of the panel trimmer might then be desirous in order to keep the circuits accurately in tune. This method of balancing the volume control against the reaction control will be found to enable any desired selectivity to be obtained, but the panel trimmer will have to be operated in order to keep the H.F. and detector circuits in step.

On the Short Waves

On the short waves the aerial will, generally speaking, have to be connected to socket A1, but this will depend upon the aerial system. If possible, a separate short-wave aerial should be erected in order to obtain maximum results on the short-waves, although an aerial system of the all-wave type will be found quite effective. Naturally, in order to obtain the best results on the short waves, a standard full-length outdoor aerial would not be the best arrangement, and each listener should try for himself the various schemes which have been detailed in these pages from time to time so as to obtain the maximum performance on every waveband.

Next week further operating instructions will be given.

Random Jottings

By JACE

"Extremes Meet—Which Music?"

DISCUSSION about the relative merits of different kinds of music is perennial even if it is useless, and the Western Amenities Council will deal with this question at its meeting on November 9th. Listeners will hear the views of the serious student of music, the devotee of jazz, and the supporter of light music. The presumably detached laymen will also make his contribution to the discussion. Whatever they decide, the discussion should at least be spirited and the participants well-informed.

Anatomy of Swing

"SWING Music" has always been well represented in the Northern programme. "Swing" gramophone recitals have become a feature, and the Northern Revue Orchestra has usually included a proportion of "swing" numbers in its programmes. Now Henry Reed, the well-known Manchester pianist and composer, is forming a special dance orchestra which will broadcast nothing but "swing" music. In a series of four or five concerts, it is proposed to give listeners, by practical illustration, some idea of the part played by each individual instrument in the swing ensemble. The opening concert, on November 13th, will be in the nature of an introduction, showing the whole orchestra in action. Subsequent instalments will be devoted to individual sections of the orchestra. Brent Wood, whose gramophone recitals of dance music are well known, will act as compère.

"1066 and All That"

AN excerpt from "1066 and All That" will be broadcast in the Western programme from the Prince's Theatre, Bristol, on November 14th. Reginald Arkell, who is a West Countryman, has written the book and lyrics, based on the work of that name by W. C. Sellar and R. J. Yeatman, and he will act as commentator.

Money for Jam

A FULL-BLOODED musical comedy, with the conventionally impossible story, has fallen from the pen of Max Kester, of the B.B.C. Light Entertainment Department. His musical collaborator, Peter Mendoza, is responsible for the music and lyrics. The story hinges round two young men who, having lost all their money on slow horses, determine to recover their fortunes in the marriage market. One bets the other that not only will he marry a rich woman, but the first girl he asks will say "yes." She does. Her father owns a jam factory, and the young man, unable to suppress his "brilliance," invents a liqueur chocolate. All the customers become habitually inebriated. The young man is sacked, ends up in prison, is rescued by an American cabaret star, and so the plot goes on.

The cast includes Tommy Handley, Trudi Gordon, Eddie Pola, C. Denier Warren, Pat Tayleur (originally of the "Step Sisters" featured in B.B.C. Music Hall programmes), the Radio Three and the Three Ginx. This play will be radiated on the National on November 13th and from the London Regional on the following day.

What for Wheesie-Whassigo!

THIS programme for the Scottish Children's Hour on November 9th consists of rhymes and stories from Orkney, prepared by Ann Scott Moncrieff; "The Cairn of the Lovers"—a tale of the Findhorn by Helen Drever—and songs by John Tainsh. Writers and singer are all well known to Scottish listeners.

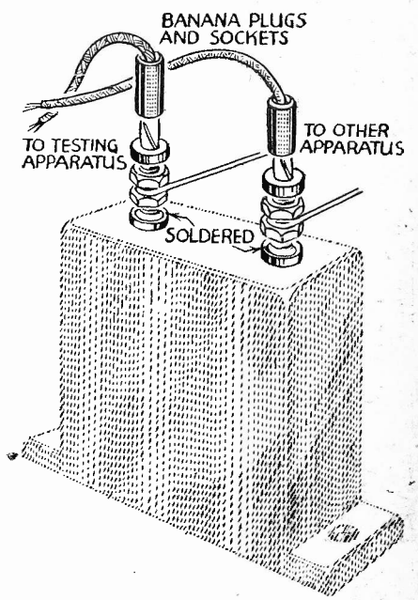
Arias by Isobel Baillie

ISOBEL BAILLIE, the famous soprano who lives in Manchester, is to broadcast for Northern listeners a recital of arias from famous operas and oratorios on November 8th. Her programme will include works by Offenbach, Puccini, Handel, Bizet, and Verdi.

Facility Testing

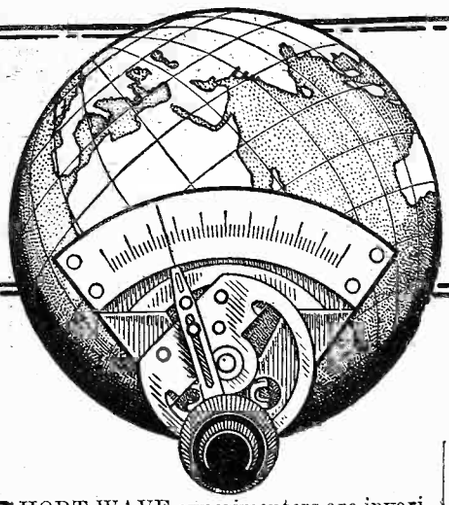
HAVING used a D.C. eliminator constructed simply on a baseboard, and without the necessity of a panel for separate H.T. tappings, I thought that other readers may find the principle I employed of use for "quick test" purposes.

The illustration shows clearly that sockets are simply soldered to the existing screw terminals of the component being used, in this case a condenser.—E. R. WATSON (W.C.2).



A method of making connections quickly for test purposes.

[*The idea may, of course, be applied to practically any standard radio component for test purposes, and is a development of the scheme illustrated on page* 585 *of our issue dated August* 22*nd last.—Ed.*].



SHORT WAVE SECTION

CHASSIS OR BASEBOARD?

Some Important Details in Connection with this Controversial Subject. By A. W. MANN

SHORT-WAVE experimenters are invariably prolific readers and keen students of design and development. Whilst they are collectively in agreement as to the pleasures, thrills, interest, and instruction to be derived from short-wave listening and experimental work respectively, they do not agree so far as technical considerations are concerned.

For example, in the correspondence columns, at club meetings, and wherever members of the short-wave fraternity foregather, individual opinions are expressed and arguments entered into, and in no uncertain manner. To the beginner, reading or listening to the views expressed, it is apt to be a little confusing, and the problem so far as he is concerned is that of knowing who is right.

Chassis and baseboard construction, compact layouts, circuits, etc., are all subjects of discussion, and opinions expressed are usually based on practical and individual experience. Baseboard construction is favoured in many instances because every component is accessible. Accessibility is a commendable feature, but there is absolutely no point in carrying it to extremes. Admitted, quick changes can be carried out conveniently. On the other hand, however, it must be remembered that experimental work does not consist of building a receiver and then fitting alternative components of different values throughout.

Fixed Components

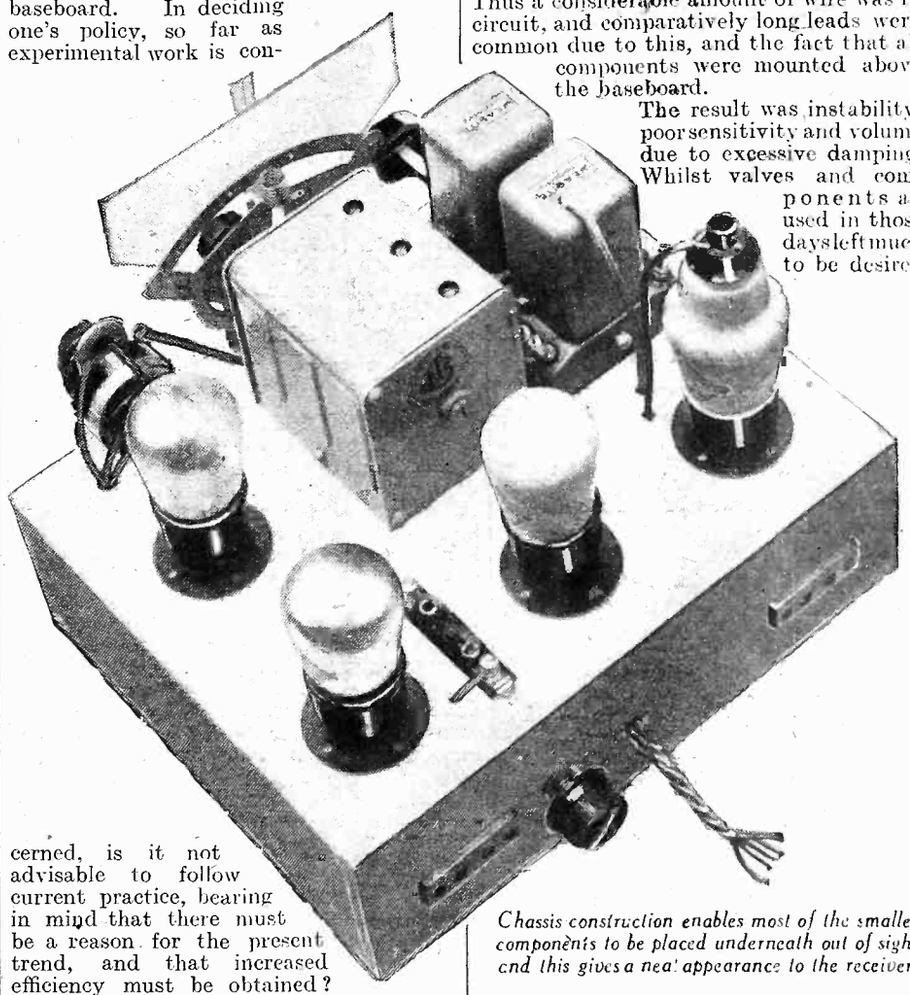
For example, there are certain definite values for decoupling condensers and resistances; also definite combinations of resistances and fixed condensers associated with resistance-capacity coupling, according to the type of valve used. It is unlikely that decoupling components will be altered and values chosen against accepted recommendations, and as resistance-capacity values are based on the characteristics of the preceding valve, such values will be decided upon, or should be, during the initial stages of construction, and if different types of valve are to be tried it is quite possible to build up resistance-capacity coupling components in unit form.

Accessibility allows quick changes of components to be made, but, in the writer's opinion, does not offset the disadvantages associated with necessity for a baseboard of comparatively large dimensions in order that the various components can be suitably spaced, or of long leads and an excessive amount of wiring in circuit.

"Yes!" you may say, "but by using copper foil under the baseboard, wiring can be reduced." Granted, but in doing so are not chassis principles being adopted? In referring to baseboard construction, I mean the original method.

The general trend appears to be to do things in a violent hurry, overlooking the fact that there is a vast difference between a hook-up and a "lash-up." Even an experimental receiver should be built as a finished job, devoid of time considerations.

Whilst chassis construction is in some instances not in favour, a metal panel or some form of screening is used, and thus the earth potential sides of the tuning condensers are earthed directly. This is a great advantage, yet it is offset by the extra amount of metal panel which is necessary, due to the comparatively large baseboard. In deciding one's policy, so far as experimental work is concerned, is it not advisable to follow current practice, bearing in mind that there must be a reason for the present trend, and that increased efficiency must be obtained? Otherwise, designers and manufacturers are wrong; and if this is so, there must be, one would imagine, millions of sets which are not as they should be. Clearly such reasoning is unsound.



Chassis construction enables most of the smaller components to be placed underneath out of sight and this gives a neat appearance to the receiver.

Standard Circuits

Let us examine and discuss the matter from an entirely different but most practical viewpoint. We will not take into consideration modern receiving circuits of the tuned radio-frequency and superheterodyne types, but the simple straight circuits of the 0-V-1 and 0-V-2 types, because they were originally used for S.W. reception, and are still deservingly popular.

During the early days, receivers employing the above types of circuit were built on baseboard lines. The foil-lined baseboard was unknown, metal panels were also unknown.

All points at earth potential were taken directly to the earth terminal of the receiver. Thus a considerable amount of wire was in circuit, and comparatively long leads were common due to this, and the fact that all components were mounted above the baseboard.

The result was instability, poor sensitivity and volume due to excessive damping. Whilst valves and components as used in those days left much to be desired an experiment some years ago convinced the writer that chassis construction was much better. An old 0-V-2 was reconstructed on modern chassis lines, using all the original components, including valves. This receiver was used for over two years for DX work and proved entirely satisfactory and far ahead of the original in every way.

(Continued overleaf)

SHORT-WAVE SECTION

(Continued from previous page)

Benefits of Modern Components

Nowadays we have available special components in which losses have been reduced to the absolute minimum and, therefore, in order to obtain the last ounce of efficiency, it is advisable to adopt modern methods of construction. To do otherwise is to introduce avoidable complications. The advantages of the chassis method of construction are many. Wiring is reduced to the minimum, and, due to the fact that decoupling components, R.C.C. components, GB batteries, etc., can be fitted underneath the chassis, it is possible to build short-wave receivers in compact form without fear of interaction.

In the writer's opinion, the advantages of chassis construction are many, and entirely offset the featuring of inaccessibility as a colossal disadvantage. Whether our receivers are permanent or experimental, we must choose wisely, and in deciding as to the form of construction to be adopted ask ourselves this question: Which is to be preferred, a high standard of efficiency, i.e., sensitivity, stability, average selectivity and volume, or accessibility?

To the serious and methodical experimenter, the correct answer will be obvious. Modern components and modern applications go hand in hand. To recognise this fact means progress, otherwise one's receivers will never be anything else but experimental.

Don't Be In a Hurry

In any case, whatever changes are necessary, do not depend upon working to a split second, and the excuse that when testing on actual short-wave signals it is necessary to make quick changes appears to be weak, and does not take into account that signal volume may increase or decrease considerably during even a quick change of components such as resistances, condensers, etc.

During experiments of the kind in which alternative valves are to be compared, a simple modulated oscillator is advisable. With a constant signal available, the time factor does not arise. If an output meter of the most simple type can be made up, so much the better.

Whilst choice of circuit is a most important factor, it should not be imagined taken type for type, that there are some circuits which function when built in practical form, and others which do not. The beginner usually possesses one great fault, and that is, he thinks big. For example, how many who read this, build and use either experimental or sponsored two or three valvers to suit their pockets, yet have visions of one day building a seven valve superheterodyne?

Whilst ambition is commendable so far as the average experimenter is concerned, and may, in due course, be realised, it is better to start in a modest way and progress in easy stages. It will be found that during the early part of an experimental career, the realisation that all circuits function, but apparently someone else knows how and why, but you do not seem to get away with it, comes to the fore.

It is much better to start with simple circuit receivers and get to understand them fully. By doing so, when the big receiver is about to become a realisation, its construction will be easier and its good points more easily appreciated.

Leaves from a Short-wave Log

DURING the past fortnight conditions have so much improved for the reception of DX that from the early afternoon the listener may now sit near his wireless receiver with the assurance that broadcasts from short-wave stations overseas can be tuned in at good strength. The volume of the signals rises rapidly with the advent of dusk, and by tea-time, as a rule, he should, without difficulty, be able to log transmissions from several quarters of the globe. As is usual at this period of the year, the reception of broadcasts on the 30- and 40-metre bands is rapidly becoming pleasanter; atmospherics have greatly decreased and stations which a month ago offered but a mere whisper are producing signals at good readable strength.

Careful Tuning Necessary

If transmissions are not to be missed, tuning must be carried out very carefully, and, provided the listener resorts to true "slow motion" when handling the condenser dial, the log will be daily enriched by many entries.

Signals from the West

There are a number of broadcasts on channels between 31.06 m. (9,660 kc/s) and 31.58 m. (9,500 kc/s), a section of the band much favoured by trans-atlantic studios, and a little patience should bring you clear speech and music from the United States, Brazil, Argentine Republic, and others. The number of transmissions in the Spanish and Portuguese language found in this band will surprise you if you carry out your search on this section between G.M.T. 21.00 and 24.00. LRX, relaying LR1, Radio el Mundo, Buenos Aires, on 31.32 m. (9,580 kc/s), is a regular performer every evening; it has been logged on a channel slightly above CT1AA, Lisbon (31.07 m., 9,655 kc/s), with which it should not be confused. Between the two you may find occasionally HP5J, Panama City (31.22 m., 9,610 kc/s), and more frequently HJ1ABP, Cartagena (Colombia), on 31.25 m. (9,600 kc/s). The latter gives out an English call: *Radio Cartagena of the Cartagena Broadcasting Company.* YNLF, Managua (Nicaragua), previously on 46.47 m. (6,451 kc/s), has now also crept into this band and its separation from HJ1ABP is only 5 kilocycles, namely, 9,595 kc/s (31.26 m.). If you hear a military march accompanied by bugles and drums, log the broadcasts as from YNLF. W3XAU, Byberry (Pa.), the short-wave outlet of WCAU, Philadelphia, is now well heard on 31.28 m. (9,590 kc/s) from G.M.T. 18.00 onwards, and the condenser reading should be well noted, as it is needed for finding VK2ME, Sydney (N.S.W.), on Sunday mornings. Slightly above this position—barely a hair's breadth—you may pick up HJ1ABG, Barranquilla (Colombia), on 31.31 m. (9,583 kc/s); the station has been tuned in on several occasions on the south coast of England during the past week. The call: *Emisora Atlantico* and the four chimes used as interval signal every fifteen minutes assist identification. Again moving up with caution will bring you W1XK, Millis (31.35 m., 9,570 kc/s), taking the WBZ, Boston, programme of the N.B.C. network; signals have so much improved lately that the station is logged nightly. On 31.38 m. (9,560 kc/s) DJA, Zeesen, may prove disturbing from G.M.T. 23.00, when it comes on the air for its third daily broadcast, but from about 17.30-23.00 it is silent, and, in consequence, allows you to search the neighbouring channels.

Lisbon, CSW

CSW, Lisbon, the new Portuguese national transmitter on 31.41 m. (9,550 kc/s), will be discovered testing from G.M.T. 22.00 and will offer no difficulty, as the call is often given in English, with a request for reports on reception. LKJ1, Jeloy, although advertised as working on 31.48 m. (9,530 kc/s), is slightly below W2XAF, Schenectady, on the same official channel, and the two broadcasts are easily separated. A slight movement brings in GSB, Daventry (31.55 m., 9,510 kc/s), which, when carefully cleared, reveals PRF5, Rio de Janeiro (31.58 m., 9,501 kc/s), and HJU, Buenaventura (Colombia), at a later hour.

Italy Speaks to the Moslems

Should you tune in a transmission reminiscent of the language often heard from Algiers or Rabat, do not log it as a broadcast from North Africa. If on 25.4 m. (11,801 kc/s), it is a news bulletin or talk given through 12RO, Rome, daily in Arabic between G.M.T. 17.40-18.00.

V K 2 M E November Schedule

Sydney on 31.28 m. (9,590 kc/s) is a worth-while catch in the early morning hours, and now may be heard at good volume on Sundays between G.M.T. 05.30-07.30. Other broadcasts are made from G.M.T. 09.30-13.30 and from 14.30-16.30. Listen for the Kookaburra laugh, which will confirm your reception at the end of each transmission.

Neighbouring Channels

Although when referring to U.S.A. short-wave transmitters mention is more frequently made of the Schenectady and Pittsburgh stations than of any others, such broadcasts as those from W1XK, Millis (Mass.), on 31.35 m. (9,570 kc/s), are by no means a difficult capture. Relaying, as it does, WBZ, Boston, it provides an alternative N.B.C. programme on most nights. The station is on the air daily from G.M.T. 11.00-05.00 and at its best during the evening between 19.00-21.00 and after midnight. Log the condenser dial reading carefully when identification is assured as it will assist materially in your search for VUB, Bombay, working on the next channel, 31.36 m. (9,565 kc/s). Broadcasts take place on Sundays (G.M.T. 06.00-07.00); Tuesdays (16.00-17.30), and on Saturdays between 16.30-17.30. As no doubt you have already logged DJA, Zeesen, on 31.38 m. (9,560 kc/s), the German will provide a good jumping-off point and careful tuning at the times given should bring in VUB at audible strength.

ABC of the Modern Receiver—7

The Low-frequency Amplifying and Output Stage; Triode and Pentode Valves; Low-frequency Volume Control; Tone Correction

IT was seen last week how the audio-frequency signal voltages from the detector are applied to the grid-cathode circuit of the low-frequency amplifier, so now we must study the amplifying valve itself. In the simple type of circuit such as that which we have been taking as an example, there are two principal forms of output valve which can be used: a triode and a pentode. Besides this point, however, it must be appreciated that there are several different models of valve in each of these two general classes, so that the final choice is not always easy.

Grid Voltages

As was previously explained in connection with the H.F. valve, fluctuating voltages are applied to the grid, and these cause greater fluctuations in the voltage developed across the anode-circuit "load." The voltages fed to the grid of the output valve are, naturally, considerably greater than those previously dealt with, so that the valve has to operate differently. It is easily possible to "overload" the wrong type of valve, and this is an important aspect of the question. It is evident that the most important factor is that the valve must not cause any distortion—or at least, the minimum amount of distortion. This means, in effect, that it must respond proportionately to signal voltages of every value. Put another way, it means that the change in anode current produced by varying the grid voltage from three to four must be the same as that when the signal voltage varies between half and one and a half.

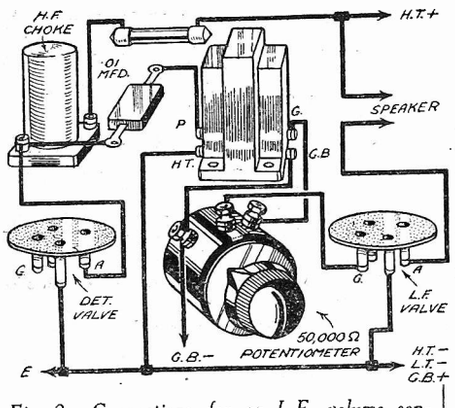


Fig. 2.—Connections for an L.F. volume control when using transformer or resistance-fed-transformer coupling.

The Characteristic Curve

This brings us to an important matter concerning any valve: its grid voltage-anode current characteristic curve. The name sounds rather formidable, but it should not be difficult to understand the meaning of this curve of which a typical example is given in Fig. 1. This curve applies to a typical small battery power valve, and it can be seen that when 120 volts is applied to the anode the "curve" is practically a straight line between about eight and zero grid volts. If we are to obtain the kind of working mentioned above, the valve must be used so that the grid voltage is always between these two limits. This means that a steady voltage must be applied to the grid in addition to the signal voltages, for these become positive and negative in turns. And if a positive potential were actually applied to the grid, part of the H.T. current from the filament to the anode would flow to the grid instead, resulting in several peculiar effects which would give rise to serious distortion. Additionally, of course, the H.T. current passed by the valve would be excessive, and probably more than the H.T. battery could supply—certainly more than the valve could stand without its being damaged.

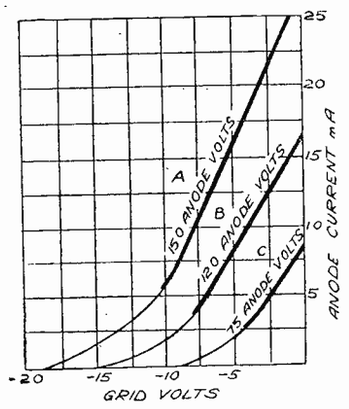


Fig. 1.—Anode-current-grid-volts characteristic curves for a typical small power valve. Straight portions of the "curve" are shown heavier to simplify reference.

Maximum Signal Voltage

Theoretically, the steady grid voltage (grid bias) which should be applied ought to be such that, when signals are not being received, the valve operates at the centre of the straight portion of the "curve"; 4 volts in curve B in Fig. 1. This would enable the valve to handle a maximum signal voltage of eight (four on each side of the centre), before distortion set in. In practice, a valve of this type would never require to deal with a signal voltage anything like as high as this, and so the grid bias voltage can be increased, in order to ensure more economical H.T. consumption. The signal voltage would not normally exceed two, and so a G.B. voltage of seven could be used. Batteries are not tapped at 7 volts, and so we should employ either 7½ or 6 volts. The higher figure would be maintained if this did not result in distortion causing the reproduction to become "thin," and the smaller one if this were found to give a marked improvement.

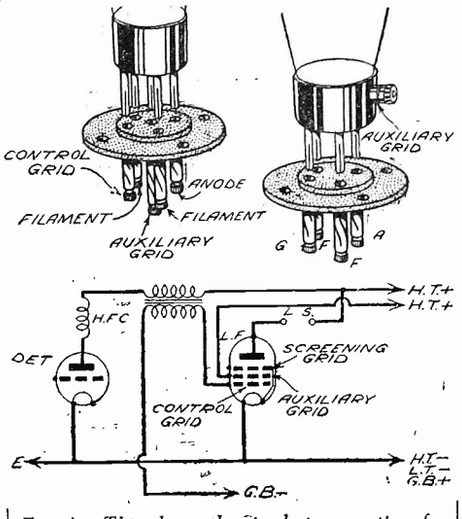


Fig. 4.—This shows the simplest connections for a pentode, as well as the corresponding connections for five-pin and base terminal valves.

H.T. Voltage Variations

If the signal voltage exceeded 4 volts—and it would not in a circuit such as that taken as an example—the G.B. voltage could be reduced with advantage to reproduction, or the H.T. voltage could be increased. The better and more correct method would be to increase the H.T., so that a longer straight portion of the "curve" would be available, as can be seen in curve A in Fig. 1; the G.B. voltage could then be increased to 7½ or 9. Before leaving this question of the characteristic curve, it should be mentioned that a reduction in the H.T. voltage reduces the length of the straight portion, making it necessary to use a lower G.B. voltage, and also making distortion far more probable; this is an important reason for reducing G.B. voltage as the battery runs down, and for obtaining a new H.T. battery when distortion sets in.

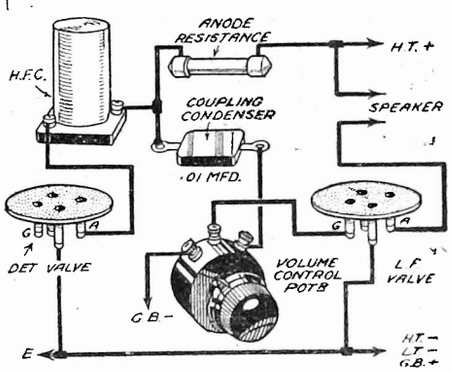


Fig. 3.—L.F. volume control in an R.C.C. or choke-capacity coupled amplifier. The potentiometer volume control replaces the grid leak and should be of similar value.

Amplification Factor

A valve having characteristic curves similar to those shown in Fig. 1 would have an amplification factor of about 9 (at 150 volts H.T.). This means that a

(Continued overleaf)

ABC OF THE MODERN RECEIVER

(*Continued from previous page*)

change of 1 volt on the grid would be equivalent to a change of 9 on the anode. When the input voltage to the valve is comparatively low—not more than 1½, say—it is possible to use a valve having a higher amplification factor, and so to obtain a greater output volume. There are special valves designed for such use, these generally being referred to as "steep-slope" valves, because the characteristic curve rises more rapidly. Valves of this type have an amplification factor of about 15, and can successfully be used in a simple H.F.-Det.-L.F. three-valve circuit. But even then overloading might occur on the local stations, especially if a good aerial system were employed. This explains why it is often necessary to turn down the volume control to avoid distortion.

L.F. Volume Control

In conditions such as these it is often beneficial to include an L.F. volume control, in addition to that acting on the variable-mu valve, and connections for this are given in Figs. 2 and 3. Those in Fig. 2 apply to transformer, or resistance-fed-transformer coupling, and those in Fig. 3 to resistance-capacity or choke-capacity coupling. Although not essential, this extra volume control gives additional latitude, particularly on powerful though distant stations.

Using a Pentode

A pentode valve provides results which are similar in many respects to those given by the "steep-slope" valve, but provides still greater amplification. This valve is the same in general construction to the high-frequency pentode which has been described before. In addition to the grid, filament and anode, there are two extra grids—the auxiliary grid and the screening grid—arranged as shown in Fig. 4. The auxiliary grid requires an H.T. positive connection, whilst the screening grid is normally connected (inside the valve) to the filament. Most battery pentodes are of the five-pin type, the auxiliary grid being joined to the centre pin, although there are still pentodes available in which this grid is connected to a terminal on the side of the base. The latter type is becoming obsolete, and the former is always recommended for this reason, and because it is more convenient in use.

In Fig. 4 the auxiliary grid is shown as simply being connected to a tapping (generally about 20 volts below maximum) on the H.T. supply, but a rather better method is to connect it to the maximum tapping through a fixed resistance of

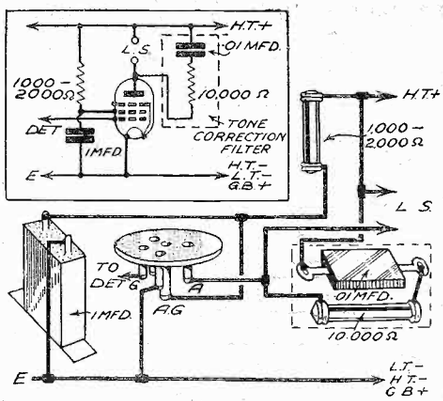


Fig. 5.—A pentode used with tone-correction filter and decoupler for the auxiliary grid.

between 1,000 and 2,000 ohms, and to connect a by-pass condenser of 1 mfd. between the auxiliary grid and earth. This is shown in Fig. 5. The resistance and condenser serve for decoupling (see previous articles) and also obviate the need for a separate H.T. tapping.

Pentode Disadvantages

Since a pentode gives greater amplification, it might be asked why it is not invariably used instead of a triode. There are several reasons, one being that the valve is more expensive, another that it generally requires rather more H.T. current, and another that it does tend to give slightly more distortion. The last-mentioned reason is rapidly vanishing, due to the improvement in valve construction, but it is still often worth while when using a pentode to employ a simple tone-correction filter to curtail the response to the higher sound-frequencies. This explains the reason for the series resistance and condenser in Fig. 5. The values given are average ones, but the fixed resistance might well be replaced by a 25,000-ohm variable one, so that simple tone control is possible.

The Harries Valve

A valve of fairly recent introduction, which functions in a similar manner to a pentode, and also provides a similar degree of amplification without the same tendency toward high-note emphasis, is the Harries output valve. This has two grids only, the screening grid being dispensed with, although it is connected in circuit exactly as is a pentode, but does not call for the tone-correction filter. The difference in construction is in connection with the "critical" spacing of the anode and grids; the distance is exact to a calculated figure, so that its construction calls for a high degree of accuracy.

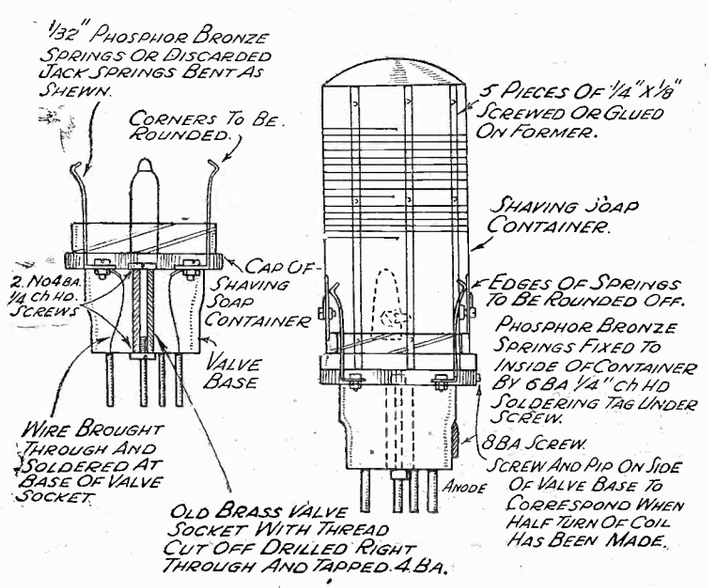
In the next article the use of automatic grid bias will be explained. The importance of this will be appreciated from what has been written above, for it causes the exact bias voltage to vary in sympathy with the H.T. voltage. Thus, as the battery runs down the G.B. voltage is reduced. Additionally, it permits the use, where necessary, of a voltage different from that which can be obtained from a battery which is tapped in 1½-volt steps only.

(*To be continued*)

A NOVEL QUICK-CHANGE COIL

THE former of this novel coil is a bakelite shaving soap container with a screw cap, half a turn of which screws it up tight. The plug is an old valve base and the springs came off an old jack that I had by me.

The drawing more or less explains itself, the idea is that the plug is connected into the holder on the baseboard and left there. Having made two or three coils from the tops it is a simple matter to twist on and off the coils for different wave-lengths, and I find it very efficient.—R. W. HORNE (West Ewell).



The diagrams explain clearly the idea mentioned by Mr. R. W. Horne for the construction of an easily-changed short-wave coil.

FEEDING THE LOUDSPEAKER

(*Continued from page 242*)

and that the H.T. and L.T. supplies are more than sufficient to supply the set, an improvement could best be effected by fitting a pentode in the output stage, or by using a valve in that stage which has a greater amplification factor than the existing valve. If a pentode is already fitted and the voltage supplies are adequate, an existing stage could be inserted between the last two stages, or an exactly similar valve could be connected in parallel with the output stage. In this case, the additional cost would be small, but the running costs would be increased. By adding an intervening L.F. stage, the initial cost would be greater (as the L.F. coupling components would have to be purchased), but the running costs would be lower.

Where a receiver is fitted with a volume control and it is found that this can never be turned more than a short distance without distortion setting in, the output valve should be replaced by one which requires a much greater grid bias voltage, and valve lists should be studied so that a valve may be found in which very little additional anode current is taken, so as to keep the operating conditions more or less the same.

Those readers who are not familiar with the meaning of grid swing and input voltages should read the article on page 251.

THE BRITISH LONG DISTANCE LISTENERS' CLUB

Aerial Efficiency

WE have received some interesting information from Mr. Harold Leigh regarding aerial experiments. This communication has been written as a result of the request made in our issue dated October 24th last regarding some of the results which have been experienced with special aerials designed for short-wave reception. Here is Mr. Leigh's communication :—

"I have given this subject much attention and herewith give some details. My aerial system consists of three separate aerials, all using 14 gauge copper wire.

(1) 66 ft.

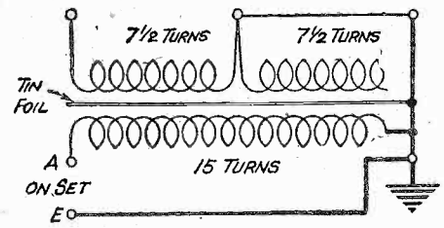
(2) 16½-16½ft. Dipole (with twisted flex lead in).

(3) Broadcast aerial.

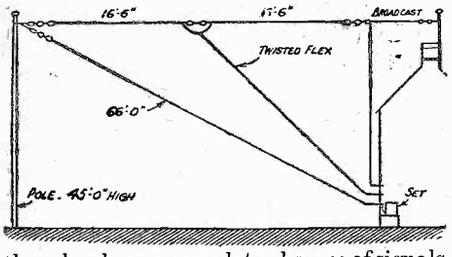
(See attached sketch.)

The "lead in" comes through glass tubes.

The 66ft. aerial is certainly a good all-wave aerial, but on the 20-metre band when



These two diagrams show Mr. Leigh's aerial arrangements; the upper diagram depicting the transformer, and the lower, the arrangement of the aerial wires.



there has been a complete absence of signals, I have switched over to the Dipole and managed to hear one or two. Another advantage of the Dipole is that during windy weather signals are much more steady. Of course, it must be coupled up to the set by some means, and I find a transformer as follows the best way :—

Two-inch diam. cardboard tube wound with fifteen turns 18 gauge insulated wire, centre tapped. Then layer of tinfoil, layer of insulating tape, and fifteen turns of 18 gauge wound on top for secondary coil.

This, without any doubt, is the best system for 20 metres ; in fact, it is good from about 13 to 30 metres. For the higher wavelengths (40 to 80 metres) all that is necessary is to remove the earth wire from the centre tap of the primary winding. I might add that while I was first testing the Dipole 344 stations were logged from June 22nd to September 1st on the 20-m. band. In just over a year seventy countries have been logged and the number of stations 2,030 on all-wave bands.

The receiver is a two-valve Det. and Pen., resistance coupled, supplied with 100 volts H.T. from accumulators."

A Protest

FROM Mr. Everard we have received a strong protest regarding our correspondence on QSL collectors. This is what he says :—

"I wish to make a strong protest against the tone of the letter in your paper of October 17th by E. de Coltignies (Prittlewell), and most strongly disagree *re* 'QSL collectors.' I wonder *how many* of these Mr. Coltignies possesses (as he mentions '*G*' QSL and which are of *no* DX value at all). I have been a steady listener on 14-mc/s, etc., bands for 2-3 years and have on file here many letters from American and other 'hams,' thanking me for my very FB and useful reports (and which were *not* QSA5, R9+ either, as QSA5 R9 signals must be heard all over and outside the house before I'll call any signal that). Re SUICH's remarks *re* S.W.L., I was quite aware of these (probably before Mr. de Coltignies). In any event Egyptian 'hams' are *not* very important DX. But I most heartily agree with E. R. Crane's letter in your same issue, and will go further and say that a *good detailed* report (sent to a real DX station) should be worth a QSL, whether a reply coupon is sent or not. Total QSL's here, 1,215 from 79 countries, all on 'phone or music, so *I should* know a little about DX'ing and S.W.L."

[*Mr. Everard was, incidentally, the winner of the B.L.D.L.C. DX contest.*]

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 Short-wave Radio and Television Society (Thornton Heath)

A MEETING of this Society was held on Tuesday, October 6th, at St. Paul's Hall, Norfolk Road, Thornton Heath. Mr. R. E. G. Copp presided.

Mr. F. G. Stanfield gave a talk on the nickel-cadmium battery and the Milnes H.T. Unit. Dealing first with the battery, the lecturer said that the active material employed is composed of nickel hydrate mixed with specially prepared graphite of high conductivity for the positive plate, the negative consisting of intimately mixed oxides of cadmium and iron. The electrolyte employed is a solution of potassium hydrate in distilled water, the specific gravity being 1.190. It was interesting to note, Mr. Stanfield pointed out, that the electrolyte used was a preservative of all the materials used and it was therefore impossible for sulphation or corrosion to take place. Further, the plates are practically indestructible.

The main feature of this battery which would appeal to all experimenters is the length of time it will retain the charge without attention. On actual test this type of battery has been found to be absolutely efficient after having been left for two years or more.

Mr. Stanfield then gave a description of the Milnes H.T. unit. The normal voltage of a nickel-cadmium cell is 1.25 which rises when fully charged to 1.5. Mr. H. R. Milnes, the inventor of the unit, found that if four nickel-cadmium cells were connected in series they would give an output of 5 volts, and if these four cells were connected in parallel with a 6-volt lead-acid accumulator, current would flow from the latter into the former and continue to flow until they were fully charged.

The Hon. Secretary of the Society is Mr. Jas. T. Webber, of 368, Brigstock Road, Thornton Heath.

The Croydon Radio Society

THE Croydon Radio Society was honoured on Tuesday, October 13th, by the presence of Mr. Frank Davey, M.A., of E.M.G. Hand-made Gramophones, Ltd., in St. Peter's Hall, Ledbury Road, S. Croydon. His subject was: "Some points in Quality Design," and firstly came views on tuned circuits, where some interesting graphs gave a new outlook on this part of the circuit. For instance it was seen how drastic band-pass tuning caused stray and unwanted field effects to appear. A linear detector was wanted, and many suggestions were given, and criticisms made of various circuits. The L.F. valve must have linear characteristics of the right magnification, and Mr. Davey went on to criticise push-pull amplification. It was at least an interesting suggestion, but there were inherent disadvantages such as ageing of valves, and difficulty of keeping the apparatus correctly matched. He preferred a triode output valve with choke capacity filter output. Finally, Mr. Davey deplored the exaggerated high-note response of some loudspeakers, as he wanted reproduction with neither top nor bass more conspicuous than the original.—Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

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.

W. H. T. (Ridgewell). Your receiver is not one of our designs, but we think the S.W. converter-adapter shown in Blueprint P.W. 48A will function satisfactorily with it. Consult the designer in order to make quite certain.

W. B. H. (Southville, Bristol, 3). We have no details of a converter at the price mentioned. The best unit of this type is shown on Blueprint P.W. 48A, but it costs much more than the figure named.

W. N. (Belturbet, Co. Cavan). You cannot step up a D.C. supply. To carry out your idea you would have to obtain a converter to change your accumulator supply into A.C. and then this could be stepped up by means of a transformer in the ordinary way. You cannot obtain a greater wattage, however, and therefore, the resultant A.C. would only have a very low current value.

H. R. P. (Dagenham). The coils cannot be identified by us. There were numerous coils turned out by the manufacturers named and each differed so far as the pin connections were concerned. A good local radio dealer should be able to trace out the connections and you could then employ the coils in any desired circuit.

J. J. M. (Cork). There are dozens of faults which could result in the trouble named. The receiver may be out of alignment and need re-trimming, or a valve or some other components may have broken down. With regard to your other query we advise you to have the receiver examined by a local service agent of the manufacturers.

J. D. (Glasgow, S.W.2). The charging rate is generally that given by the rectifier, and the lower voltage ratings are obtained by series resistances. Therefore, although a low voltage cell is joined to a high-voltage point, there will be no substantial rise in current, but there will be a great risk of damage to the rectifier.

A. D. (Wavertree). You should write to the makers of the receiver and obtain advice regarding the correct impedance to use as an additional speaker, and what arrangements are necessary in order to preserve the correct load on the output valve.

A. F. (Ilford). The increased power of certain short-wave stations, and the effects of the longer hours of darkness are no doubt mainly responsible for your trouble. The remedy is to make a more selective circuit. A smaller diameter coil would not be of any material use, but some form of small aerial coupling coil should be fitted, with the facilities for changing the coupling to suit different conditions.

L. N. S. (Tyseley). You must measure the resistance of the coil before endeavouring to use it. A meter and voltage in series will enable this to be done. We have no data of the speaker, but probably the makers could assist you. We suggest you communicate with them if you are unable to measure the resistance. The method of using the speaker will depend upon its resistance.

F. R. (Longdon). We cannot give coil-winding data in the form of a reply. We refer you to the article entitled Short-Wave Coil Data, published in our issue dated May 9th, 1936.

W. B. (Lympstone). If the speaker is in order the trouble is due to the receiver. No doubt the faults now apparent were formerly masked by the speaker, and the more faithful reproduction obtained from your new speaker shows up the faults. The L.F. circuits should be improved. Attend to the H.T. and G.B. voltages.

R. S. (Hull). The receiver in question is not one of our designs, but we believe it was described in one of our contemporaries.

R. S. (Forres). We regret that we cannot give instructions for modifying our published circuits. The makers' instructions can be followed regarding the fitting of coils and valves. If sufficient interest is shown, we may publish details on the lines mentioned at some future date.

A. B. (Willington). Although a device of the type mentioned could be used, you would obtain much better results by using a converter. This is included in front of your first valve and would change the complete apparatus into a four-valve superhet. Blueprint P.W. 48A described a unit which may be used either as converter or adapter, without alteration, and we recommend this.

S. N. W. (Kilmainham). There is no unit of the type you mention on the market. You could build a simple L.F. amplifier to include with a pick-up, or why not use your present wireless receiver? It will not entail any alteration to this and the radio reproduction or operation will not be affected.

W. V. T. (Shepherd's Bush). The new valve probably had a much lower amplification factor. Alternatively, it may have taken very much more anode current and thus prevent the H.T. supply from delivering sufficient for the remainder of the receiver.

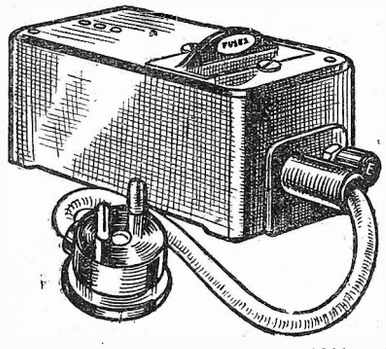
J. W. (Dundee). There are two possible explanations of the effect mentioned. Either the noise was brought in with the station, and removal of the earth shifted the tuning point and thus removed the noise, or it was introduced into the receiver by induction.

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

Belling-Lee Set Suppressor

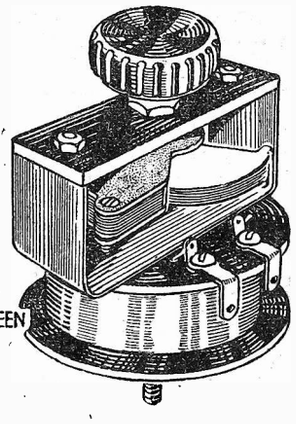
INTERFERENCE which is carried by the mains leads is not very difficult to eliminate, and in many home-built receivers a suitable input filter is permanently connected to the mains input circuit. In some commercial receivers this factor is missing, and also in certain home-made sets no such arrangement is incorporated, perhaps on account of the fact that no interference is experienced when the apparatus is first installed. In the event of interference arising, and the source being traced to the mains, the inclusion of an interference suppressing device is not a difficult matter nowadays, as there are several suitable components already produced for this particular purpose. In this column is illustrated a device of this nature manufactured by Messrs. Belling-Lee, and it will be seen that it consists of the necessary filter components and mains fuses incorporated in an insulated case, with an earthing terminal and a mains plug ready connected. The device is attached to the wall or skirting board near to the mains socket and the plug attached to the device is inserted into the mains socket. The plug which is attached to the radio receiver is then inserted into the holes in the suppressor, and this automatically interposes the filter in circuit, with the additional protection offered by the ½ amp. fuses. This device is reference No. 1211 and the price is 17s. 6d. It functions equally well on medium and on the long waves.



The Belling-Lee set suppressor, type 1211, which costs 17s. 6d.

Sound Sales Whistle Suppressor

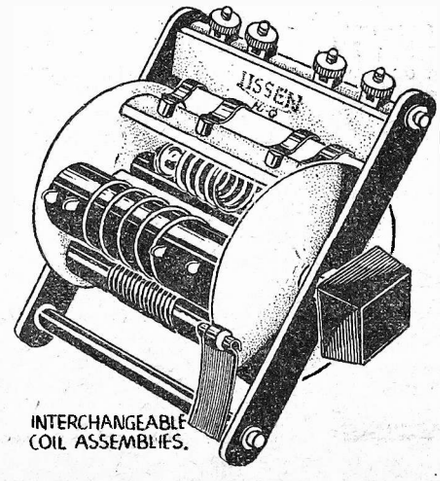
ALTHOUGH a superhet is looked upon as the only receiver which gives trouble from whistle interference, a well-designed quality receiver will also be found troublesome from the same cause. This is due to the heterodyning of the carriers of two stations working on a wavelength close to each other, and if the high-note response of the receiver extends well into the upper frequencies (as it should do in order to reproduce high quality from the ordinary broadcast programme) the whistle will be heard on quite a number of stations on both medium- and long-wave bands. In the case of a superhet the trouble arises from interference due to low selectivity on the aerial side, but in both cases the trouble may be avoided by fitting to the receiver a high-note suppressing circuit, the cut-off being arranged at a frequency of approximately 9,000 cycles per second. This will then take care of station heterodynes, and in many cases to second-channel whistles, although in the latter case it may even be necessary to cut off at a lower frequency. This will depend upon the design of the superhet circuit. The Sound Sales component illustrated on this page consists of a choke with parallel condenser, the two being combined to form a neat and compact unit. The choke is a special bobbin-winding, and the inductance value has been so chosen that the tuning is quite sharp, and the attenuation at 9,000 c.p.s. is of the order of 30 decibels, but at 8,000 c.p.s. it is only 7 decibels. Therefore, the musical quality is not unduly marred by the suppressor, although an interfering hererodyne whistle is completely suppressed. The unit is provided with a threaded bolt so that it may conveniently be mounted on a chassis (either metal or wood) and it is intended for inclusion between the detector and the first L.F. stage. The price is 10s. 6d.

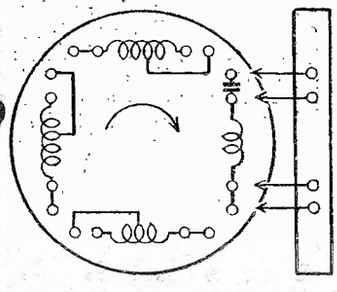


A 9,000 c.p.s. whistle suppressor from the Sound Sales range of components.

Lissen Rotary Coil Unit

MANY listeners find difficulty in deciding upon a suitable short-wave circuit on account of the coil-changing difficulty. Although it is possible to build a short-wave coil unit in which wave-change switches are incorporated, the efficiency is obviously not so high as when separate coils are used for each separate waveband, and there have been several suggestions for designing a coil-changing unit for use on the short waves only. The latest component of this type is illustrated on this page and is one of the new Hi-Q devices produced by Messrs. Lissen. It is a four-range tuner, in which separate coils are employed to cover the range from 4.8 to 91 metres, and each coil is wound in the most effective manner according to the range covered. Thus, the highest range is covered by means of a simple solenoid of enamelled wire on a paxolin former, whilst the lowest range employs a self-supporting thick wire coil mounted on a ceramic base. The latter coil may be seen at the top of the unit, whilst one of the higher range coil is seen at the bottom. The diagrammatic sketch shows how the coils are connected to the four terminals, and it will be noted that a series condenser is included on one range, whilst on another a transfer aerial tapping is included. Thus, maximum efficiency may be expected on every range covered by the tuner. The switch contacts are solid nickel and are of the self-cleaning type, whilst each position is accurately registered. No noises will arise due to poor contacts, and the tuner may be incorporated in practically any type of short-wave apparatus, including transmitters, converters, superhets, straight receivers, etc. The price of the tuner complete with four coils is 15s. 6d., but in addition an extra coil may be obtained to cover the range from 75 to 175 metres at 2s. 6d., and an unwound former, for those who wish to wind special coils may also be obtained for 9d.





The Lissen Hi-Q 4-range S.W. Tuner and diagram showing the method of bringing into circuit the individual coils.

New Varley Coils

A NEW series of iron-core coils has been produced by Messrs. Varley, reference numbers BP.111, 112, 113, and 114. These are available in two-and three-gang units and may be used in straight or superhet receivers. The coils are wound to the standard inductance values: medium waves 157 microhenries and long waves 2,200 microhenries. There is a special coil for oscillator circuits having inductance values of 126.9 and 1,056 microhenries, and this may be ganged with the other types of coil and tracked with a condenser designed to provide an intermediate frequency of 110 kc/s. For 465 kc/s there is another oscillator coil wound to inductance values of 85 and 400 mics. BP. 111 is a three-gang unit comprising a band-pass pair with a 110 kc/s oscillator coil; BP. 112 is an aerial and 465 kc/s oscillator coil; BP. 113 is a three-gang band-pass and H.F. transformer; and B.P. 114 is an aerial and H.F. transformer. The prices are as follows: BP. 111 and BP. 113 cost £1 1s. each, and BP. 112 and BP. 114 cost 13s. 6d. each.

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.)

QSL Cards and Reports

SIR,—I have read with interest the many letters you have published referring to reports and postage, and in reading that from G6JI I should like to make a few points clear for his benefit.

In his letter, he explains the experience of W. T. Cooper. I quite agree in the cases he has quoted, but has this any bearing on the title at the head of his letter which reads "Reports and Postage"? In every case none of the reports received included postage, and the majority of complaints published deal only with reports sent *with* postage. Therefore it is clear that G6JI is "barking up the wrong tree." I suggest that he ignores all useless reports sent without postage. Even when a report is useless it is only decency to use any postage sent, if only to tell the sender that his report was no good.

As to amateurs being wealthy men, I am well aware that this is not the case. I happen to be radio 2AFO, and even though only an A.A. man, I feel the expense very much, especially as I am not one of the few "wealthy men" among amateurs. I realise that I must spend money to make anything of a show out of my hobby. Like anyone else I do not want to throw money away on useless articles. Hence my complaint about my Reply Coupons.

Can any reader tell me what happens to reports *and* postage that are not required? Let me once again remind readers that it is the postage that all these letters are about, not mere QSL collections.

I might add that although only a working man earning an average wage of 45s. per week, I shall be very pleased to answer all reports on my transmissions, when I get properly on the air, providing postage is sent. That is all that is asked of all amateurs.—N. OWEN (2AFO) (Kettering).

Mr. Cooper Replies

SIR,—With reference to the question of QSL cards, there appears to be a great misunderstanding by most of the readers who have replied, whose letters you have been good enough to publish. As I am the original writer, may I ask you to publish another letter in the hope that this time it will be read and understood more fully?

Until two months ago I was the holder of an A.A. G.P.O. licence for experimental non-radiating transmission, and as I had never at any time transmitted on the air, I had received up to the time of my first letter thirty-seven SWL cards from Australia, New Zealand, and America, reporting having heard my signals on 20, 40, and 80 metres; these reports gave my signals as QSA5, R9, T9, and so forth.

My object in writing to you is to show how the collecting of QSL cards could be abused, at the same time killing their value from an experimental point of view. Since I last wrote I have received quite a lot more, also two letters from the Gold Coast asking for photo cards and gifts, etc. Now, strange to say, I have a transmitting licence, my call being G8BS, and since I have been carrying out experiments on 160 metres, I have asked for reports on my signals, stating that every report received will be answered, but I have not had a single reply. I agree with Mr. Ismay (G6JI) that QSL card collecting has got to a stage similar to collecting cigarette pictures. To some people the value of reports is not understandable, all that is wanted is the card. I think the above should help to clear up the matter.

May I add that I will send a QSL card to everyone who sends me a report on my signals, but unless there is a report, and not just a request for the card itself, my pocket will not allow me to take up the hobby of just swapping cards.—W. T. COOPER (G8BS) (Walthamstow).

Our All-wave Battery Set: Mains Version!

SIR,—I have followed your all-wave battery sets with great interest, but may I suggest that a mains edition would be appreciated by your readers.—R. STAGG (Wood Green).

[*What do other readers think of this suggestion?*—ED.]

Back Numbers Wanted

WOULD any reader kindly loan me the issues and blueprint describing the "A.C. Hall Mark Four," which appeared in January, 1935? I will, of course, return the issues promptly and refund any expense incurred.—R. A. MARWOOD (2, Blandford Road, Lower Compton, Plymouth).

Reports and Postage

SIR,—May I be allowed to encroach further on your valuable space in order to reply to Mr. E. R. Crane, who by his letter in your issue of October 17th appears to have overlooked the main point in my previous letter.

In attempting to justify the indiscriminate circulation of the large number of fictitious and exaggerated reports, he quotes a few cases of transmitters reporting "R9+ QSA5 repeat last part, etc." There are a number of circumstances which could cause a receiving operator to miss part, and the fact that he had missed it would not alter the QRK and QSA of a signal.

The QSL card was introduced as a means of confirming a QSO, a point Mr. Crane himself makes, and if these cards were plain instead of "Works of Art," this situation would never have arisen.

To suggest that I want to reserve short-wave work for "Hams," is ridiculous, and if Mr. Crane objects to my likening his hobby to collecting cigarette pictures, I do not mind changing the simile to "scalp hunting." But whereas the Red Indian hangs the result of his hunting on his belt, the short-wave reporter hangs his on the wall of his shack.

In either case, the victim is not supposed to have any say in the matter.—J. W. ISMAY (G6JI) (Walthamstow).

From an American Reader

SIR,—In a recent issue you ask for information regarding COCQ. This station relays the programme of CMQ, not CMCQ. The correct frequency is 9,750 kc/s, or 30.75 m., and the QRA, Calle 25, No. 445, Havana, Cuba. They send two veri's. South American stations are noted for their drifting habits, so that Mr. Casling is probably right. COCX, 11.55 megs., Havana, relays CMX (Say Emmay Eckis), QSA5 R9, 4-7 p.m. E.S.T. (16.00-19.00 G.M.T.), announces in English and Spanish, and uses a series of gongs. Another is D.R. HIN (N, Nebraska), Trujillo City ("The Voice of the Dominican Political Party"), 11 megs., QSA5 R8, also on 6.26 megs. They stated they would verify promptly. VK6ME, 9.59 megs., Perth, West Australia, will soon be testing, as also CE9G0, Santiago, Chile. Another good catch for DX-ers is ZP1O, Ascencion Paraguay, 6.666 megs, 15 watts, Saturday, 20.00-22.00 G.M.T., QSA4 R5-6 here. On 20 m. readers may build up their logs by trying some of the following amateurs: VK2AK and JU, 13,990 kc/s; CO7HF, HK1Z, LU1AX, LU1ES, LU2DA, OA4B, PZ1AA, VK2AP, UC, 3SU and VK4RW, all on 14,000 kc/s; VK2TI, 14,010 kc/s; VP3BG, PY2BD, ZU6P, 14,020 kc/s; CE1BC, PY1DK, VK2LZ, VK3JT, 14,030 kc/s; PY2EP, SU8MA, VK5DI, 14,040 kc/s; PY9HC, VK2ABG, AD, and VK4JU and VB, 14,050 kc/s; LU1EX, VK2AZ, 14,060 kc/s; ZS6AM, 14,070 kc/s; HK5AM, PY1BK, SU1GP, VK2BK, 3JC, 3MR, and VK4JA, 14,080 kc/s; OK3ID, SU1HH, VK2BD, 3AC, and VK4BB, 14,100 kc/s. The latest QSL's are XE2HF, VK3EG, PY2EJ, VP6YB, VE4QV, F8BR, OA4AA, CO2KY, G2NH, W8QBT (Great Lakes Exposition), SM5SX, LU8AB, G2XV, PY2CK, EA8AT, PI1AF, YV5AA, TI2FG, LU4BH, VK2CI (10 watts), PY2BA, G5BJ, PY1DK, VK3KX, and VK2IQ. I see, too, that DX-ers are having the same trouble that we've had for years—stations not answering letters, but there is nothing much we can do about it.

Hoping this will help listeners to build up their logs.—J. SANDERSON (Broad Street, Newark, N.J., U.S.A.).

CUT THIS OUT EACH WEEK

Do you know

—THAT a frequent cause of hum in an A.C. receiver is the unbalancing of a heater winding due to uneven wiring.

—THAT trouble from the above cause may be removed by using a Hum-dinger or Nodaliser across the winding instead of using the centre tap.

—THAT the scheme recently mentioned for obtaining an artificial centre-tap on a push-pull input transformer cannot be adopted for the output component.

—THAT a portion of a speaker cone may be stiffened for tone modification purposes by painting with shellac.

—THAT the main characteristics of most valves are taken at certain definite voltages—in the case of battery valves with 100 volts H.T.

—THAT the substitution of a metallised valve for an ordinary type may sometimes give rise to difficulty owing to the presence of the earthed screening near to some inductive component.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *George 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.

QUERIES and ENQUIRIES

The Monitor

"I wish to build the Monitor 3 for bedside use and I want to use headphones whilst listening at night, yet be able to use a speaker when my people are out. What alteration will have to be made for this purpose? I have some headphones with a resistance of 2,000 ohms. Will these be suitable? I have no aerial in the bedroom and wonder, therefore, if a Pix invisible aerial would do, as our house is surrounded with trees. Finally, can it be built without soldering, as I can't solder."—P. F. R. J. (Redhill).

THE Monitor should be quite suitable for your requirements, and good results should be obtained from an indoor aerial of the type mentioned. Headphones could be connected in place of the loudspeaker, but to avoid the difficulty of disconnecting the speaker each time a change-over switch could be employed, with a silencing switch on the speech coil of the speaker. The headphones in this case would be filter fed, the speaker transformer acting as a choke. If volume is too great on the headphones, you might find it worth while to include the 'phones in the anode circuit of the detector valve, a fixed condenser feeding the 'phones direct from the detector anode circuit, and the other side of the 'phones connected to earth. A simple on-off switch between 'phones and earth would enable you to switch out the 'phones when using the loudspeaker.

Replacing a Frame Aerial

"I have a four-valve S.G. receiver with M.C. speaker and have always had good results on both long and medium-waves. The set has an internal frame aerial, which of late has been fraying and breaking with the result that I cannot possibly repair it any more. In any case I want to dismantle it and work the set with an outside aerial and earth and have tried this but cannot get signals. What alterations are necessary to achieve this? I enclose a circuit of the receiver."—J. McE. (Glasgow, N.W.).

IT would appear from the diagram that the input circuit consists of a tuning coil to which is coupled a simple small aerial. If this is the case, it should only be necessary to connect a standard aerial to the point marked A and a standard earth to the point marked E. If, however, the diagram is only schematic, and the grid circuit consists of a standard frame aerial, it will be necessary to replace this by a standard dual-range broadcast coil, to which an aerial and earth should be joined in the usual way. In any case, as the present frame has broken, we suggest you remove the leads now joined to the fixed and moving vanes of the first tuning condenser and join these to the appropriate terminals on a modern coil. (The correct terminals will be shown on the maker's leaflet supplied with the coil.) If possible, you should get a coil similar to that now used between the H.F. and detector stages, but if this is not possible, it may be worth while replacing this also by a modern coil, obtaining a matched pair of coils and tuning them both with a two-gang condenser.

Small P.A. Amplifier

"I should be grateful if you could supply me with constructional particulars of a D.C./A.C. amplifier for use with a gramophone pick-up and microphone. This should be of about 6 watts output and intended for use with an audience of approximately 100 persons.—H. A. N. (Yeovil).

THE only small P.A. amplifier designs we have capable of the output mentioned are designed only for A.C. mains operation. It might be possible to modify these in order to utilise the high-voltage mains valves with the standard arrangement of a rectifier for A.C. use, but we cannot supply instructions for so modifying our receiver designs. Our Universal Hall-Mark Four receiver (blueprint P.W.47) could, however, be used for the purpose indicated, the H.F. stage being left unused, or employed to pick up radio programmes when desired.

RULES

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

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

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

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

Learning Morse

"I am anxious to learn the Morse Code both transmitting and receiving, and cannot yet understand the various stations which I pick up. What is the best method of obtaining proficiency in this branch of wireless, as I am anxious eventually to obtain a transmitting licence."—A. C. (Hove).

ALTHOUGH a simple buzzer may be used, better results will be obtained if you use a valve oscillator, in conjunction with headphones. The wearing of the latter enables you to concentrate more when beginning, and much better results will be obtained, and speed will be more quickly acquired if you can get a friend to help you. You can then take it in turns to send and receive. The sending key should be included in the filament circuit and the valve fed in the usual way. By the use of fixed condensers the note may be varied in order to prevent monotony and also to increase the practice which is obtained.

Short-Wave Noises

"I have planned a short-wave receiver with one or two novel features. The great point was to accommodate this receiver in a special cabinet which I already had and this resulted in a rather peculiar layout, the detector stage being on top of the chassis and the output valve immediately beneath it (the chassis is of aluminium). The condensers, both aerial and reaction, are operated by means of rods and bevel gears taken from the well-known constructional toy. The trouble is loud grating noises all the time the set is in action and nothing I have tried will stop it. Can you offer any suggestion as to cause and cure?"—G. T. (Cork).

THERE can be dozens of causes of the noise, but we think that the most probable in your case is the bevel drives for the condensers. The gear wheels are not precision cuttings, and you will find no doubt that there is a slight play in each setting. Although earthed, the movement of the teeth due to vibration or even due to the fact that H.F. currents are present in the metal, will result in the noise. To prove this you can obtain a piece of copper gauze and place this over one of the gears, turning the drive so that the gauze is wedged between the two wheels. You will then probably find that no noises are heard. Frictional contacts should always be avoided on the short waves, and a better idea, if you must use the drive at an angle, is to employ the Bowden cable arrangement which will avoid the frictional contact in such a vulnerable position.

Winding a Resistor

"I wish to wind one or two resistors for a power amplifier. The total current carried is about 1 amp., and I should like to know if there is a gauge of resistance wire which has some even value of resistance to facilitate the working out of my various items. What wire do you recommend, and what is the price?"—F. E. R. (Highbury).

ORDINARY nickel-chrome, 24 S.W.G. will carry 1.3 amps in a solenoid winding and has a resistance of approximately 4 ohms per yard. This should be quite suitable for your requirements. We do not know the purpose of the resistors but the fact that a simple solenoid of wire has inductance should not be overlooked by you, and you may find it desirable in most cases to double the required quantity of wire and wind the resistor with the doubled wire to annul the inductance. The wire in question, enamelled, will cost 4s. 6d. per ounce, and there are approximately 258 yards to the lb.

Simplified Construction.

"I am anxious to build a receiver of the superhet type, but I wish to go down to the short-waves. I know that multi-range coils are on the market, but I am rather afraid of the trimming and matching difficulties. Is it not possible to have this carried out by some firm so that it is accurately tuned. Also, can a ready calibrated dial be obtained for such a receiver."—G. T. (Edgware).

WHY not make use of one of the ready tuned and assembled units? These contain the tuning condenser and aerial and oscillator coils, together with valve-holders, and are ready ganged. A four-range tuning dial is also fitted. Such a unit needs only the addition of the I.F. and output stages, in which the trimming is very simple. Such a unit may be obtained from the Raymart Manufacturing Co. for £5 10s.

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

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are full size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7½d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" 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

STRAIGHT SETS. Battery Operated.

	Date of Issue.	No. of Blueprint
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..		PW31A
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D Pen)	11.8.34	PW36B
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty-Shilling Three (D, 2 LF (RC & Trans))	2.12.33	PW34A
Leader Three (SG, D, Pow) ..	—	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow)	—	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))..	*June* '35	PM2
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	31.8.35	PW55
The Monitor (HF Pen, D, Pen) ..	8.2.36	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)..	—	PW64
The Gladiator All-Wave Three..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
Four-valve : Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen) ..	—	PW11
Beta Universal Four (SG, D, LF, Cl. B)	15.4.33	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67

Mains Operated.

Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	15.7.33	PW25
A.C. Three (SG, D, Pen) ..	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (R.C))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) ..	31.8.35	PW56
Four valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF, Pen, D, Push-Pull)	9.2.35	PW47

SUPERHETS.

Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	—	PW40
F. J. Camm's 2-valve Superhet (Two-valve)	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)..	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	11.1.36	PW60

SHORT-WAVE SETS.

Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	15.9.34	PW38A
Three-Valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	8.2.36	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68

PORTABLES.

Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	16.5.36	PW65
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12

MISCELLANEOUS.

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

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	—	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det, Pen) ..	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	*July* '36	WM409
Three-valve : Blueprints, 1s. each.		
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)..	*June* '33	WM327
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP 21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM389
Certainty Three (SG, D, Pen) ..	*Sept.* '35	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen) ..	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP 21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: Blueprints, 6d. each) ..	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H.K. Four (HF Pen, HF Pen, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	*May* '33	WM329
Class-B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344

Mains Operated.

Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C./D.C. Two (D, Pen)	*Sept.* '35	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C. ..	—	AW388
Three-valve : Blueprints, 1s. each (*contd.*).		
S.G. Three (SG, D, Pen) A.C. ..	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW436
Mantovani A.C. Three (H.F, Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen) ..	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	—	AW425
Heptode Super Three A.C. ..	*May* '34	WM359
"W.M." Radiogram Super A.C..	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
TWO H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)..	—	WM367
Five-valve : Blueprint, 1s. 6d.		
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340

SHORT-WAVE SETS—Battery Operated.

One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America ..	—	AW429
Roma Short-waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det, Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen) ..	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans. Super-regen)	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen)	*Jan.* 19,'35	AW463
The Carrier Short-waver (SG, D, P.)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World Beater (H.F Pen, D, RC, Trans) ..	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM338
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super ..	*Nov.* '35	WM397

Mains Operated.

Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	—	WM368
"W.M." Long-wave Converter ..	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C. ..	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	*Aug.* '35	WM391

MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6)	*June* '35	WM38
Listener's 5-watt A.C. Amplifier (1/6)	*Sept.* '35	WM392
Radio Unit (2v.) for WM392 (1s.)	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New style Short-waver Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-wave Adapter (1/-).. ..	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.L.D. L.C. Short-Wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-) ..	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	*July* '36	WM408

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Surplus, Clearance or Secondhand, etc.

VAUXHALL.—Polar Midget 3-gang condensers, straight or superhet, 8/9; Polar full vision, horizontal or Arcuate dial and drives, 5/-.

VAUXHALL.—Flat, sheet aluminium, hard rolled, 18 gauge, 12in.×12in., 3/-; 18×18, 5/6; other sizes proportionate.

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

VAUXHALL.—Hivac valves, mains or battery, all types. Usual discounts from new prices.

VAUXHALL.—Colvern Ferrocart iron cored coils, 2-gang, 20/-; 3-gang, 30/-; straight or superhet.

VAUXHALL.—Volume controls, Erie Colvern Centralab, 2/-. With Switch, 3/-. 2,000 to 2 meg. Fitted knobs and terminals.

VAUXHALL.—T.C.C. electrolytic condensers, 8 mfd. and 4 mfd., 550 volt, 3/-; 500 volt, 2/6; 200 mfd., 10-volt, 2/6.

VAUXHALL.—T.C.C. condensers, tubular, non-inductive, 0.1, 6d.; 50 mfd., 50v. working, 1/6; 50 mfd., 12v., 1/3; 0.05, 6d.; 0.002, 0.0002, 0.001, 0.0001, 4d. each.

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

VAUXHALL.—Resistances by well-known manufacturers, 1-watt type, 6d each; all values.

VAUXHALL.—Centre tapped iron cored I.F. transformers, bases, terminals, 110 k/c; 6/6 guaranteed.

VAUXHALL.—Set manufacturers' surplus, skeleton type Westinghouse rectifiers, H.T.8, 9/6; H.T.9, H.T.10, 10/-; complete with fixing brackets.

VAUXHALL.—Collaro 32 Model, 32/6; Universal model, 47/6; complete unit, A.C. 200-250v., first quality pick-ups and volume control, 48/-.

VAUXHALL.—Eddystone and Bulgin short-wave components, large range now available.

VAUXHALL.—Clix valve holders, terminals, 5-pin, 7d.; 9-pin, 9d.; baseboard mounting, 5-pin, 4½d.; 7-pin, 1/-.

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

VAUXHALL.—Immediate delivery, carriage paid, lists free; cash with order, or c.o.d.—Vauxhall Utilities, 163a, Strand, W.C.2 (Temple Bar 9338).

WE BUY for cash, all types of Modern Second-hand Radio Sets, Accessories, etc. Unbeatable Part-exchange allowances for new goods. Bring, send or write.
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EXPERIMENTER'S OPPORTUNITY. Parcels containing Wireless Components 40/- value for 5/6. Carriage 1/-.—Taylors', Radio House, Macaulay Street, Huddersfield.

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RADIOGRAPHIC, Ltd. For all-wave Radios, Valves, Components, Professional Receivers, Kit Sets. Every type of American Tube. None to compare with RADIOGRAPHIC. Write for our FREE CATALOGUE. Remember our Guarantee—"ABSOLUTE SATISFACTION OR MONEY REFUNDED."—RADIOGRAPHIC, LTD., 66, OSBORNE STREET, GLASGOW, C.1.

MISCELLANEOUS

GRAMOPHONE attachments for Radio, electric motors, 25/-; pick-ups, 9/6; portable gramophones, 12/-; spring motors, 4/6, dozen 36/-, 100 £12/10/0, 1,000, £100; walnut pedestal Anexagram, £5; soundboxes, 1/6; tone-arms, 2/6; horns, 2/6; cabinets, 4/-; 1,000 needles, 1/3; gears, springs, accessories, cheapest. Trade discount. Thousands to clear. Liquidating stock bargains. Catalogue free.—Regentam, 120, Old Street, London, E.C.1.

FOR SALE.—W. B. Stentorian 36.s., 25/-. As new.—L. Norman, Tendring, Clacton-on-Sea, Essex.

HEADPHONES. Brown, G.E.C., B.T.H., Nesper, Sterling, Ericsson, Marconiphone, Telefunken, etc., from 2/6 pair. Postage 6d. List free. CRYSTAL SETS. Complete. Guaranteed. Burne-Jones, 5/6. Ditto, double circuit, 8/-. Large P.O. type, 10/-. Crystal detector. Complete parts, 1/-. Sensitive permanent detector, 1/6.—Post Radio, 183, Caledonian Road, London, N.1.

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Offer the following Manufacturers' Brand New Surplus Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-; under 5/- postage 6d. extra. Orders under 5/- cannot be sent C.O.D.

1/9 **SHORT-WAVE COILS,** 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, with circuit.

4/- **SPECIAL** set of 3 S.W. coils, 14-150 metres, with circuit.

2/- **PREMIER** 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit.

1/- **COIL FORMERS,** in finest plastic material, 1½in. low-loss ribbed, 4- or 6-pin.

SUPER CERAMIC CONDENSERS, S.L.F. .00016, .0001, **2/9** each; double-spaced, .00005, .000025, .000015, **3/-** each. All brass with integral slow motion, .00015 tuning, **3/9**; .00015 reaction, **2/9**. British, Radiophone 2-gang .00016 with trimmers, **5/6.**

4/6 **MAINS VALVES,** famous Europa 4 v. A.C. types, H.L., L., S.G., Var.-Mu-S.G., H.F. Pens., Var.-Mu-H.F. Pens., 1, 3 and 4-watt A.C. directly-heated output Pentodes. Full-wave rectifiers, 250 v. 60 m.a. A.C./D.C. types. 20-volt. .18 amp. S.G. Var-Mu-S.G., H., H.L., Power.

5/6 **FOLLOWING TYPES.** Full-wave rectifiers, 350 v. 120 m.a. and 500 v. 120 m.a. 2½ watt indirectly-heated Pentodes. Frequency Changers, Octodes and Heptodes.

BATTERY VALVES. 2 volts, H.F., L.F., **2/3.** Power, Super-Power, **2/9.** S.G. Var.-Mu-S.G., 4- or 5-pin Pentodes, H.F. Pens, V.-Mu-H.F. Pens, **5/-.** Class B, **3/6.**

5/6 **AMERICAN VALVES.** Genuine American **HYTRON** first-grade Valves, 3 months' guarantee. All types. New Metal-glass Valves, all types, **6/6** each. Genuine American **DUOTRON** Valves, all types, **3/6** each.

VALVE HOLDERS for all above types, **6d.** each. Octal Bases, **9d.** each.

12/6 **SHORT-WAVE KIT** for 1-valve receiver or adaptor, complete with chassis, 4 coils, 14-150 metres, condensers, circuit and all parts, **VALVE GIVEN FREE! DE LUXE MODEL, 17/6. SUPERHET CONVERTER KIT, 13/6.**

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42/- **3-VALVE S.W. Kit. S.G. Det. 2 Pen. Valves given free!**

50/- **ALL-WAVE "ALL-WORLD RANGE" 3-**valve kit, 12-2,000 metres in 4 wavebands without coil changing, complete kit of parts with 3 valves, S.G.H.F., S.G. Det. and Pentode (2 volts). Q.P.P. Model, **6/6** extra.

12/6 **LISSEN ALL-WAVE COILS,** 12-2,000 metres, complete with switching and wiring diagram.

25/- **THE LOT. BAND-PASS TUNING PACK,** comprising set of Telsen 3-gang iron-cored coils with switching, mounted on steel chassis with 3-gang condenser, illuminated disc-drive and 4 valve-holders. All mains or Battery circuit. **FREE!**

40/- **3-WATT A.C. AMPLIFIER,** 2-stage for mike or pick-up, complete kit of parts with 3 valves.

SPECIAL OFFER! 12/6 P.M. Speaker, **35/-** Transverse Current Mike, complete with transformer, and **7/6** Stand. If purchased with above kit, **25/-** the lot.

£4:4:0 **7-WATT A.C./D.C. AMPLIFIER.** 3-stage, high-gain, push-pull output. Complete kit of parts with 5 specially matched valves.

SPECIAL OFFER! 21/- pair Matched Speakers, **35/-** Transverse Current Mike, complete with transformer and **7/6** stand. If purchased with above kit, **35/-** the lot.

£5:5:0 **10-WATT** 3-stage A.C. Amplifier Kit with 5-valves.

SPECIAL OFFER! 21/- pair Matched Speakers, **35/-** Transverse Current Mike, complete with transformer and **7/6** stand. If purchased with above kit, **35/-** the lot.

£8:8:0 **20-WATT** 3-stage A.C. Amplifier Kit with 5 valves.

SPECIAL OFFER! £6 pair P.M. Exponential Horn Speakers, **35/-.** Transverse Current Mike with transformer and **7/6** stand. If purchased with above kit, **£5 10s.** the lot.

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ROLA latest type P.M.'s, **18/6.** K.B. 7in. mains energised, 1,500 or 2,500 ohms, **7/9. GOODMAN'S** 8in. mains energised, 1,000 ohms field, **10/6** each.

DIALS.—Clarion. Illuminated. S.W. slow-motion Dial with 2in. knob, **2/-.** Premier All-Wave 2-speed Dial, full vision straight-line, dual ratios 10-1 and 150-1, **6/6,** with escutcheon.

POTENTIOMETERS by well-known makers. All values up to 1 meg., **2/-**; with switch, **2/6.**

30/- **PREMIER** (Reisz Pattern) Transverse-current MIKE, High Output, Straight Line Response. Transformers, **5/-.** Table Stand, **7/6.**

PREMIER wire-end type with screened primaries, and tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. H.T. 8 & 9 or H.T. 10 with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., **8/6.** 250-250 v. 60 m.a., 4 v. 1 a., 4 v. 2 a. and 4v. 4 a., all C.T., **8/6.** 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **10/6.** Any of these transformers with engraved panel and N.P. terminals, **1/6** extra. 500-500 v. 150 m.a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., **19/6. AUTO TRANSFORMERS,** step up or down, 60 watts, **7/6**; 100 watts, **10/-.**

SMOOTHING CHOKES, 25 m.a., **2/9**; 40 m.a., **4/-**; 60 m.a., **5/6**; 150 ma., **10/6.** 2,500 ohms, 60 m.a. Speaker Replacement Chokes, **5/6.**

5/9 **MILLIAMMETERS,** moving-iron, flush, 2½in., all ranges from 0-10. Visual tuning, 6 or 12 m.a., **5/9**; Moving-coil meters, 2½in. 0-1 m.a., **18/6**; 3½in. 0-1 m.a., **22/6.** Multipliers, **1/-** each.

ELECTROLYTICS. U.S.A. 4, 8, or 12 mfd., 530 v. peak, **1/9** each. Dubilier, 4 or 8 mfd. 500 v., **3/-**; 50 mfd. 50 v., **1/9**; 12 mfd. 20 v., 6d.; 25 mfd. 25 v., **1/-**; T.C.C. 4 or 8 mfd. 650 v., **4/-**; 15 mfd. 50 or 100 v., **1/-**; 50 mfd. 12 v., **1/-.** Paper Condensers. W. E., 250 v. working 4 mfd., **2/-**; 2 mfd., **1/-**, 1 mfd. **6d.**; 850 v. working 4 mfd., **2/6**; 2 mfd., **1/6**; Dubilier 500 v. working 4 mfd., **4/-**; 800 v. 4 mfd., **6/-.** Wego 450 v. working 1 mfd., **1/-**, 2 mfd., **1/9**, 4 mfd., **3/-**; 700 v. working 2 mfd., **2/-**, 4 mfd., **3/6.**

TRANSFORMERS, latest type Telsen R.G.4 (list **12/6**), **2/9.** Lissen Hypernik Q.P.P. (list **12/6**), **3/6.**

10/- **ELIMINATOR KITS** for A.C. mains. 120 v. 20 m.a., or 150v. 25 m.a., tapped S.G. det. and output. Complete Kit with long life valve rectifier (replacement cost only **2/-**).

PREMIER L.T. CHARGER KITS for A.C. mains, including Westinghouse Rectifiers and Tapped Mains Transformers. 8 volts at ½ amp., **14/6**; 8 volts 1 a., **16/6**; 15 volts 1 a., **19/-**; 15+15 volts 1 a., **37/6**; 15+15+15 volts 1 a., **50/-**; 8 volts 2 a., **29/6.**

TELSEN iron-cored screened coils, W.349, **4/-** each. Electric **SOLDERING IRONS,** 200-250 v., A.C./D.C., **2/3.**

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COSMOCORD Pick-up with Tonearm and Vol. Control, **10/6. Pick-up head** only, **4/6.**

6d. **TUBULAR CONDENSERS,** non-inductive, all values up to .5 mfd.

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£3.12.6 **MODEL S.B.21, 3-VALVE BATTERY SUPER-HET,** 4 Stages, listed 9 gns. Complete with valves, aerial-tested.

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All the above guaranteed in perfect working order. Order Early to avoid disappointment.

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75/- **A.C./D.C, AMERICAN MIDGET,** 5-valve type. A real quality job. Jensen Moving Coil Speaker, etc. Brand new, boxed.

BRYCE MAINS TRANSFORMERS AND CHOKES, standard for the season, finest made, British and guaranteed.

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10/6 350-0-350, 120 m.a., 2-0-2 volts, 2.5 amp., 2-0-2 volts, 4 amp.

12/6 350-0-350, 150 m.a., 2-0-2 volts, 2.5 amp., 2-0-2 volts, 4 amp., 2-0-2 volts, 2 amp.

17/6 500-0-500, 150 m.a., 2-0-2 volts, 2.5 amp., 2-0-2 volts, 6 amp., 2-0-2 volts, 2 amp., 2-0-2 volts, 2 amp.

8/6 **H.T.8 TRANSFORMER.** 250 volts, 60 m.a., 2-0-2 volts, 4 amp.

17/6 Ditto with H.T.8 metal rectifier.

ALL TRANSFORMERS ARE FULLY SHROUDED.

MAINS CHOKES,

4/6 40 m.a. 30 henrys.

6/- 60 m.a. 40 henrys.

10/6 150 m.a. 40 henrys.

21/- 250 m.a. 15 henrys.

6/- 60 m.a. 80 henrys. 2,500 ohms for speaker replacement, etc.

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(Continued at top of column three)

(Continued from foot of column one)

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