TROUBLE TRACKING MADE EASY!

Practical and Amateur Wireless

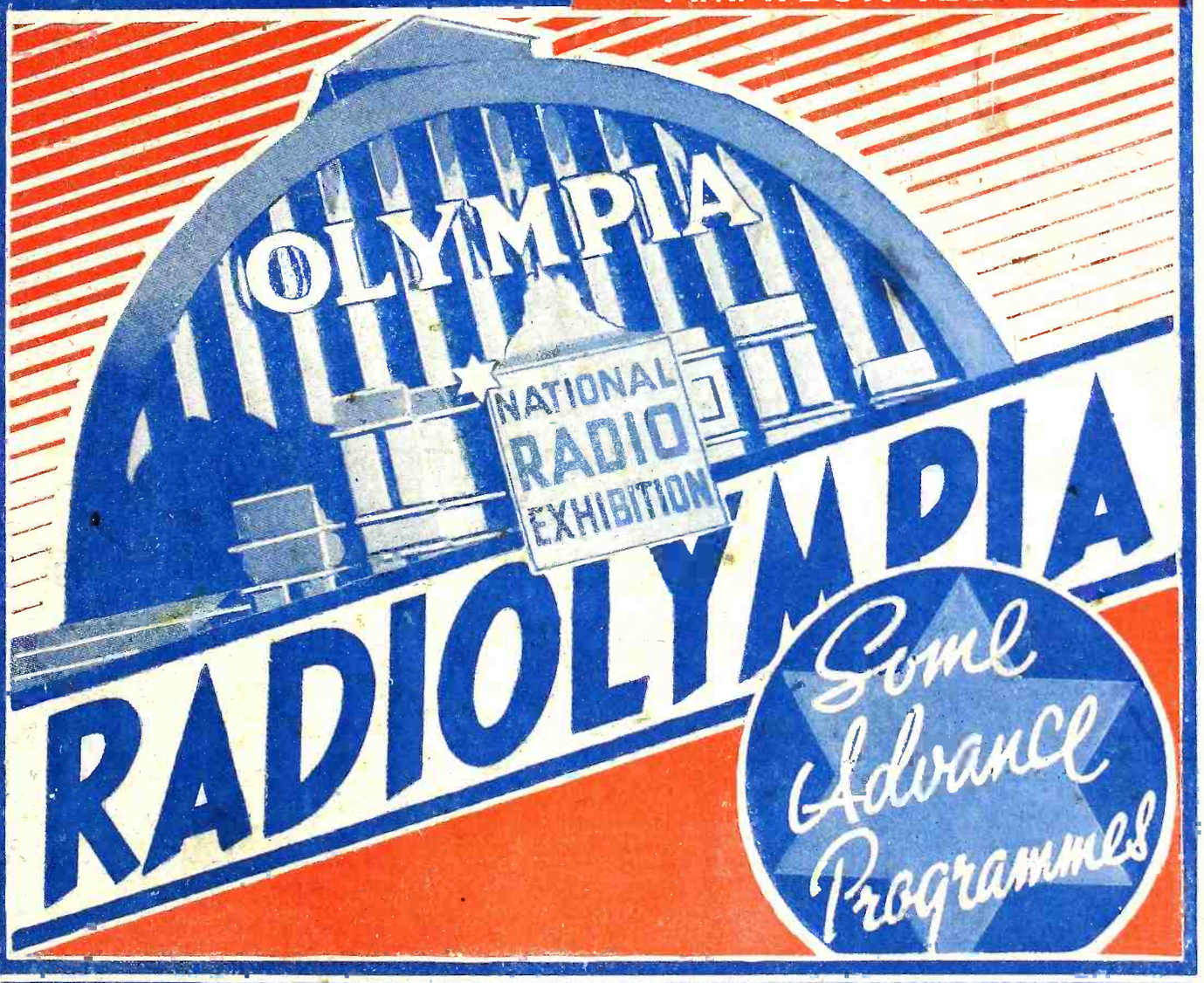
3D EVERY WEDNESDAY

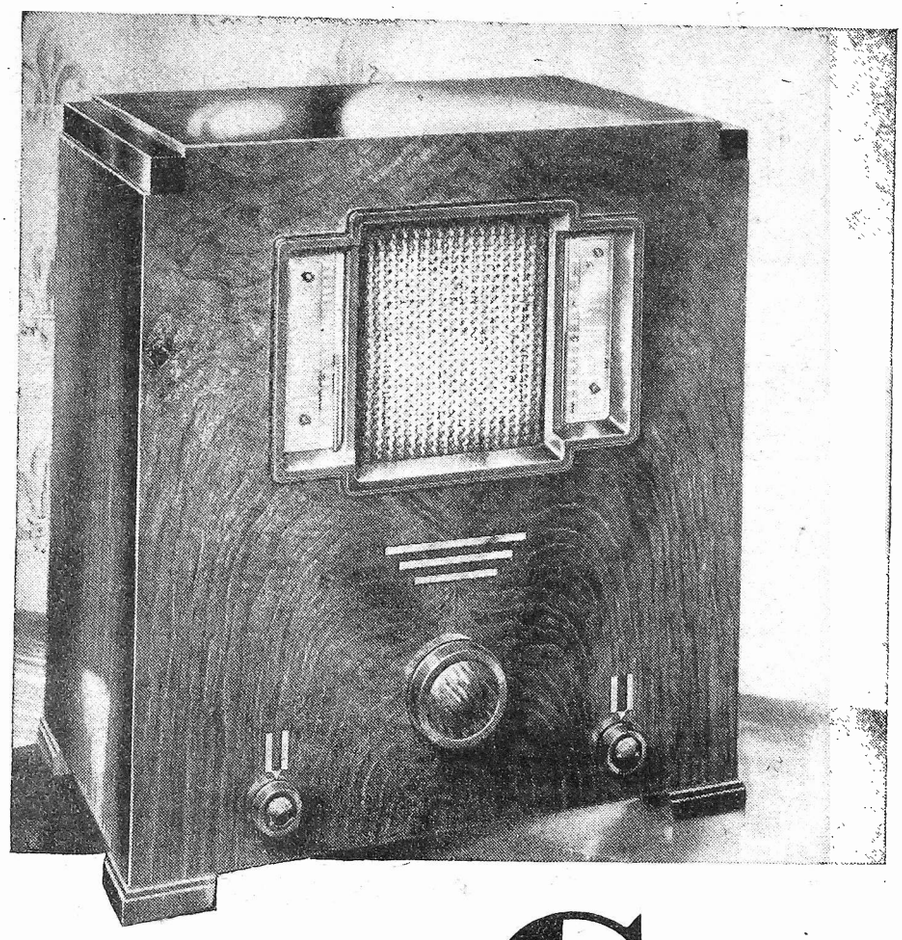
Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 6. No. 149. - July 27th, 1935.

AND AMATEUR TELEVISION





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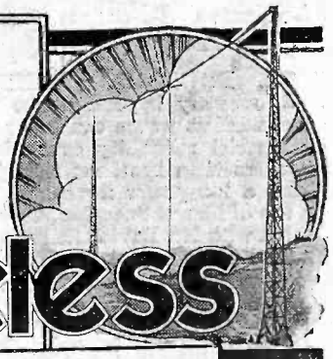
Designing Your Own Set!—See Page 517

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. VI. No. 149. July 27th, 1935.



ROUND *the* WORLD *of* WIRELESS

Norway's Proposed Network

FOR the reorganisation of its system, the Norwegian Broadcasting Administration plans a chain of nine main and ten relay stations with, in addition, one short-wave transmitter. Although the country has only been given one channel in the 1,000-2,000 metre band, the new 10-kilowatt Aalesund-Vigra station will work on a long wavelength.

Polskie-Radio Torun

THE Polish transmissions which are occasionally picked up on 304.3 metres, a channel shared with Genoa, emanate from the new station at Torun. In almost every case they are relays of the Warsaw radio entertainments. Torun, however, possesses its own interval signal; it consists of two bars of a popular folk melody sung by the timber drifters on the Vistula.

Weather Forecasts for Fishermen

DAILY at B.S.T. 05.00, VAS, Louisberg, (Nova Scotia), on 441.2 metres (680 kc/s), broadcasts meteorological bulletins destined to ships trawling off the Newfoundland banks. The calls is: *This is VAS, the Marconi station of the Atlantic Broadcasting Company, Nova Scotia.* These transmissions have been picked up in the British Isles.

International Choral Broadcast

BY arrangement with the U.I.R., following the recent Warsaw Conference, an international broadcast is to be made on October 27th next between G.M.T. 17.00-19.00. *Youth Sings Beyond the Frontiers* is the title of the programme to which groups of youths drawn from organisations in most European countries, and also from states overseas, will each contribute in turn a four-minute broadcast. It will be the first truly international relay in the history of radio entertainment.

Monsieur Radiolo

UNDER this *nom-de-plume* many listeners will recall Marcel Laporte, who for many years acted as announcer for the Radio-Paris broadcasts. Following engagements at Radio-Vitus and at Juan-les-Pins, he has now been appointed chief announcer at the studio of the new Nice-La Brague P.T.T. high-power station which it is hoped will soon be on the air.

Canned News Bulletins

FOR some considerable time the Berlin station has featured the broadcast of topical events recorded by its mobile radio van during the day. In future, these transmissions, on a larger scale, are to be given daily except Saturdays, from B.S.T. 19.45-20.00, and again between B.S.T. 22.20-22.30. On Sundays, under the title *German Sport Echo* the broadcast will be given between B.S.T. 19.30-20.00.

ON OTHER PAGES

France Goes Ahead

NOTWITHSTANDING the number of broadcasting stations operating in Paris so far, registered listeners in the French capital at the end of last April numbered only 871,032; on the other hand, other parts of the country have recently shown a good increase, and the provinces are represented by 1,086,162 licences. By now France may have reached the two million mark which, although registering progress, is far behind what her neighbours have attained in the same period.

Germany's Proposed Saarbruecken Transmitter

CONTRARY to the decision taken some months ago, the German Authorities now intend to erect an independent station in the Saar district. It will provide its own programmes, but will be connected to the main network for the broadcast of transmissions of a national character.

Grand Opera on a Football Ground

THE Hohenwarte Football Ground, one of the largest in Austria, is to be used for the presentation of open-air grand opera. It will accommodate an audience of 20,000 spectators, and for the purpose a special platform has been built, capable of staging shows with one thousand singers, and an orchestra of two hundred musicians. Two of the operas will be broadcast by the Vienna station.

Afghanistan Installs Radio

THE Royal Afghan Government has placed an order with the Marconi Company, London, for the supply of five wireless transmitters to be erected at Kabul, Diyazunghi, Khost, Khanabad, and Maimene. The Kabul station will possess a short-wave plant for direct communication with London, Melbourne, Rio de Janeiro, and Tokyo. This would appear to be a preliminary step to the establishment of a broadcasting system in that country.

Another Golden Voice

WHEN Stockholm closes down at night, the exact time is given in a feminine voice. The studio is not responsible for the announcement, which is automatically received from the Swedish telephone headquarters. The voice of the sweetest-voiced operator has been recorded on film, which, actuating through rays of light, photo electric cells, connected to amplifiers, broadcasts the exact hour, minute, and second at any time desired.

From Weston-s.-Mare

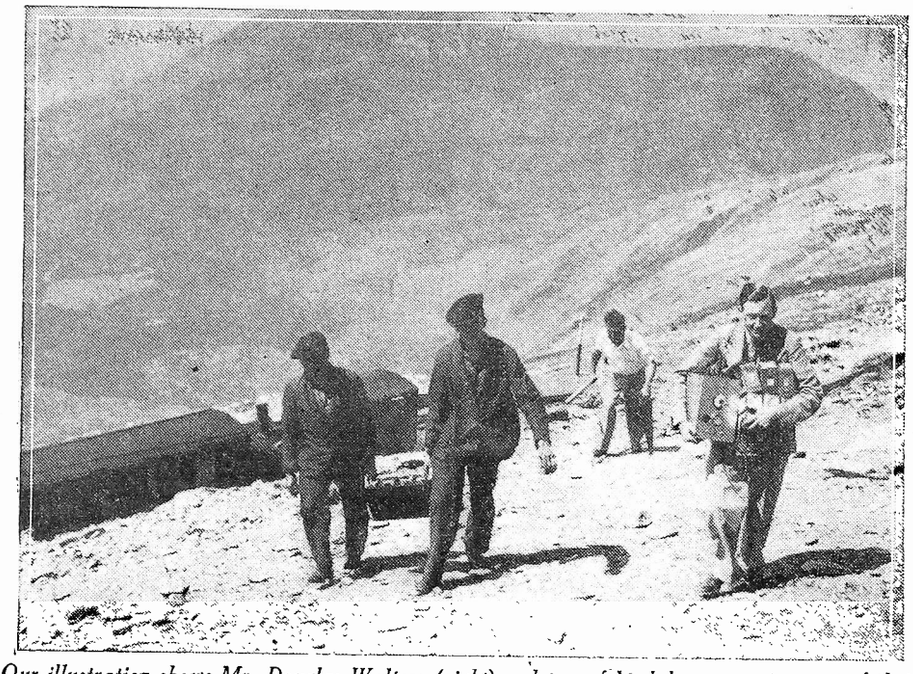
THE feature "You pays your money" which is described as a choice of evening entertainments will be taken from Weston-super-Mare for Western listeners on July 24th. This broadcast will be run on similar lines to the others and will take the form of visits to a number of places of entertainment, including the Winter Gardens, where a dance band will be heard; the Odeon Cinema, where an organ recital will be given; Burgess and his orchestra will be relayed from the Madeira Cove; an Alfresco Concert Party will be taken from the Beach; also a Punch and Judy man, and probably a talk by an ice-cream man.

ROUND the WORLD of WIRELESS (Continued)

Short-wave Messages Heard 207 Miles Away

MR. DOUGLAS WALTERS proved recently beyond doubt that ultra-short wireless waves can be operated with commercial reliability over much greater distances than has been thought possible. Using a low-power five-metre transmitter on top of Mount Snowdon, Carnarvonshire, Wales, with Mr. David Richards, the Mount Everest radio expert, he established what he believes to be new long-range records. Experimenters operating at Stoke Poges, Buckinghamshire, 160 miles away, and Romford, 207 miles away, heard his speech perfectly.

SHORT-WAVE RADIO RECORDS BEATEN



Our illustration shows Mr. Douglas Walters (right) and two of his helpers carrying part of their apparatus to the wireless station on Mount Snowdon.

INTERESTING and TOPICAL PARAGRAPHS

"City of Music"

THOUSANDS of musical listeners delighted in Julius Buerger's "Life of Offenbach," a musical story of Offenbach's struggle from youth to his successful career in Paris, where, after the composer's death, his charming operetta "The Tales of Hoffmann" scored an enormous success. Julius Buerger has now turned his gift for pot-pourri to Vienna, and his programme, "City of Music," will be heard on July 24th and 25th. In this pot-pourri listeners will make a journey through 150 years of Viennese music. In the prelude to this programme snatches of the Austrian National Hymn, Strauss's "Blue Danube," and other well-known waltzes of this composer will be included, as well as excerpts from Mozart's "Magic Flute" and the works of Beethoven and Schubert.

"Only a Mill Girl"

ON July 30th Martyn Webster will produce in the Midland studio the mock melodrama "Only a Mill Girl," by the Melluish brothers. He first produced it in London, and it was put on after he was appointed producer at the Birmingham studio. Reginald Burston will conduct the B.B.C. Midland Orchestra and the B.B.C. Midland Revue Chorus, and the cast will include John Lang; Hugh Morton; Alfred Butler, as the villain; Dorothy Summers; and Marjorie Westbury, playing the title part.

"Playtime"

THIS is the title of a popular show, presented by Nat Day, which will be relayed from the Esplanade Pavilion, Burnham-on-Sea, for Western listeners on August 1st.

Talk on Rodeos

RODEOS in the Western States and Canada will be described to Midland listeners on July 29th by Brendan K. Vallings, who spent some years out West. He is now in charge of the Ministry of Agriculture's campaign against the musk rat in Shropshire. His capacity for telling a good yarn has already been shown in his broadcast talk "Buffaloes and Bears."

Talk on Cricket

"RECOLLECTIONS of the Great Days" is the title of a talk on cricket which will be given by Sir Ernest Cook for Western listeners on July 29th. Sir Ernest was captain and honorary secretary of Bedminster Cricket Club for twenty years and an old Somerset county player.

"North Wales Night"

THE Northern Outside Broadcast staff are undertaking another "North Wales Night" feature, which will be broadcast in both Northern and Western programmes on July 31st. Billie Manders' all-male concert party, the "Quaintesques," will be relayed from the Pier Amphitheatre, Rhyl; there will be a recital by Horace Bagot at the organ of the Winter Gardens, Llandudno; and further concert party shows, by the "1935 Evening Follies," from the Arcadian Pavilion, Llandudno, and by the "Colwyn Follies" from the Pier Pavilion, Colwyn Bay.

Variety from Coventry

THE variety bill for Midland listeners on August 2nd is to be relayed from the Hippodrome Theatre, Coventry.

Good Fare from the Northern Regional

TRAM-GUARDS and drivers, shed-men, and so forth, comprising the Manchester Corporation Transport Banjo, Mandolin, and Guitar Orchestra, will broadcast a concert in the Northern programme on August 1st. Their conductor is A. F. Hill. On August 3rd the "Bouquets" concert party, presented by Murray Ashford and Wilby Lunn, will broadcast to Northern listeners from the Pier Pavilion, St. Anne's-on-Sea.

Band Concert for Western Listeners

A BAND concert will be given for Western listeners on July 28th by the Melingriffith Volunteer and Cadet Corps Band, conducted by T. J. Powell. This band was formed more than sixty years ago under the name of the Whitchurch Brass Band; it is now connected with the Melingriffith Company. Most of the members are engaged in the tinplate industry. The conductor is a well-known composer for brass bands, his marches being very frequently used in broadcasts and competitions. The soloist at the broadcast concert will be Olive Gilbert (contralto).

Pinero's "Sweet Lavender"

THE third of the series of plays by Midland repertory companies is to be broadcast to Midland listeners on July 28th. This is Pinero's "Sweet Lavender," to be performed by the Coventry Repertory Company, and produced in a studio by A. Gardner Davies, the company producer, and Owen Reed, of the Birmingham studios.

SOLVE THIS!

PROBLEM No. 149.

Franklin's four-valve receiver was of the universal all-mains type and had given good service for twelve months. One day, however, he found that signals were very weak, and after an hour or so ceased entirely. He tested the valves and found that two of them had broken down, the heater circuits being internally disconnected. As he was using the receiver on A.C. mains he decided that the valves which he should get for replacement should be of the A.C. type, and accordingly purchased two of similar characteristics to those which had broken down. When inserted in the receiver, however, he obtained very poor signals, and he found it impossible to obtain satisfactory results. Why? Three books will be awarded for the first three correct solutions opened. Envelopes must be marked Problem No. 149 in the bottom left-hand corner, and must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Entries must be received not later than the first post Monday, July 29th, 1935.

Solution to Problem No. 148.

As the anode current was high on the output valve, and yet the H.T. battery had been in use, the inference would be that the grid-bias was low. As a modification of bias did not affect anode current it was obvious that no bias was getting to the grid and, therefore, the grid circuit was open-circuited, due to a breakdown in the transformer secondary (or grid leak should R.C. coupling have been employed).

The following three readers successfully solved Problem No. 147, and books are accordingly being forwarded to them: A.G. Haken, Rossendale, Hyde Street, Winchester; S.C.P. Mears, 14 Foxlands Road, Dagenham, Essex; H. Bolton, 41 Billinge Street, Blackburn.

TROUBLE TRACKING

Hints on the Equipment Required and the Methods of Locating Faults and Troubles which Might Arise in Battery and Mains-operated Receivers. By L. ORMOND SPARKS

EVERY radio constructor experiences, at one time or another, certain faults which, whether simple or complex, are often irritating and, in many instances, most discouraging. It is fairly safe to say that finding the fault usually takes more time than effecting the actual cure, but this is probably due to a lack of systematic investigation.

While it is obviously impossible to compile a table of every ill a receiver or amplifier is likely to develop, it is a great advantage to classify the numerous faults under suitable headings, thus limiting the field of cause and effect. Such a procedure, if adhered to, and augmented from time to time by notes and observations obtained during trouble tracking, will save a great deal of time and frayed tempers.

If funds only allow one meter, it is suggested that a low-reading milliammeter is the most useful proposition.

Testing Procedure

To proceed with the actual testing, arrange the milliammeter in series with a 1½-volt dry cell, as shown in Fig. 1. Provide leads at least one yard in length, and

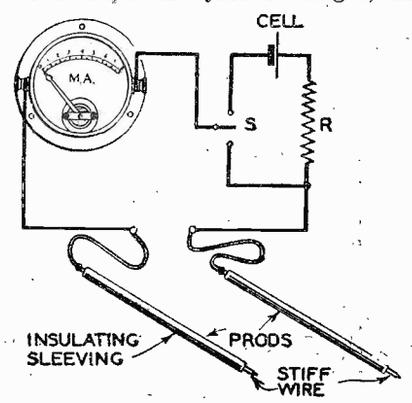


Fig. 1.—An efficient method of arranging a milliammeter for testing purposes.

terminate the free ends with a pair of testing prods. These can be purchased for one or two shillings, or can be made quite easily from stiff copper wire covered, except the tips, with insulating sleeving. The resistance R is fitted to protect the meter, and its value should be such that, when the tips of the prods are touched together, the meter deflection is just below maximum. For a 15 m.a. meter, a value of, say, 50 ohms will be ample.

The single-pole double-throw switch S enables a quick change over to be made, from continuity reading to milliamps, and also cuts the battery out of circuit.

Assuming the receiver to be tested is of the battery type, it will be found most helpful if the milliammeter is connected in the negative H.T. lead, as depicted in Fig. 2. After making sure that all batteries are connected, switch on and note the meter reading. This should be approximately the same as the sum of the anode currents of the valves in use, which can be determined from the makers' leaflets.

A slight excess might be caused by low bias or any resistances in the circuit across the H.T. positive and earth. If no reading is obtained, attention must be paid to the L.T. and H.T. batteries, their voltages and connecting leads; the fuse should be test for continuity, while the switch action and contacts must be examined, and, finally, the valve filaments. Assuming the fault is revealed and rectified, the current is noted

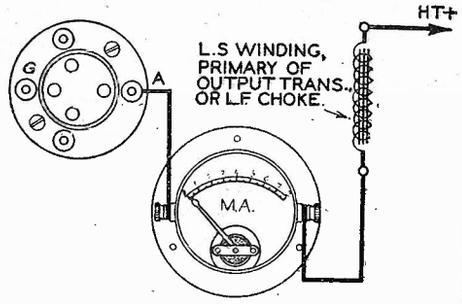


Fig. 3.—This is the method of checking the output stage for distortion.

and each valve withdrawn from its holder in turn. With each withdrawal, the current should decrease by an amount equal to the current consumption of the valve removed. No decrease will, of course, point out that

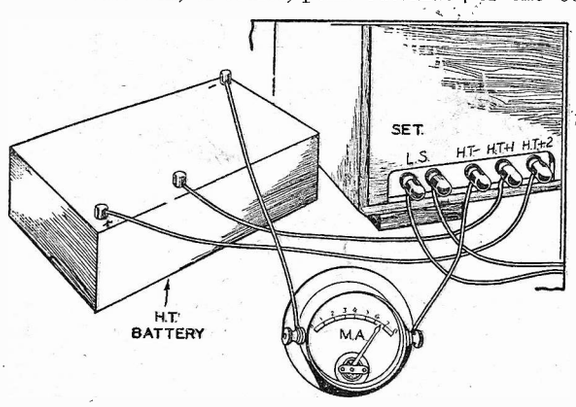


Fig. 2.—To find the total consumption of H.T. the milliammeter is connected in the H.T. negative lead.

the valve is not operating, or the H.T. or L.T. circuit to that holder is broken somewhere.

From this test it is possible to determine if various parts of the circuit are satisfactory. For example, with no valves in the receiver, the meter will register any current that may be flowing, due to potentiometers, resistances, or leakage across the H.T. supply. With the S.G. valve in position, the bias or screen control can be tested, by noting their effect on the anode current; while L.F. and output grid circuits can be checked by plugging in the respective valves, adjusting the bias, and again noting meter readings.

If the receiver is mains operated it is advisable to connect milliammeter in the anode circuit of each valve, in turn, and not in the common negative lead, owing to voltage increase across the various resistances when the load is reduced by the removal of a valve. Examine all cathode circuits, bias resistances, and decoupling condensers. If the field of the loud-speaker is energised or used as a smoothing choke, the continuity test should be applied.

Tests for Distortion

Distortion will be indicated by violent fluctuation of the needle, and bias or H.T., or both, should be adjusted until the minimum movement, either side of the standing current of the whole circuit, is obtained.

If tests are being applied for distortion only, it is more satisfactory to connect the meter as shown in Fig. 3. Here it will be seen that the reading obtained will be that of the output valve, the current flowing through the L.F. choke, or primary of the speaker transformer, or the L.S. winding, according to the form of output employed. This test, therefore, will give some indication of the efficiency of these components apart from the valve.

Fig. 4 shows the necessary connections to place the meter in the anode circuit of the detector valve. In this position tests can be applied for overloading, instability or operation of reaction circuit, tuning circuit peculiarities, and, in a straight or ordinary H.F. circuit, indication of accurate ganging. It should be remembered that the readings will depend on the form of detection used. If the more common grid-condenser method is used the needle will kick downwards when a state of oscillation is produced, or when a signal is received, the maximum deflection indicating that the associated tuned circuit is dead in tune with the signal. Should the anode-bend method of detection be employed it will be found that the indications are the reverse. The meter reading will *increase* if instability is present, and when the circuit is in tune.

(Continued overleaf)

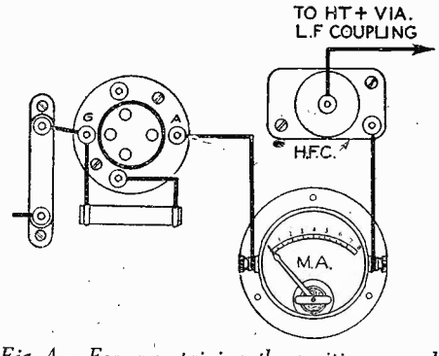


Fig. 4.—For ascertaining the position regarding overloading, the meter should be used in the detector stage as here shown.

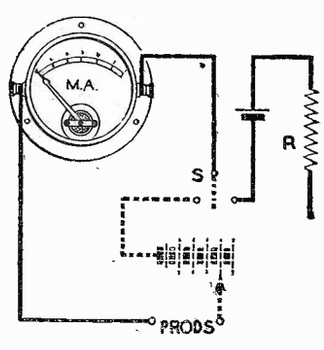


Fig. 5.—Testing a component, here represented by the resistance "R."

(*Continued from previous page*)

With circuits embodying A.V.C., a slightly different procedure is necessary. The meter should be connected in the H.T. lead feeding the H.F. valves to which the A.V.C. voltages are being applied.

It will be noted that the use of a voltmeter has received little mention. There is a two-fold reason for this; unless a good high-resistance meter is used, the readings obtained, especially across any mains-operated apparatus, are likely to be misleading, owing to the current produced through the meter windings. The second reason is that in so many parts of a circuit voltage does not convey a true impression of the operation of the components concerned. For example, if a valve is supposed to pass, say, 4 milliamps for most efficient results, surely it is better to adjust the circuit so that the required current does flow than measure the voltage across the H.T. supply and assume that the correct current is flowing. It is quite possible, owing to anode components, instability, and other electrode potentials, that it may be very wide of its mark. I am, of course, assuming that it is known that the valves are normal.

Components Tests

There is very little the average constructor can do in the way of accurate testing of components other than continuity, resistance, and current-flow tests. However, it is usually possible to obtain approximate information about inductance and capacity by simple substitution methods.

The continuity circuit already explained will be found quite satisfactory for coils, switches, H.F. chokes, variable condensers, and circuit checking, but for components having a resistance over, say, 500 ohms, it will be necessary to employ a larger voltage than that provided by the cell specified. A 9-volt grid-bias battery will be ample, and providing a low voltage is applied at first, and then increased if the dial reading is too low, no harm is likely to be caused to the meter by the test revealing a dead short. To determine the resistance of a component it may be necessary to use a section of the H.T. battery, according to the meter and the item under test. The switch should be in position to cut out the resistance R, and 1½-volt cell (Fig. 5) and the additional battery connected are as shown by the dotted lines.

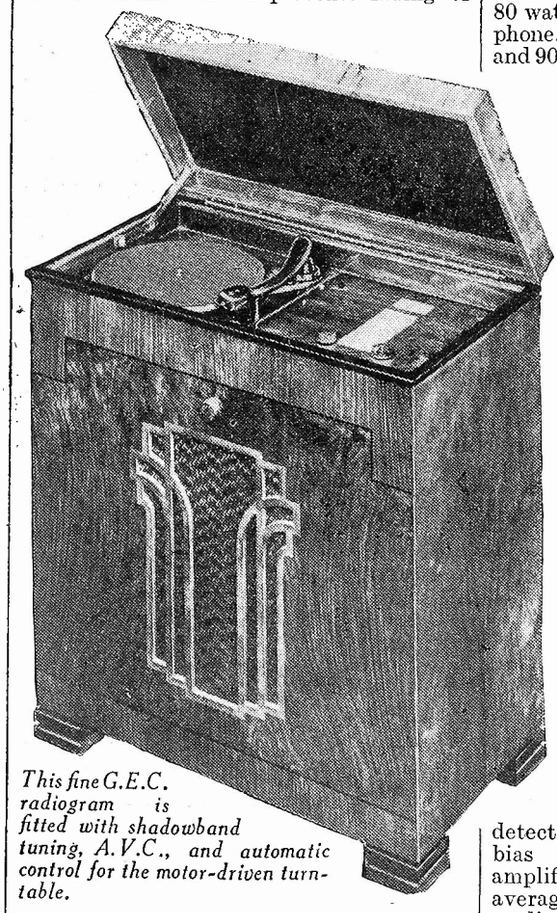
It will be seen that the meter is now used as a milliammeter and that the voltage must be measured. If possible this should be adjusted to a round figure to simplify calculations. After applying the prods across the item under test, and noting the m.a. meter reading, Ohm's Law will enable the value of the resistance to be determined, remembering that $R = \frac{\text{Volts} \times 1{,}000}{\text{Milliamps}}$. While it is possible to determine the majority of faults likely to be experienced in a receiver or component by careful application of the above tests and notes, it must be remembered that the remedies are not intended to cope with inherent faults in the design of a circuit or component; similarly, the continuity and resistance tests would not, necessarily, reveal the faults in the characteristic of a component.

Choosing Instruments

Those readers who have no equipment, and are interested in the subject may find the article in last week's issue on page 503 of interest. This dealt with the various types of measuring and testing instruments and their selection. Complete multi-purpose instruments have also been described in these pages from time to time.

THE NEW G.E.C. SHADOWBAND FIVE

THE latest radiogram produced by the G.E.C., known as the "Shadowband Five," supplements what is traditionally associated with the firm as regards quality, with added simplicity and accuracy of control, made possible by a shadowband-tuning device. This is a visual indicator for the exact tuning of a required station by "focusing" a shadow, the band of shadow being broadest when the set is not tuned in to the station, and narrowest when the tuning point is reached. A powerful superhet radio chassis ensures an almost unlimited choice of stations, which can be instantly identified on the luminous station-name indicator. Automatic volume control prevents fading of distant stations, and a noise-suppressor control is provided to subdue inter-station background noise. The moving-coil speaker is of the energised concert type. Other refinements include an internal aerial, connections for an extension speaker, a switch to silence the "parent" speaker, and variable tone control, enabling the relation between the higher and lower frequencies to be continuously varied over a very wide range. Dimensions are as follow: height, 34¼in.; width, 29½in.; and depth, 16¾in. Cash price, complete with Osram valves, is 23 guineas. The standard model is for 190-250 volts, 40-60 cycles for A.C. mains. In the case of a special for 110-130 and 210-230 volts, 40-60 cycles the price is half-a-guinea more.



This fine G.E.C. radiogram is fitted with shadowband tuning, A.V.C., and automatic control for the motor-driven turntable.

Technical Details

This floor-model receiver has side-by-side deck lay-out. Power consumption is 80 watts on radio, and 100 watts on gramophone. The wave-range is 200-550 metres and 900-2,000 metres. A.C. output is 3 watts. The instrument embodies the now well-known 13-volt .3 amp. range of universal valves, the filaments of which are run in parallel and fed from the mains transformer at 13 volts. The aerial input is fed by a radio-frequency band-pass filter to the control grid of the heptode. The first I.F. band-pass filter is in the anode circuit of this valve, I.F. amplification being provided by a variable-mu screened pentode. A second I.F. band-pass filter passes the signal in the anode circuit of this valve to the second detector. A double diode-triode, which combines the functions of detector, A.V.C. valve, A.V.C. amplifier and low-frequency amplifier. Resistance capacity coupling is used between the triode of the above valve and the output pentode. Manual volume control varies the input to the output pentode. Automatic volume control, which is delayed to prevent loss of signal strength on weak signals, is of the amplified type and is very complete. The detector diode supplies a voltage varying in accordance with the incoming signal to the grid of the triode portion of the detector valve and the amplified voltage controls the amplification of both the first detector and I.F. amplifier by varying their bias voltages. Intermediate-frequency amplification is carried out at 125 k/cs. The average sensitivity of the receiver over the medium-wave band is some 10 microvolts. This means that for a standard output (50 milliwatts) in the loud-speaker circuit a potential difference of only 10 microvolts at high-frequency modulated to a depth of 30 per cent. need be fed to the aerial and earth terminals.

When the instrument is used as a gramophone reproducer the pick-up is applied between the grid and the cathode of the triode portion of the double-diode-triode valve, the volume being controlled by the potentiometer in the grid circuit of the output pentode. The low resistance of the pick-up automatically rearranges the bias conditions, making them suitable for gramophone pick-up amplification.

The motor is of the induction type and is fitted with an automatic stop and start mechanism which operates on any type of record having a quick run-in groove. The gramophone pick-up, integral with the motor assembly, is of the electro-magnetic type and housed in a neat bakelite moulding.

Designing Your Own Wireless Set

The Most Suitable Type of Circuit for Individual Needs is Discussed This Week, and Details of a Receiver Suitable for the Average Person are Given.

NOW that we have reviewed circuit arrangements as a whole we may consider the matter of choosing a circuit for individual requirements, considering the various portions of the circuit in greater detail. In the first place a decision must be made as to whether the set shall be designed for battery or mains operation and, if the latter, whether it shall operate from A.C., D.C. or both. This question is almost entirely governed by purely domestic conditions, for it would be futile to make a mains receiver if the house were not wired with electricity; on the other hand, if an electric supply is installed there should be no question as to the power supply, for a battery set cannot compare in

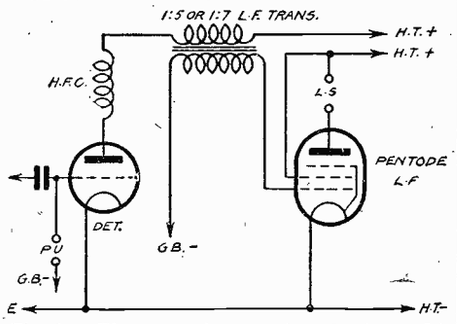


Fig. 1.—The circuit for a single-valve (pentode) L.F. amplifier suitable for an output of about 500 milliwatts.

any respect with a mains-operated one of similar type. It appears that there are still a few constructors who are rather dubious regarding their capabilities in the direction of making a mains receiver, and who rather believe that the undertaking is more difficult than the construction of a battery set, and less likely to prove entirely successful. In point of fact, however, there is no reason whatever why this should be so, for a mains set can be made just as easily as one for battery operation and, so long as ordinary precautions are taken, there is no danger involved, and no difficulty in securing completely satisfactory results.

Use the Mains if Possible

And since the efficiency, valve for valve, of a mains receiver is far greater than for a set drawing its power from batteries, every one who has a mains supply is strongly advised to use it. Of the two kinds of current, A.C. is the more convenient, since its voltage can be changed as required, but a D.C. receiver using modern valves is highly efficient. A difficulty which is often present when D.C. mains are taken into the house is that the supply will be changed—probably at a not very distant date—for A.C. In such cases, a universal receiver, suitable for use with either A.C. or D.C., provides the logical solution. Incidentally, it is worth mentioning that a universal set costs very little more than one intended for use on D.C., so that it is worth while to make the set universal in the first place, rather than providing for D.C. operation with the idea of modifying the instrument at a later date.

How Many Valves?

The next step is to decide definitely on the number of valves, and the type of circuit which will provide the kind of reception required. In considering this it is always wise to be as generous concerning the number of valves as funds will permit, because more satisfactory reception is usually obtained by using an extra valve not fully loaded than by pressing every valve in the set to the very limit. There are cases to which this cannot be applied, but they are the exceptions which prove the rule; a typical example is the "£5 Superhet," but this is a very special receiver, expertly designed after considerable experiment. It is evident that the number of valves must be determined by the results expected, and the questions of range, selectivity, quality, cost and maximum undistorted output must all be settled individually.

Most constructors to-day are more anxious to have a receiver that will give really good reception of about four British transmissions than to be able to tune in any station in Europe, and their requirements are not hard to satisfy. On the

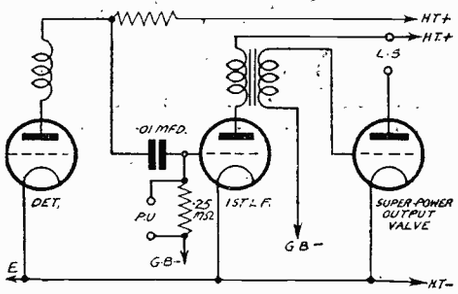


Fig. 2.—A two-valve L.F. amplifier giving a similar output to the arrangement shown in Fig. 1. It is more suitable when pick-up connections are required, but much "heavier" on H.T. current.

other hand, there are still a few listeners who are quite content with moderate quality provided that they can bring in at least the more powerful of the Continental transmissions; and it is not very difficult to provide them with what they want. But if world-wide range combined with perfect reproduction are sought, there are many interesting problems to be solved, and a suitable receiver can only be built by spending a not inconsiderable amount of money.

For Average Requirements

Let us consider first of all the type of circuit most likely to please the man who wants to be able to obtain good reception from a few British stations, and who occasionally would like to listen to the programme from one of the more powerful European stations. Provided that the receiver is well thought out, and that the best possible use is made of modern valves, a high-frequency amplifying stage is not essential, and so a detector-L.F. arrangement can be considered. The next question is the kind of reproduction required—the output volume and the "quality." Unfortunately, the latter is a very comparative term, and the meaning varies considerably according to the listener. At the present time, however, we will assume an average person who likes music, but who has not a critical musical ear. His requirements will be satisfied by an ordinary L.F. amplifier with transformer coupling, and with either a triode or pentode valve in the output stage. This same listener will probably be quite content with an undistorted output of about 500 milliwatts, and this can be obtained by using a single pentode valve transformer coupled to the detector valve, as shown in Fig. 1, or by employing two L.F. valves, the first of which is resistance coupled to the detector, and coupled by means of a 1 : 3 transformer to a super-power output valve, as shown in Fig. 2.

These remarks apply to a battery receiver, and in the case of a mains set (either A.C. or D.C.) the requirements could easily be met by using a single triode valve of the indirectly-heated, small-power type, as shown in Fig. 3. In considering the available output the best course is to refer to the makers' figures regarding the maximum undistorted output for the various valves, or to look up the series of articles published in PRACTICAL AND AMATEUR WIRELESS under the heading of "Valve Types and Uses"; the articles dealing with output valves appeared in the issues dated December 29th, 1934, and January 19th, 1935.

One or Two L.F. Stages?

A mains-operated set capable of providing an output up to 1 watt or so does not present any difficulty, and the design is perfectly straightforward. In the case of the battery receiver, however, there are several points which must be borne in mind. It is evident from the above statement that either of two entirely different L.F. arrangements will give the required results. The constructor might well ask why a two-L.F.-valve circuit

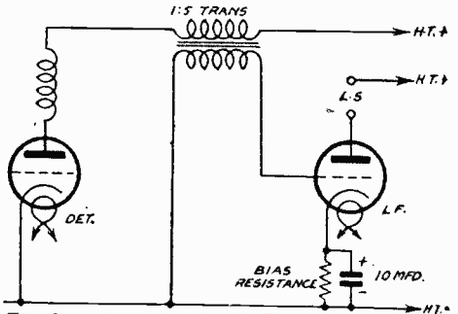


Fig. 3.—A single-valve L.F. output stage for A.C. operation. This will give an output equal to, or greater than, that provided by the circuits in Figs. 1 and 2.

should be considered when a similar output can be obtained by using a single pentode valve in a simpler circuit. Evidently, the cost of the latter arrangement must be less than that of the other, so what are the advantages of the two-valve circuit? The chief advantage is that it is somewhat easier to obtain

(*Continued overleaf.*)

(*Continued from previous page*)

"natural" reproduction from the two valves, due to the fact that each valve provides a lesser degree of amplification, so that there is in consequence less risk of instability. This point is one which has been over-emphasised, however, by a few critics who have always contended that a pentode must, of necessity, produce a certain amount of distortion by giving greater amplification to the higher notes. In practice this point is of far less importance than it is in theory, and a modern pentode, properly used, can be trusted to perform very satisfactorily.

Pick-up Connections

A more important advantage of the two-valve arrangement occurs when the receiver is to be used as a radio-gram., or when pick-up terminals are to be provided. In this case it would be necessary—in order to obtain the required degree of amplification—to connect the pick-up in the detector grid circuit when only a single L.F. valve was employed. This is not an ideal method, especially if the pick-up leads have to be long and if the detector valve is of the high-amplification type. With the two-valve amplifier an adequate degree of amplification, and good quality reproduction, can be ensured by connecting the pick-up in the grid circuit of the first of the two L.F. valves. The two sets of connections referred to are shown in Figs. 1 and 2.

The position is similar, but not quite so difficult, in the case of a mains receiver. At the same time, however, the degree of amplification provided by a mains pentode is very high, and a fair output can be obtained by feeding the output from a modern sensitive pick-up into the grid circuit of the output valve. Despite this, when gramophone reproduction is regarded as being very important there are good reasons for using two L.F. valves.

Detector-stage Requirements

We can now turn our attention to the detector valve of the hypothetical det.-L.F. circuit under consideration. Since this must be connected directly to the input from the aerial-earth system, it is evident that the valve should be highly efficient, and that it should be preceded by a reasonably selective tuning circuit. In many respects a screen-grid or H.F. pentode valve might be considered most suitable, since this would give a fairly considerable amount of amplification. In practice there are difficulties in matching valves of these types, however, since the impedance in the anode circuit should be something between 500,000 and 1,000,000 ohms; this cannot be provided by the set; this means that the valve should be of the H.F. or H.L. type.

Ordinary leaky-grid detection is probably most suitable in a receiver such as that under consideration, but the advantages of other forms of rectification will be explained in later articles in this series. The aerial tuner should for preference be of the iron-core type and should be provided with a loose-coupled aerial winding, the complete detector circuit being as shown in Fig. 4, where both battery and A.C. versions are given. The circuit is a very usual one, but one addition is indicated, this taking the form of a 250-ohm fixed, non-inductive resistance in the reaction circuit. This may not always be essential, but its effect is to "smooth"

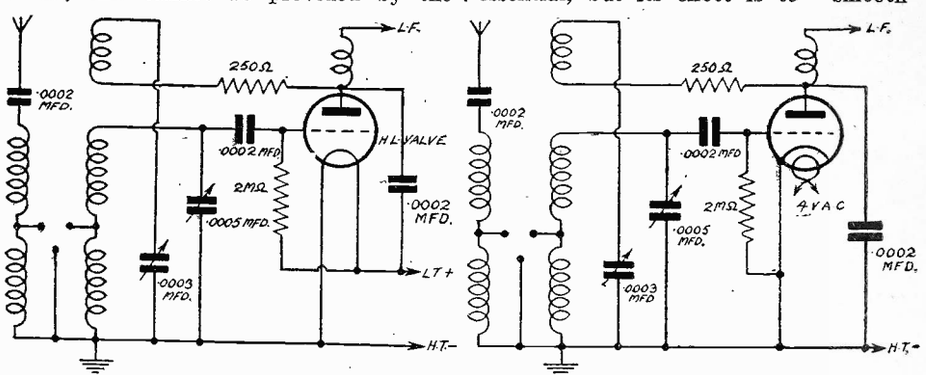


Fig. 4.—These two circuits show the type of detector circuit referred to on this page. The circuit on the left is for battery operation, and that on the right for A.C.

average L.F. transformer, and if a resistance were used it would cause such a drop in the H.T. voltage that the valve would be prevented from functioning correctly. The best plan is thus to use a triode valve having an amplification factor of about twenty-four in the case of a battery receiver, and fifty in the case of a mains reaction control, and thus to prevent the detector from bursting into oscillation suddenly. This is an important point, because the absence of H.F. amplification makes it necessary to obtain the greatest possible amount of amplification in the detector stage, which really functions as a combined H.F. amplifier *and* detector.

A REMOTE-CONTROL DEVICE

HERE is a device for effecting control of the set from a distance, which is at once compact, neat, and efficient.

Fig. 1 shows the appearance of the arrangement when finished.

The coils should be fixed a sufficient distance apart so as to enable the armature to make close contact when in the "on" position, and just clear the tongue of the contact when "off."

The baseboard should be made of fairly stout wood, say ⅝in. thick, and should, to make a neat job, be stained and polished before the components are mounted.

The coils are made from the sawn-off ends of two cotton reels with two 1in. iron bolts and nuts ¼in. thick, wound with (approx.) 500 turns each of No. 26 D.C.C.

The hinge should move easily so as to enable the armature by its own weight to make good contact with the tongue.

Nos. 1 and 2 terminals are connected to the L.T. battery and set. Nos. 3, 4, and 5 are joined to two distant bell pushes, one contact of each being inter-connected.

Either triple flex or bell wire can be used for the extension.

The loose cover can be made of stout plywood and should be arranged so as to leave the terminals exposed, as shown in Fig 2.

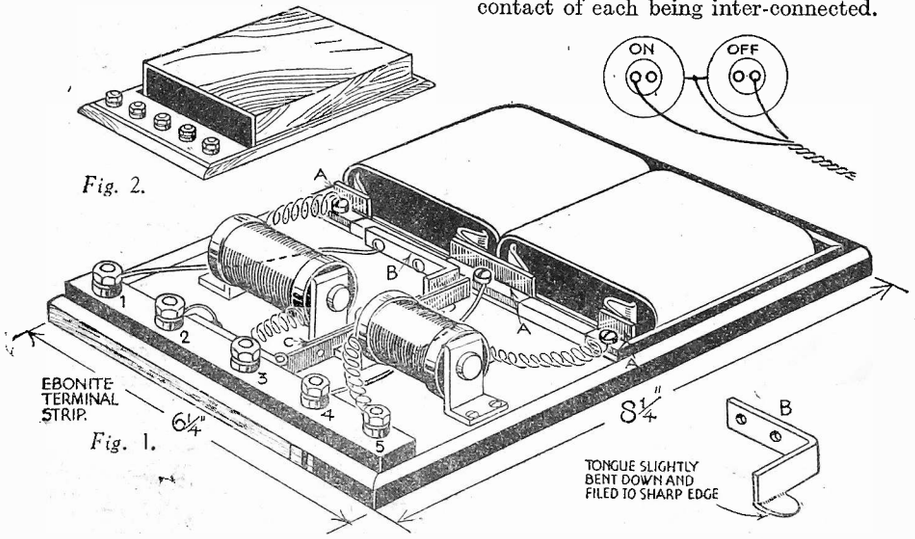


Fig. 2.

Fig. 1.

The complete remote-control device, and a view showing the general arrangement of parts.

NOTES AND NEWS

Interesting Statistics

IT has been computed that Europe is now in possession of twenty-three and a half million wireless receivers, and that some twenty-four and a half millions are distributed over the rest of the world, which represents a total of roughly forty-eight million sets. As a conservative estimate this would mean two hundred million listeners. The world population is usually put down at one thousand eight hundred millions, so we must take it that of its inhabitants one out of every nine listen to radio entertainments.

Proposed New Pilsen Transmitter

THE Czech Broadcasting Company is seeking a site for the new broadcasting station which it has decided to build in the neighbourhood of Pilsen. The studio will take many of its concerts from Carlsbad.

China Disapproves

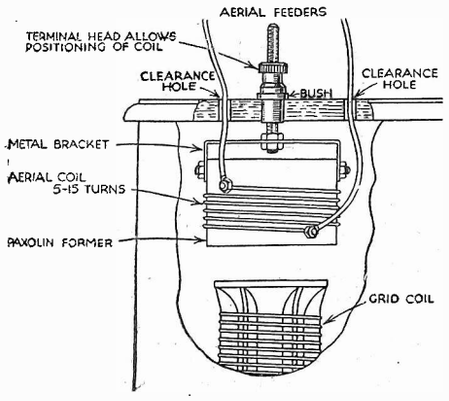
THE Peking Authorities recently decreed that Chinese studios must strictly veto the broadcast of "any songs or stories which may arouse laughter in naughty children." The telling of ghost stories in the children's hour is also forbidden.

A PAGE OF PRACTICAL HINTS

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

Variable Aperiodic Aerial Coupling

IN order to achieve stability in a two-valve S.W. set, and knowing that the aerial coupling has a lot to do with this factor, I devised the following scheme. I obtained a paxolin coil former, and to this I attached an angle bracket cut out of scrap tin.



A variable aperiodic aerial coupling device attached to the lid of a receiver cabinet.

Fixed to this is a brass threaded rod fixed with nut on each side. I fixed the former to the bracket with a nut and bolt on each side. I next drilled a hole in the lid of the cabinet directly above the tuning coil, and this hole is fitted with a bush suitable to take the brass rod on the aperiodic coil. The number of turns on this coil does not appear to be critical, and there is scope for experiment in this quarter. I use ten turns.

The brass rod on the aperiodic coil is pushed through the bush from the underside and a large terminal fitted. The aerial twin feeder lines are led in through two holes in the lid and are connected to each end of the aperiodic coil. If a single feeder is used the bottom end of coil is connected to earth.

This device has made my set very stable on all the short-wave bands down to 12 metres, and there can be no dead spots once the coupling has been adjusted for the particular wavelength employed. Coil changing is not interfered with in any way, as on raising the lid the coil is raised completely out of the way.—A. TETSTALL (Leicester).

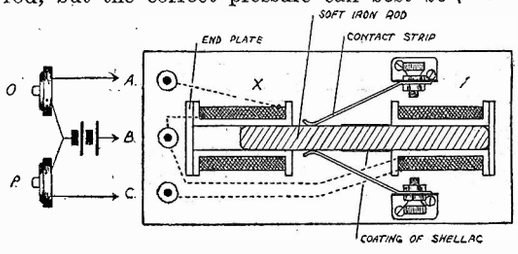
An Efficient Remote Control Switch

HERE is a scheme for remote control which I have found to give highly satisfactory results in every way. The switching, in particular, is very definite. The base is a piece of ebonite or wood approximately 2in. by 4in., or, alternatively, the control may be built direct on to the baseboard of the receiver. A piece of ¼in. soft iron rod, 2½in. long, is obtained, and two formers for the solenoids are made to slide smoothly on it. These formers are each wound with 200 turns of 26-gauge enamelled wire, and a wooden disc is glued

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.

on one end of each. A band ½in. wide in the centre of the rod is given a good thick coat of shellac and left to harden thoroughly. When this is ready the solenoids are slipped over each end and they are then mounted in their respective positions by clamping under metal bands screwed to the base. The connections to terminals A, B and C may be carried out as shown. The contact strips are cut from very thin sheet aluminium or brass (do not use any magnetic metal, as this would tend to retard the movement of the rod), and are clamped under terminals mounted on two brackets which are in turn fixed to the base. These contacts may rest quite firmly against the rod, but the correct pressure can best be



Sectional view of a solenoid-operated remote control switch.

found by experiment. Connections are made as indicated in the diagram, O and P being two bell-pushes, and the battery one of the 4½-volt flash-lamp type. When P is pressed the solenoid Y is excited and draws the rod into the position shown, making contact between the two strips. On depressing the other bell-push the rod moves in the reverse direction, the band of shellac breaking the circuit.—JOHN E. DAVEY (South Norwood).

A Handy Trimming Condenser

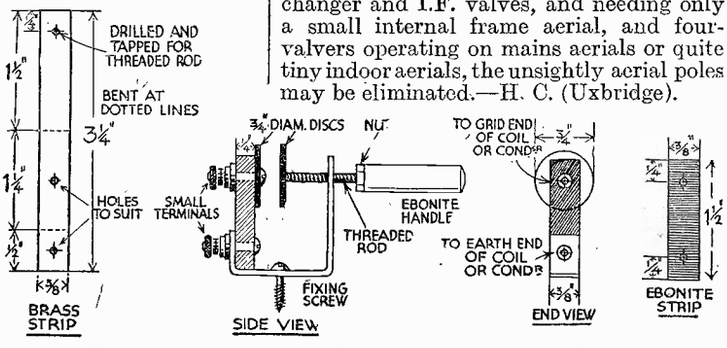
THE following particulars are of a small variable condenser, which I have found very successful in resolving stations on my short-wave set. A station is tuned in by adjusting the slow-motion dial of the short-wave condenser in the usual way and the little condenser is then screwed forward or backward till the station is heard at its best. The material required consists of a piece of brass strip drilled and marked off as shown, a small ebonite strip, two ¾in. diam. brass or copper discs, a piece of threaded rod and nut to fit same, a handle from the junk box, two small terminals, and a screw for fixing to baseboard. Bend the brass strip to form a bracket. Attach one of the discs to the end of the threaded rod, then screw the rod into the threaded hole provided, and fix the ebonite handle. Attach the other disc to the ebonite strip by means of one of the small terminals. The other end of the ebonite strip is fixed to the bracket by means of the other small terminal. The condenser can now be fixed to baseboard ready for use, and the handle and nut can be so adjusted that the two metal discs can never touch when the rod is fully screwed forward.—F. T. EELES (New Washington).

Good Results with Short Aerials

THE sensitivity of modern receivers employing two radio-frequency stages or their equivalent in a super-het circuit is so great that a considerable amount of latitude is given with regard to aerial efficiency. In fact, many manufacturers of commercial receivers definitely state that their sets are built to give full performance with aerials consisting of from twenty to thirty feet of wire all told. As a matter of interest I have recently been making a few experiments with various types of set in connection with quite short indoor aerials, and with quite astonishing results.

The aerial I have been using is of the indoor type, only ten feet high, and with the horizontal portion only six feet long. It is well insulated, and the earth connection is short and direct to a really hefty earth plate. With this simple collector system, and a very ordinary type of four-valve superhet of good make, I have identified over fifty stations in a short evening, all free from interference, and all at really good strength.

Thus, with five-valve supers having one H.F. stage in addition to the frequency-changer and I.F. valves, and needing only a small internal frame aerial, and four-valvers operating on mains aerials or quite tiny indoor aerials, the unsightly aerial poles may be eliminated.—H. C. (Uxbridge).



Details of construction of a handy trimming condenser.

Negative Resistance

An Explanation of a Little-used Term which Sometimes Confuses the Amateur Wireless Experimenter.

By W. J. DELANEY

IN certain textbooks and also in various papers on electricity the term "negative resistance" occurs, and it would appear from correspondence that this term causes a certain amount of confusion in the mind of the non-technical listener. It would seem that this is because the term "positive resistance" is seldom seen, and it is not a simple matter, therefore, to compare two opposite types of resistance in order to arrive at a decision concerning one of them. It is well known that when a voltage is applied to any conductor there is a restraining force at work endeavouring to prevent the flow of electricity. This restraining influence will vary with the material being used and the form in which that material is arranged, and it is practically always referred to as "resistance"—but actually it should be referred to as "positive resistance," if the flow of electricity is a steady unvarying current. Thus in Fig. 1 we see a battery joined to a resistor, which may be the filament of a valve or any similar device, and the current flowing through that resistance will be a steady, unvarying current of a certain value, determined by the voltage of the battery and the size and kind of material from which the resistance is made. This is an example of "positive resistance."

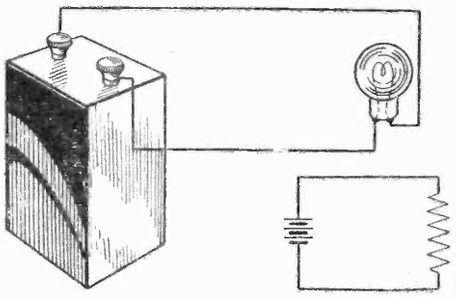


Fig. 1.—A direct current supply across a resistance.

A.C. Instead of D.C.

The supply of current from a battery is, of course, what is known as a direct current, and is flowing always in one direction. If, however, instead of using this type of supply we use an alternating supply, what happens to the current flow when the changes in direction and polarity take place? It has already been explained in these pages that an alternating current starts from zero, rises gradually to a certain positive value, and then, at the same speed, drops back to zero, passing on to a negative value and again returning to zero. Therefore, if an A.C. is applied to a pure resistance, there will be a gradually increasing difference of potential between opposite ends with a periodic change in polarity, and there will be a fixed relationship between the potential difference, and the voltage, and the value of the resistance, just the same as with the direct-current supply. If, however, instead of using a pure resistance we use an ordinary arc, and superimpose an A.C. supply on a D.C. supply applied to that arc, we find a different state of affairs. Firstly, the alternating current will always flow through the arc in the opposite direction to that in which the alternating difference of potential is acting, because the total current will be reduced owing to the fact that at certain moments currents are flowing in an opposite direction. From this it may be seen that instead of an arc consuming energy in a circuit of this nature and thus tending to stop the flow of A.C., it actually encourages the A.C. circuit and supplies energy.

The Duddell Circuit

Now look at Fig. 2, which shows an ordinary arc circuit across which is joined an oscillatory circuit (a coil and condenser in series). If the resistance is adjusted until the arc is struck there will be a steady flow of current through the arc; but a steady current cannot flow through a condenser and thus it was discovered by Duddell that an alternating current is set up in the circuit formed by the arc and the coil and condenser, and this is due to what is known as the negative resistance of the arc. Due to this fact also, it is found to be impossible to strike an arc from a source having the exact voltage required by the arc itself, but it must be connected to a much higher source of supply with a resistance in series.

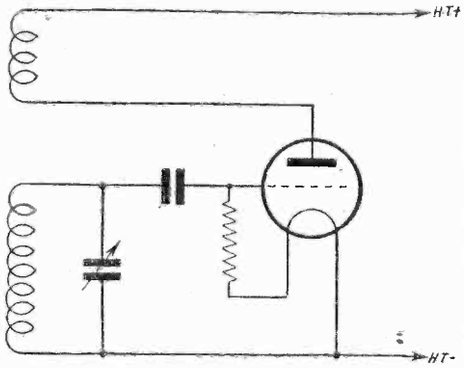


Fig. 3.—A standard reaction arrangement, the degree of coupling between the coils being variable.

The Ordinary Reaction Circuit

The ordinary valve as used in a wireless receiver also has the ability to provide negative resistance under certain conditions, and the most popular arrangement is generally referred to as the reaction circuit. By referring to the ordinary detector valve circuit (Fig. 3) and comparing it with the points just mentioned, we find that if the anode is joined to the positive terminal of a battery (or source of direct current) and the heated filament is joined to the negative pole of that battery, there will be a steady direct current flowing from filament to anode inside the valve. Ignoring, for the time being, the effect of a potential on the grid, if an increase in anode current is required it will be necessary to increase the anode potential, and thus in this condition the valve offers a positive resistance to A.C. We know, however, that the potential on the grid can have a very marked effect on the flow of current in the valve, and for this reason the L.F. valve is biased to reduce the anode current. Thus an increase in anode current may be obtained (without varying the anode voltage) by modifying the grid potential, but if this applied potential is of a certain value it will be found that the increase in current may be obtained and yet the anode potential may be decreased. In this condition the valve offers negative resistance, and the conditions are satisfied by connecting an inductance coil in both anode and grid circuits and arranging these in such a manner that there is a degree of coupling between the two inductances. The degree of negative resistance is governed by the degree of coupling between the two coils, and in theory it should be possible to adjust this coupling to such a point that the resistance could be reduced to zero, but various small fluctuations in the ordinary valve circuit prevent this ideal from being obtained. As the degree of negative resistance increases, however, the changes in anode current due to an applied E.M.F. in the grid circuit will grow, and thus whereas, without the negative resistance effect, a weak signal in the grid circuit would produce no change in anode current, we are enabled, with the aid of this effect, to obtain changes in anode current from very weak signals and thus build up the strength of an otherwise inaudible station. This is, of course, one of the most valuable properties of the reacting detector valve, and the effects are well known to every listener. With reaction it is possible to hear many stations which are otherwise inaudible.

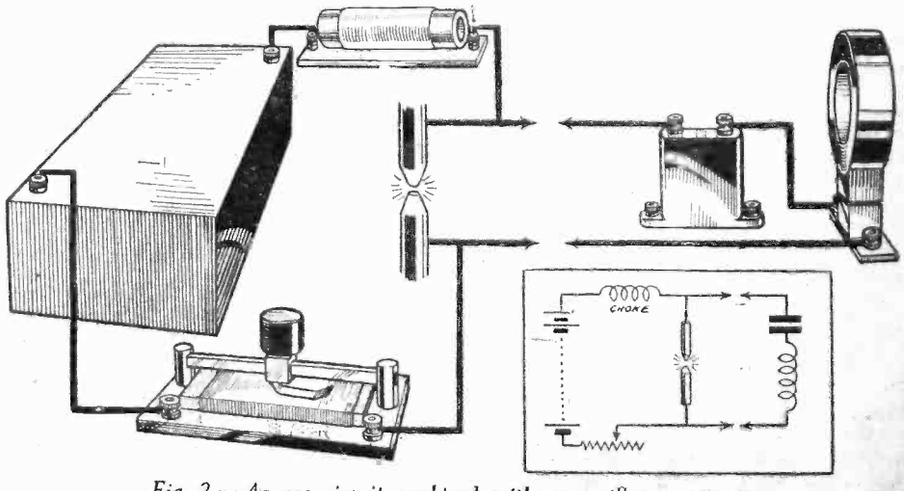
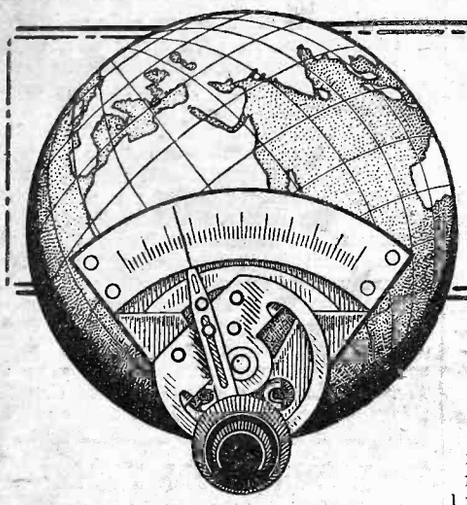


Fig. 2.—An arc circuit combined with an oscillatory circuit.



SHORT WAVE SECTION

At the Short-waver's Bench

The Aerial System, Reception on 5 Metres, and Loud-speaker Pointers are Among the Subjects Dealt With in This Article

Short-wave Variables

IT is rather interesting to note how, as short waves have progressed, so the size of the variable condenser used for tuning has decreased. I was reminded of this fact by discovering a .00035 mfd. variable which was used for tuning a short waver some five years ago. The .00025 mfd. size soon became popular, then .0002, and so to .00015 and .0001 mfd. as used to-day. A capacity of .00004 mfd. is now coming into favour as the main tuning condenser in band-spread schemes, and this

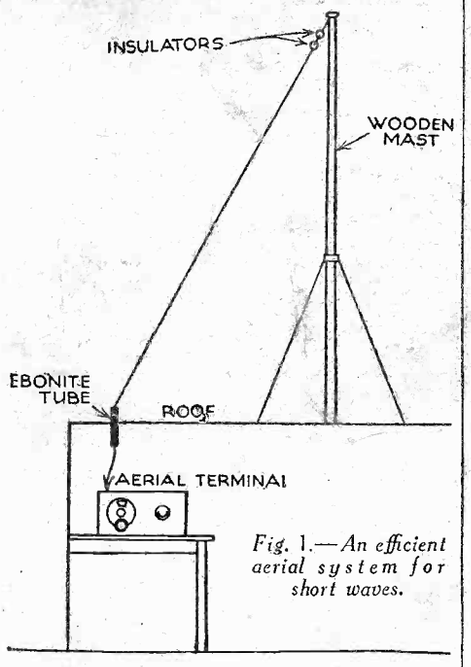


Fig. 1.—An efficient aerial system for short waves.

size, down to one as small as .00001 is favoured in the modern ultra-short waver for working around 5 metres. I have just dismantled and reassembled the .00035 condenser previously mentioned with half as many plates. Using the same number of spacers the distance between the plates is doubled and the net result is that the capacity is one quarter that of the original, or, as in the condenser I converted, .00009 mfd.—a very convenient size. Any reader who has one or two of these old "intermediate" capacity condensers in his "junk-box" should find it quite a simple matter to convert them into handy short-wave components.

The Aerial System

Readers may notice that the aerial is mentioned quite frequently in the Short-wave Section, as this is almost the most important part of the receiving arrangements. Length, height, direction all play their part, and much experimenting is required to arrive at a satisfactory compromise for every waveband. My own aerial has undergone another change with very pleasing results, and details are given herewith for any who care to imitate them. The whole arrangement is quite simple and, as shown in Fig. 1, is a single length of wire (insulated, by the way) led, almost vertically, from the top of the mast to the aerial terminal, through a piece of ebonite rod fixed in the roof of the shed which comprises my "den." From the top end to the terminal the length is exactly five metres, so it will be seen that the height of the mast is nothing extraordinary, nor is the length of the aerial. Results, however, have been much better than those obtained with a 40ft. "inverted-L" previously used. The 20- and 40-metre amateur bands in particular have yielded very gratifying results on this aerial.

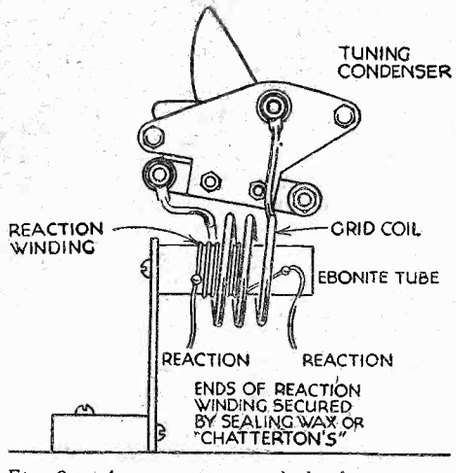


Fig. 2.—A convenient method of mounting short-wave coils and tuning condenser.

On Five Metres

The extended use of five metres as a broadcasting band should reveal a further revival in home-construction as a hobby; not only construction of sets but of components, most of which, for this band, are particularly simple. Coils, for instance, are easily made. Three turns of No. 18 tinned copper wire wound on a 1in. diameter former, with a space of about ⅛in. between adjacent turns, when removed will prove an excellent self-supporting air-spaced coil, which may be mounted directly on the end of the variable condenser. Reaction may be obtained by a similarly mounted coil or by a few turns of wire on a piece of ¼in. diameter ebonite rod, so mounted as to slip inside the larger coil (Fig. 2). Incidentally, aerial coupling in a 5-metre receiver need

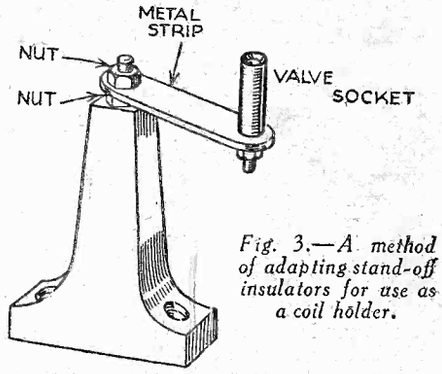


Fig. 3.—A method of adapting stand-off insulators for use as a coil holder.

only be very loose, and quite sufficient should be provided by allowing the lead-in to lie on the baseboard below the tuning coil. Some readers may be ingenious enough to make a small-capacity tuning condenser from one or two plates of an old variable, but, if this is done, it must be borne in mind that as little ebonite should be used in the construction as possible. For the short-wave choke ½in. diameter ebonite rod again is useful, and on a suitable length of it about twenty-five turns of No. 32 d.s.c. should be wound. Other items, such as valveholders, grid leaks, and fixed condensers are best bought, though the latter, of the air-spaced variety, may be easily made as described in a recent note.

Stand-off Insulators

Many amateurs prefer to have their short-wave coils mounted well off the baseboard clear of metal condensers, metallised valves, and baseboards. To this end they very often use stand-off insulators on which the coil-holder is mounted. It recently occurred to me, however, that this is a waste of a component, as the arrangement may be carried out by a simple adaptation of the insulator. A valve-pin socket is mounted on a short strip of metal—aluminium, brass or copper—which in turn is screwed on to the top of the stand-off insulator by means of a piece of B.A. studding and a nut. A further nut allows for connecting purposes, and a number of insulators so fitted may be fixed to the baseboard at suitable angles to allow the insertion of the coil-pins in the sockets. Fig. 3 shows the idea, and depicts the Bulgin stand-off insulator, which is of porcelain with a 2 or 4 B.A. tapping in the top.

Facts & Figures

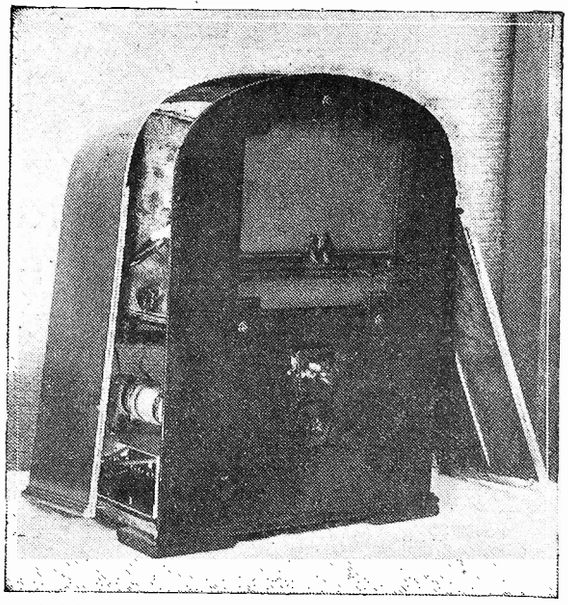
COMPONENTS TESTED IN OUR LABORATORY

New Camel Batteries

THE well-known Camel accumulators are being improved in design, and the Duralife range of cells is also being modified in a similar manner to avoid all possibility of acid creeping. As all battery-users are aware this creeping of the acid is one of the greatest difficulties with which the user is confronted, and, apart from the risk of damage to the battery connections, there is also the danger of damage to carpets, etc. which might arise due to slight splashing of the acid or even from the fumes. In the newly-designed cells the top is moulded in one piece and lead bushes are fitted for the terminals of the plates. Over these bushes a lead cap is placed and this is welded to it. It will thus be seen that it is impossible for acid to creep through the junction thus formed, and this represents a distinct advance over the usual rotatable type of bush which somehow always manages to work loose through continual use. A point of vital interest to the user is that the cells are available without any increase in price. The makers are Camel Accumulators, Ltd., 9, Newington Causeway, London, S.E.1.

A Shockproof Receiver

ALTHOUGH a receiver is made up to be used with care, the manufacturers are sufficiently careful to ensure that robustness forms quite a big feature of its make-up. The illustration on this page shows a Marconiphone receiver which was in use on a steam trawler (the *Lord Selbourne*) during last year. Whilst on a voyage north of Scotland in January last, the ship ran into a very bad storm, during which the set was thrown off the shelf on which it had been standing, and crashed to the cabin floor—a distance of about 5ft. When the set was replaced on the shelf and again connected to aerial and earth it was found to be still in good working order, being none the worse for the fall, so far as the electrical side was concerned. Of course, the cabinet was badly damaged, as may be seen in the illustration, but the receiver continued working for another six or seven weeks before the boat came into port and the receiver was put into the agent's hands for repair. No replacements were found to be necessary, which is good testimony to the soundness of valves, components and connections.



A Marconiphone receiver which survived an ordeal! After falling a distance of 5 feet it still functioned.

New "Brimar" Valve

MESSRS. STANDARD TELEPHONES AND CABLES, LTD., are adding a new pentode to their range of Brimar valves. This is the 7DC, a Universal A.C.-D.C. valve of the high-slope output type with a heater of the 50-volt .2-amp. type. The anode and auxiliary grid voltage is rated at 250, and the mutual conductance is 10 mA/V. The price of the valve is 18s. 6d.

Four New Ever Ready Valves

THE Ever Ready Company announce four new types which are to be shortly added to their range. These are a battery triode (K30A) for normal detector stages, and two L.F. triodes (K30B and K30D), together with an A.C.-H.F. pentode (A50A). The battery triodes are of the 2-volt .1-amp. type, the first having an impedance of 22,500 ohms and an amplification factor of 18, whilst the other two have impedances of 12,000 ohms with amplification factors of 11 and 18. In each case the H.T. rating is 150 volts and the price 5s. 6d. Type K30D may be obtained with a clear or metallised bulb. The A.C. valve is of the 4-volt 1-amp. heater type, indirectly heated, and has an impedance of 900,000 ohms and an amplification factor of 2,700. A grid bias of 1.5 volts is required and the anode voltage rating is 200. The price is 17s. 6d.

B.T.S. Short-wave Coil Unit

FOR covering a number of different wave-ranges on the short-wave band British Television Supplies have produced a neat triple-range unit, covering from 12 to 80 metres. This consists of two coil formers only, arranged at right-angles and separated by a metal screen. The coil formers each carry three windings, and a multi-contact switch is mounted on a small bakelite panel fitted at right-angles to the metal screen. Thus wiring is reduced to a minimum, and the coils are, in effect, mounted direct on to the switch. The two coils and their individual switch contacts are entirely separated electrically, so that the two units may be employed in H.F. and detector circuits using one coil as the aerial coil and the other as a tuned-grid coil, or in a superhet as aerial and oscillator coils, etc. The switch is of the special anti-capacity low-loss type, with self-cleaning contacts and a roller-locking device. A single-hole fixing device enables the entire unit to be mounted on a panel in a receiver without any difficulty. The ranges covered are from 12 to 25, from 19 to 40, and from 30 to 80 metres, using a .0002 mfd. tuning condenser. For reaction purposes a .0001 mfd. condenser is recommended. The price is 17s. 6d., but if a single unit is desired this may be obtained for 12s. 6d.

REPLIES IN BRIEF

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

F. (Glasgow). You have apparently confused the diagram Fig. 2 with the theoretical circuit. The former is only an illustration of the layout of the *detector* stage, and thus the first apparent valve-holder is the coil-holder. The coil, of course, is fitted with four pins arranged in the manner of a valve. A small power or a pentode valve could be used in the output stage. You will probably find that a short wire, about 15 to 20ft. long and arranged as nearly vertical as possible will give you the best results. This reply was sent to you but returned marked "Gone Away."

W. H. A. (Liverpool). The term W.C.E. refers to the Wireless Constructor's Encyclopædia, copies of the fourth Edition of which are now available for 5s. or by post for 5s. 6d.

J. A. (Funchal). The arrangement appears quite in order, but we cannot, unfortunately, state what results might be expected.

G. F. (Bristol). It would appear that one of the components or valves has failed, but we think it would be most desirable to send the set back to the makers for their opinion.

L. T. (Kentish Town). From your description it would appear that a valve is faulty and we would therefore advise you to have these tested.

R. J. S. (Coryton). The Sonochorde Speakers may be obtained from R. A. Rothermel Ltd., Rothermel House, Canterbury Road, Kilburn, London, N.W.6.

H. E. (Birmingham). In view of the fact that the unit has been modified we regret that it is not possible to help you by giving you details concerning it. The person who rebuilt it will be best able to assist you in this respect.

J. J. B. (Yorks). The eliminator will supply the valves in question, but in view of the Class B stage it will be advisable to use a stabiliser with the unit.

J. H. (Mayhill). As reaction is the only fault it would appear that the winding is incorrect. Try reversing the connections and increasing the number of turns. We presume that the reaction condenser is in good order and correctly connected.

W. I. (Notts). In view of the fact that the set is made from various circuits it is not possible to give you much assistance. Your values may be all wrong, but the click and effects from the volume control rather point to instability in the H.F. stage, the click signifying the bursting into oscillation of this stage and the lack of signals beyond this point confirming instability. This may all be due to wrong H.T., due to the method of combining the various parts of the circuit. The anode of the output valve should certainly not glow red and you should check the circuit very carefully.

J. C. P. (Nottingham). Without a signal generator or calibrated oscillator you can only get the exact positions by careful adjustment. When purchased the I.F. transformers are already adjusted and very little movement of the trimmers should be required. If not correctly matched with the oscillator section a further adjustment will be required at certain settings, and this will be your indication that such adjustment is required.

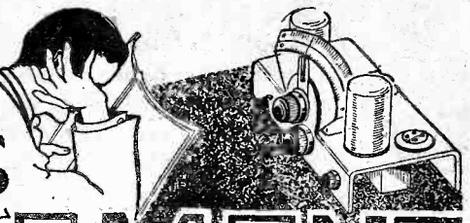
R. F. (Cubitt Town). We cannot understand in which direction you desire to improve the receiver. Please write again giving further details.

H. B. (Penally Camp). We cannot give you a full list of theoretical symbols, but these are given in the Wireless Constructor's Encyclopædia, which will be a very suitable book for you to read as a beginner. It costs 5s. from your newsagent, or 5s. 6d., from this office by post. Obtain also Everyman's Wireless Book, 3/6, or 3/10 by post from us.

G. L. (N.3). We are sorry we cannot tell you what is wrong without further details of the performance. Have you tested the H.T. in each stage? A good milliammeter will enable you to track down the trouble in a very quick and simple manner.

R. H. (March). Probably the modification of the volume control has affected results. Probably your all-wave tuner is not efficient on each band, but some sacrifice has to be made to obtain the advantage of all-wave tuning.

CHOOSING AND USING YOUR LOUD-SPEAKER



BEGINNER'S SUPPLEMENT

Some Problems Affecting Selection, Application, and Location.
By H. J. BARTON CHAPPLE, B.Sc., A.M.I.E.E.

GIVEN a receiver of good design, the success with which a naturalistic reproduction will be achieved depends upon the characteristics of the speaker, the accuracy with which it is used, and the location selected for it by the listener, and all these points are well worthy of discussion.

Good P.M. Speakers

The good class permanent magnet moving-coil speaker of to-day is a remarkably efficient piece of apparatus, for, thanks to good design and the use of new magnet steels, it is much improved in sensitivity as compared with the first models introduced many years ago, and magnets now retain their magnetism almost indefinitely. For ordinary listening, therefore, a good permanent magnet instrument will be entirely satisfactory. There are, however, advantages accruing from the use of an energised-magnet speaker where electricity mains are available. In the first place, mains energising results in a greater magnetic field strength, and this means increased sensitivity or, as it is sometimes termed, electro-acoustic efficiency. In other words, a mains-energised speaker is capable of giving greater volume for a given receiver output than a permanent-magnet instrument of similar size.

A dual pair of Rola speakers designed to give a full overall response.

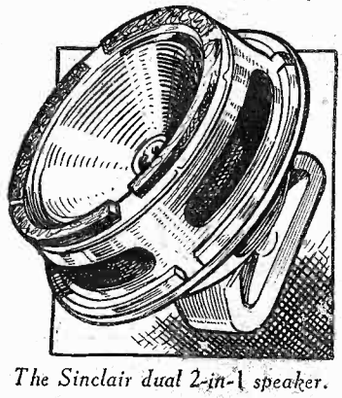
Loss of Top

The second advantage to be gained from the use of an energised speaker is that, size for size, it is less expensive in first cost, although, of course, the electricity used for energising must be taken into consideration. As, however, the magnet winding can usually be used as the smoothing choke for the high-tension supply, there is an actual economy.

Although speakers very often are deficient in top-note response, this is not of very great moment unless the listener is a real musical connoisseur, especially as modern highly-selective receivers frequently have little output above 4,000 cycles in any case. On the other hand, where good top response is required, even with a selective superhet, an expensive speaker with a reasonable upper register response will give better quality than a general purpose speaker. Another alternative, of course, is to use two speakers, one taking care of the lower and middle register, and the other specially designed to reproduce mainly the notes above 4,000 or 5,000 cycles.

Using Two Speakers

There are several methods of doing this. You can, for example, have two specially designed moving-coil speakers, or the experimenter can produce quite interesting results by using one good moving-coil speaker as the bass unit, and an old moving-iron instrument for the top notes. Another scheme is to have two speakers of similar characteristics, but to feed one through a filter which passes the top notes to a greater extent than the lower register, while a further alternative is the use of one of the new piezo-electric tweeters for the treble instrument. In the piezo speaker, it should be explained, the output is led to a specially prepared crystal—or, rather, series of crystals—



The Sinclair dual 2-in-1 speaker.

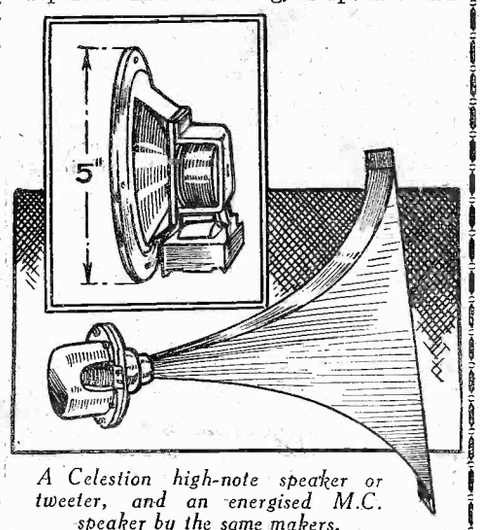
usually of Rochelle salt, having the property of changing its dimensions according to the voltage applied to it. This expansion and contraction is magnified by levers, and applied to a small conical diaphragm.

Installing a Speaker

It is common knowledge that all speaker units must be mounted on a baffle board in order to avoid losses due to the vibrations at the front of the instrument being cancelled by those at the back. These losses occur mainly in the bass region below, say, 200 cycles, and are particularly serious at frequencies below 100 cycles. For really good performance, a minimum size of 3 ft. square is recommended, although 2ft. is quite satisfactory in many instances. Of course, this refers to baffles not forming part of the receiver cabinet, for when a speaker is built into the cabinet the cabinet itself forms part of the baffle, and a smaller area suffices. There is, however, a risk that the cabinet itself will have resonances within the audible scale, with the result that instead of a true bass, most of the deep notes will consist of a boom at one particular frequency.

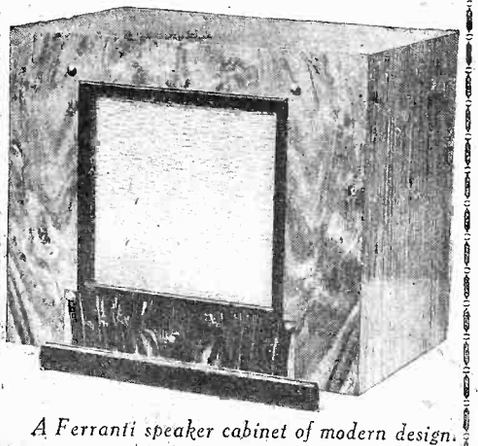
Alternatives

This brings us immediately to the question of the correct procedure—shall the speaker be built into the set, or made a separate unit? Theoretically, the separate unit consisting of speaker and really large baffle is the better, but as a large baffle is unwieldy, and is not always a welcome addition to the domestic furniture, in many cases the built-in arrangement is unavoidable.



A Celestion high-note speaker or tweeter, and an energised M.C. speaker by the same makers.

There are many devices which render a good-sized baffle far from unsightly. For example, it can be disguised as a screen, and sometimes it is possible to build the speaker into a door or even into a wall. Alternatively, a special cabinet may be built for the speaker alone, of ample dimensions for good reproduction. This has the advantage over a built-in speaker that it may be installed in the best position from an acoustic point of view, leaving the set to be placed where it is best served by aerial and earth.



A Ferranti speaker cabinet of modern design.

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).

An Ultra Slow-motion Device

SIR,—Looking through the current issue of your paper, I see on page 410 "An ultra slow-motion device." Whilst I appreciate the writer's idea, I should like to suggest that with the data given it is not wholly possible to carry out. For instance, if the second slow-motion dial shown in the sketch (Fig. 2) were to be used as the auxiliary dial, one could not use it in conjunction with the main one to give very accurate calibration, as was intended, because these types of condenser dials are arranged so that when the figures 100 or 180 as the case may be reach the hair line they stop. However, the main dial will still go on revolving, so that the two dials will lose synchronisation. Also, on the auxiliary dial, a half of it will be of no use as it is not calibrated. With the idea I submitted, however, I was most careful to avoid pitfalls like this by using one of the older, raised type condenser dials as the auxiliary dial, and having one calibrated all the way round, or, if one of these was impossible to obtain, two "reading off" spots should be used. I think on the whole it would be better for your readers to use my method in preference to the other one, for the above reasons.

I was very pleased to see the first of your series of Midget Portables described in your pages, and look forward to the next. —S. A. D. C. (Clifton).

A Midget S.W. Set for Overseas!

SIR,—Being a regular reader of your journal, I sincerely hope you will be kind enough to publish a design for a Cameo Midget short-wave set for those of us who reside in the Far East. The reason for asking this is that we rarely receive any long- and medium-wave stations.

The first valve must be a screen-grid, which is a regulation of our Post Office. The output valve may be either a pentode or a Q.P.P. Like many others, I do not mind the cost of such a set, because we buy expensive American sets here which are very popular.—LIM SIEWHGHEE (Singapore).

An A.V.C. Four-valver!

SIR,—I have been a regular reader of your publication PRACTICAL WIRELESS since its inception, and have taken advantage of the opportunity afforded of obtaining your splendid books and fine gifts. Please accept my best thanks for same.

I am one of those patient readers who are waiting for a "De Luxe A.V.C." four-valver, to include visual tuning and an ordinary pentode; this latter for economy considerations. Wishing your paper every success.—C. A. LORANGE (Stockport).

Our Two-valve Superhet: American Valves

SIR,—I read with great interest your article on a two-valve superhet. I must compliment you on your design, which is excellent, considering the limitations you are working under. Other British and Continental valve designers, with few exceptions, are well behind the Americans. "Valve noise" is, of course, the bugbear of multi-valve receivers, especially superhets, and your new design should reduce this annoyance. The most efficient rectifier is, I think, the thermionic valve. Here, of course, you come up against valve design, as you want to keep your valves down to two. The Americans have produced several excellent two-tube superhets using their wonderful series of six-volt tubes. The most popular circuit uses a 6AF as detector-oscillator, and a 6F7 as I.F. amplifier and second detector. The volume from a set of this type would, of course, greatly exceed that of a two-valve superhet. I am sure you will agree with me that our British manufacturers are very slow with their designs and developments. Some component manufacturers seem to have died a natural death, and all research seems to fall on professional set designers. Of course, I except from my list of grumbles our Communications Engineers in the G.P.O. and Services, etc. The trade wireless papers are full of the dangers of cheap American radio sets and cry out for absurd import duties. They say these sets are inefficient and too cheap. The point is this: these sets are midgets and designed as *additions* to an existing installation. Therefore they *must* be cheap or the public will not buy. The real answer to our manufacturer's grumble is that they *cannot* design a cheap set to compete in any way with the Americans. When I say "cheap" I use the word only in connection with prices. The quality of foreign radio goods is every bit as good as British. I shall be pleased to receive your opinions on several of my statements.—T. A. J. JAQUES (Lewisham).

[*Our experience of American valves is just the opposite, but perhaps British manufacturers have a reply to the above criticism.—Ed.*]

A Log of 20-metre Stations

SIR,—I have been a short-wave listener for over a year, and during that time I have never had such good results as I had the other night. I thought a report of my reception might interest other readers, so I enclose particulars. I was listening to the 20-metre 'phone stations, and I received twenty-one fresh stations in about one and a half hours, and they were all at R7-8, which is particularly good for my set, the usual strength being R4-5. I heard many of the amateurs remarking on the good conditions at the time.

Approximate time, 11.30 p.m. to 1 a.m., W2CB ?, W2HFS, W1IMG, W1KJ, W3MD, W1EEV, W2DVI, W1ARC, W2HHG, W2EUG, W2FYG, W2BTV, W3OZ, WH1MS, W3DI, W2ZB, W8HFU, W2CDL, W2BYG, W1HWD, W1PHE.—L. B. KING (Newbury).

Amateur Transmissions on 40 Metres

SIR,—Having read in your journal a short time ago a letter from a youthful correspondent regarding reception of amateur stations, my interest and curiosity were aroused. Since then I have learnt much about modulation, Q.R.M.s, amplifiers, microphones, etc., simply by listening to talks and reports exchanged between amateurs. There may be other readers who have paid little attention to these talks, and so as a matter of interest I give the following 40-metre stations logged during the past two weeks: G6VI, G2AO, G5JW, G6KV, G5PT, G6TL, G6GO, G5TP, G5IX, G6MU, G5VD, G6PK, G6UD, G2PX, G2RF, G2XC, ON4LV (Belgium). PA0EO (Holland), G2AV, G5SM, G5HJ, G2QO, G6AU, G5PP, G5GL, G6UI, G5GS, G5XA, G6SR, G6JQ, PA0MQ (Holland), G6QZ, and G2IL.

Finally, on the 20-metre band, the following American stations were received: W1IMG, W1GJE, W3EFS and W2HFS. The best time to log these stations is from 10.30 p.m.—R. HOPPER (March, Cambs.).

An H.T. Dodge from British Columbia

SIR,—I noticed in your Letters from Readers' Page, a correspondent, "J. H. Clarke," asking for an H.T. unit to be worked from a small accumulator, and I herewith give particulars of my method of solving this problem. I made a satisfactory H.T. unit, called a "B battery," in this country, by taking 6-volt accumulator plates, negative and positive, and cutting them into narrow strips which would fit into test tubes. One negative and one positive was put in each tube with a wooden separator between. I joined each three cells in series by cutting narrow strips from a lead pipe and burning these with a soldering iron into the top edge of the plates. When I use the battery I connect all the six-volt cells in series, and when I am going to charge they are connected in six-volt parallel. This battery has worked very satisfactory.

I am very interested in short-wave work, and think your journal is one of the finest.

I have a seven-valve, or tube, set as they call them in this country, which receives the short and standard broadcast band, and I receive GSE regularly every afternoon. I am very interested in the midget portable sets, and am trying to construct one with American parts.—W. V. DAWNEY (West Kootenay, British Columbia).

CUT THIS OUT EACH WEEK.

Do you know

—THAT a separate valve may be employed for automatic volume control, and in the opinion of many users is productive of the most constant results.

—THAT abrasives should not be used on the moving parts of switches, owing to the risk of metallic dust being afterwards liberated with noisy working and other troubles.

—THAT ordinary ebonite should not be used in the open air for insulation purposes, etc., unless protected from sun and rain.

—THAT when hum develops in a mains receiver a broken earth connection should be suspected.

—THAT care should be exercised when using ordinary headphones on a mains receiver.

—THAT a centre tap must be provided on the output component for a Class B stage.

—THAT it is not essential for the plate or anode of a valve to be made of solid metal, but a gauze or fine mesh is just as efficient.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

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

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.

SHORT-WAVE RADIO AND TELEVISION SOCIETY (THORNTON HEATH)

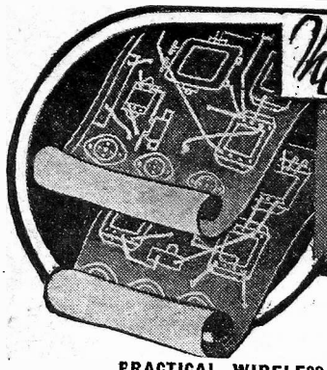
AT the weekly meeting of this society, which was held at St. Paul's Hall, Norfolk Road, on Tuesday, the 9th inst., Mr. Glide, of Ferranti, Limited, gave a talk on low-frequency amplification. One of the most neglected components in a receiver, or amplifier, he said, was the output transformer. Any deficiencies in this component would be reflected in a falling off of the characteristics of the speaker. With regard to the latter, it was now, contrary to general opinion, possible to produce a permanent magnet moving-coil loud-speaker which had a frequency response equal to, or better than, the energised speaker. Mr. Glide then emphasised the need for care in decoupling each stage. Inferior quality could easily be caused by a bad choice in the value of the decoupling components. Grid decoupling was also very necessary, to eliminate feed-back. He then described the new Ferranti "Novia" superheterodyne receiver which was capable of giving 2½ watts undistorted output.—J. T. WEBBER, secretary, 368, Brigstock Road, Thornton Heath.

DIAL LIGHTS

IN a number of instances which have come to our notice recently, several of our readers seem to be difficulties with their dial lights. Generally the trouble is short life, and is in most cases due to the use of wrong bulbs. With any set it is only asking for trouble to use bulbs of the flash-lamp rating, for these will not stand up to continuous operation. Moreover, it is quite unnecessary to have the bulbs burning at full brightness. Thus, for a battery set a bulb rated for 3½ volts is the most suitable, and as it consumes only about 0.2 amp. when used on 2 volts, the battery drain is not serious. If, however, economy is a consideration, a switch may be fitted to cut out the lamp when not required. Against this, however, must be set the fact that, with the lamp extinguished, it no longer acts as a pilot indication that the set is "on," and the saving in L.T. current may one day be offset by the waste of both L.T. and H.T. when the set is inadvertently left connected all night, and part of the next day.

For A.C. mains sets a 6-volt dial lamp is recommended. This will have a good, long life when used on the 4-volt L.T. circuit, and has the advantage that at this voltage it only consumes 0.2 amp., and thus does not cause a serious drop in heater voltage by imposing too great a load on the filament winding of the transformer, while at the same time the voltage rating safeguards the bulb should it be connected to a filament winding designed for more valves than are actually in use, and where, therefore, the voltage may be a bit higher than 4 volts.

In the case of universal sets, the lamp is connected in series with the valve heaters, and must, therefore, be capable of carrying continuously the full heater current—either 0.2 or 0.3 amp. Should a lamp connected in this way burn out, the whole heater circuit is interrupted and the set will be inoperative until the lamp is replaced. As it usually happens that no spare lamp is handy, this is apt to be a nuisance, but it can be avoided by connecting a resistance of, say, 25 ohms in parallel with the lamp-holder, thus shunting the lamp and providing an alternative path for the heater current in the event of the lamp failing. This shunt also results in the lamp being somewhat under-run, thus greatly prolonging its life.—H.C.



The PRACTICAL AND AMATEUR WIRELESS Blueprint Service

These blueprints are full-size. Copies of appropriate issues of "Practical Wireless," "Practical Mechanics," "Amateur Wireless" and of "Wireless Magazine" containing descriptions of these sets can in most cases be obtained at 4d., 7½d. and 1s. 3d. each, respectively, 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

Blueprints, 1s. each.	Date of Issue.	No. of B/print.
Long-Range Express Three	—	PW2
Mains Express Three	8.10.32	PW3
Sonotone Four	15.10.32	PW4
Bijou Three	29.10.32	PW5
Argus Three	12.11.32	PW6
Empire Short-Wave Three	3.12.32	PW7
Solo Knob Three	10.12.32	PW8
Midget Two	17.12.32	PW9
Selectone Battery Three	14.1.33	PW10
Fury Four	—	PW11
Featherweight Portable Four	6.5.33	PW12
Q.P.P. Three-Four	4.3.33	PW13
Alpha Q.P.P. Three	25.3.33	PW14
Ferrocart Q.P.P. Hi-Mag. Three	25.3.33 and 1.4.33	PW15
Supersonic Six	8.4.33	PW16
Beta Universal Four	15.4.33	PW17
A.C. Twin	22.4.33	PW18
Selectone A.C. Radiogram Two	29.4.33	PW19
A.C. Fury Four	25.2.33	PW20
Radiopax Class B Four	27.5.33	PW21
Three-Valve Push-Pull Detector Set	—	PW22
Double Diode Triode Three	10.6.33	PW23
Three-Star Nicore	24.6.33	PW24
D.C. Ace	15.7.33	PW25
Superset	19.8.33	PW26
Auto-B Three	19.8.33	PW27
All-Wave Two	19.8.33	PW28
A.C. Three	16.9.33	PW29
Premier Super	23.9.33	PW30
Experimenter's Short-Wave Three	23.9.33	PW30A
A.C.-D.C. Two	7.10.33	PW31
All-Wave Unipen	14.10.33	PW31A
F.J.C. 3-valve A.V.C. (Transfer Print)	—	PW32
Luxus A.C. Superhet	14.10.33	PW33
A.C. Quadpak	2.12.33	PW34
Sixty-shilling Three	2.12.33	PW34A
Nucleon Class B. Four	6.1.34	PW34B
Fury Four Super	27.1.34	PW34C
A.C. Fury Four Super	10.2.34	PW34D
Leader Three	10.3.34	PW35
D.C. Premier	31.3.34	PW35B
A.C. Leader	7.4.34	PW35C
Atom Lightweight Portable	2.6.34	PW36
Ubique	28.7.34	PW36A
Four-Range Super-Mag. Two	11.8.34	PW36B
Summit Three	18.8.34	PW37
Armada Mains Three	18.8.34	PW38
Midget Short-Wave Two	15.9.34	PW38A
All-Pentode Three	22.9.34	PW39
£5 Superhet Three	—	PW40
A.C. £5 Superhet Three	24.11.34	PW43
D.C. £5 Superhet Three	1.12.34	PW42
Hall-Mark Three	8.12.34	PW41
F. J. Camm's Universal £5 Superhet	15.12.34	PW44
A.C. Hall-Mark	26.1.35	PW45
Battery Hall-Mark 4	2.2.35	PW46
Universal Hall-Mark	9.2.35	PW47
Hall-Mark Cadet	23.3.35	PW48
Short-Wave Converter-Adapter	23.2.35	PW48A
F. J. Camm's Silver Souvenir (All-Wave Three)	13.4.35	PW49
F. J. Camm's A.C. All-Wave Silver Souvenir Three	11.5.35	PW50
Genet Midget Three	June '35	PM1
Cameo Midget Three	8.6.35	PW51
2-valve Superhet	13.7.35	PW52

AMATEUR WIRELESS AND WIRELESS MAGAZINE.

CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	—	AW427
1934 Crystal Set	4.8.34	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valvers : Blueprints, 1s. each.		
B.B.C. One-valver	—	AW344
B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449
Two-valvers : Blueprints, 1s each.		
Melody Ranger Two (D, Trans.)	—	AW388
Full-volume Two (SG.-Det., Pen.)	17.6.33	AW392
Iron-core Two (D, Trans.)	—	AW395
Iron-core Two (D, Q.P.P.)	12.8.33	AW396
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
Family Two (D, Trans.)	—	WM278
Three-valvers : Blueprints, 1s. each		
8 Radiogram (D, RC, Trans.)	—	AW343
P.T.P Three (Pentode-Triode-Pentode)	*June* '35	WM389
New Regional Three (D, RC, Trans)	25.6.32	AW349
Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	14.10.33	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher, Chassis Model (SG, D, Pen)	3.2.34	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
P.W.H. Mascot with Lucerne Coils (D, RC, Trans)	17.3.34	AW337A
Mullard Master Three with Lucerne Coils	—	AW424
Pentaquester (HF Pen, D, Pen)	14.4.34	AW431
£5 5s. Three: De-luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HFPen, D,Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.1.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
Multi-Mag Three (D, 2 Trans)	—	WM288
Percy Harris Radiogram (HF, D, Trans)	*Aug.* '32	WM294
£6 6s. Radiogram (D, RC, Trans)	*Apr.* '33	WM318
Simple-tune Three (SG, D, Pen)	*June,* '33	WM327
Tyers Iron-core Three (SG, D, Pen)	*July* '33	WM330
C-B Three (D, LF, Class B)	—	WM333
Economy-pentode Three (SG, D, Pen)	*Oct.* '33	WM337
All-wave Three (D, 2LF)	*Jan.* '34	WM348
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	*Oct.* '34	WM371
Graduating to a Low-frequency Stage (D, 2LF)	*Jan.* '35	WM378

Four-valvers : Blueprints, 1s. 6d. each.		
65/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
2 H.F. 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
Quadradyne (2SG, D, Pen)	—	WM273
Calibrator (SG, D, RC, Trans)	*Oct.* '32	WM300
Table Quad (SG, D, RC, Trans)	—	WM303
Calibrator de Luxe (SG, D, RC, Trans)	*Apr.* '33	WM316
Self-contained Four (SG, D, LF, Class-B)	*Aug.* '33	WM331
Lucerne-Straight Four (SG, D, LF, (Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four	*Mar.* '35	WM384

Five-valvers : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
New Class-B Five (2SG, D, LF, Class-B)	*Nov.* '33	WM340
Class-B Quadradyne (2 SG, D, LF, Class-B)	*Dec.* '33	WM344
1935 Super Five (Battery Superhet)	*Jan.* '35	WM379

Mains Operated

Two-valvers : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Three-valvers : Blueprints, 1s. each.		
Home-lover's New All-electric Three (SG, D, Trans) A.C.	25.3.33	AW383
S.G. Three (SG, D, Pen) A.C.	3.6.33	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
D.C. Calibrator (SG, D, Push-pull Pen) D.C.	*July* '33	WM328
Simplicity A.C. Radiogram (SG, D, Pen) A.C.	*Oct.* '33	WM338
Six-guinea A.C./D.C. Three (HF Pen, D, Trans) A.C./D.C.	*July* '34	WM364
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	*Nov.* '34	WM374

Four-valvers : Blueprints, 1s. 6d. each.		
A.C. Melody Ranger (SG, DC, RC, Trans) A.C.	—	AW380
A.C./D.C. Straight A.V.C.4 (2 HF, D, Pen) A.C./D.C.	8.9.34	AW446
A.C. Quadradyne (2SG, D, Trans) A.C.	—	WM279
All Metal Four (2SG, D, Pen)	*July* '33	WM329
"W.M." A.C./D.C. Super Four	*Feb.* '35	WM382
Harris Jubilee Radiogram	*May* '35	WM386

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.		
1934 Century Super	9.12.33	AW413
Super Senior	—	WM256
1932 Super 60	—	WM269
Q.P.P. Super 60	*Apr.* '33	WM319
"W.M." Stenode	*Oct.* '34	WM373
Modern Super Senior	*Nov.* '34	WM375

Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super, A.C.	10.3.34	AW425
1932 A.C. Super 60, A.C.	—	WM272
Seventy-seven Super, A.C.	—	WM305
"W.M." D.C. Super, D.C.	*May* '33	WM321
Merrymaker Super, A.C.	*Dec.* '33	WM345
Heptode Super Three, A.C.	*May* '34	WM359
"W.M." Radiogram Super, A.C.	*July* '34	WM366
"W.M." Stenode, A.C.	*Sep.* '34	WM370
1935 A.C. Stenode	*Apr.* '35	WM385

PORTABLES.

Four-valvers : Blueprints, 1s. 6d. each.		
General-purpose Portable (SG, D, RC, Trans)	—	AW351
Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Town and Country Four (SG, D, RC, Trans)	—	WM282
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	*Aug.* '34	WM367

SHORT-WAVERS. Battery Operated.

One-valvers : Blueprints, 1s. each.		
S.W. One-valve	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	10.11.34	AW452

Two-valvers : Blueprints, 1s. each.		
Home-made Coil Two (D, Pen)	14.7.34	AW440

Three-valvers : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW433
Experimenter's Short-waver	*Jan.* 19, '35	AW463
Short-wave Adaptor	*Dec.* 1, '34	AW456
Superhet, Converter	*Dec.* 1, '34	AW457
The Carrier Short-waver	*July* '35	WM390

Four-valvers : Blueprints, 1s. 6d. each.		
"A.W." Short-wave World Beater (HF Pen, D, RC, Trans)	2.6.34	AW436
Empire Short-waver (SG, D, RC, Trans)	*Mar.* '33	WM318
Standard Four-valve Short-waver	*Mar.* '35	WM383

Mains Operated.

Two-valvers : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	10.11.34	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	*Aug.* '34	WM368
"W.M." Long-wave Converter	*Jan.* '35	WM380

Three-valvers : Blueprints, 1s. each.		
Emigrator (SG, D, Pen), A.C.	—	WM352

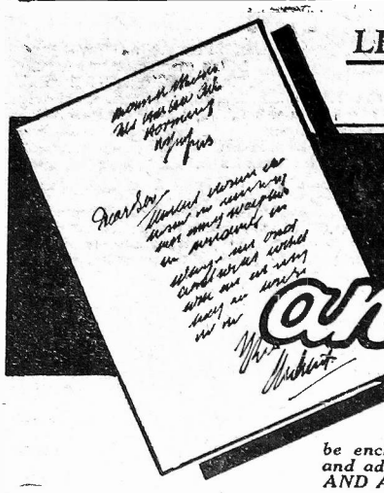
Four-valvers : Blueprints, 1s. 6d. each.		
Gold Coaster (SG, D, RC, Trans) A.C.	*Aug.* '32	WM292
Trickle Charger	*Jan.* 5, '35	AW462

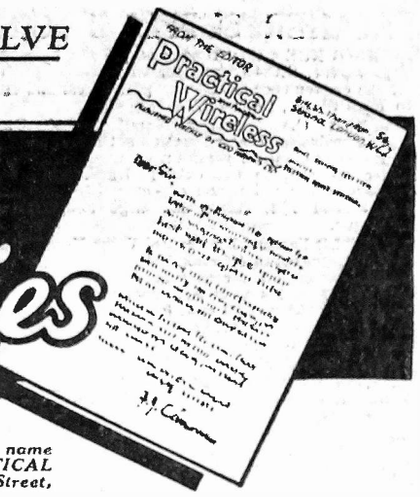
MISCELLANEOUS.

Enthusiasts Power Amplifier (1/6)	*June* '35	WM387
Newstyle Short-wave Adapter (1/-)	*June* '35	WM388

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

Queries and Enquiries





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

SPECIAL NOTE

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

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

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

A Universal Coil Winder

"I have been looking through your back numbers and would like to build the universal coil winder described in your issue of September 15th, 1934. Is there a blueprint for this as I cannot understand all details from the article? For instance, I don't quite understand the clutch gear, and would like a drawing for this."—B. S. S. (Itchen).

WE are sorry that we cannot locate the part of this coil winder which you refer to as a "clutch gear." If you could write us again a little more fully, giving exactly the points which are troubling you, we will endeavour to help you. The details given in the article seem quite adequate, but no blueprint or other drawing has been prepared. If possible, we will endeavour to clear up your difficulty with a rough sketch upon receiving your further query.

Cutting Down the Bass

"I have built a splendid A.C. receiver, but it gives rather too much bass for my liking. I believe it is actually due to the loud-speaker, as the values in the circuit are quite standard, and one of the L.F. stages is fed with the transformer. What is the simplest way of reducing the bass notes—if possible, with some sort of adjustable reducer?"—P. S. (Woking).

A TONE control may be fitted in your loud-speaker circuit if this is used with an output-filter circuit. You need a large-capacity condenser—say, .25 or .5 mfd., and a variable resistance of 15,000 ohms. The latter should be connected across the condenser and the two should then be inserted in series with one loud-speaker lead. Adjustment of the resistance value will vary the degree of low-note response, and, obviously, when the resistance is short-circuited it will short-circuit the condenser and the normal response of the receiver will be obtained.

A Local Station Set

"I live just outside North London and wish to build a set to work from the A.C. mains. I am not keen on foreigners, and simply want to hear the B.B.C. programmes with really good quality. What is the minimum number of valves I can use with satisfaction? Can you give me details of a suitable set?"—R. Y. O. (Wood Green).

YOU would no doubt find an A.C. two-valver would give you adequate results. A band-pass tuner should be used with a power-grid detector, and this should be coupled to a good output pentode through a 5 to 1 L.F. transformer. With a 250-volt mains section you should obtain ample volume with really good quality, and may also find that alternative programmes would be obtained on suitable occasions from the more high-powered foreign stations.

Using a Converter

"I should like to try short-wave reception, and would build the short-wave converter-adaptor described in your recent issue. I am not certain, however, whether this will work with my set, which is a 5-valve superhet. If you can assure me on this point I will go ahead with the building."—G. A. D. (Birkenhead).

UNFORTUNATELY we cannot give you the assurance you ask for. It may work with your set and it may not. We have no circuit details of your set and cannot ascertain the particular circuit which is adopted. If it is a perfectly straightforward superhet you will probably find that the converter may be used by tuning your superhet to a wavelength of about 1,500 to 2,000 metres. To make certain on the point, however, we think it would be wisest to write to the makers of the set and obtain their view, as there may be some peculiar aerial-input arrangement which would prevent good short-wave reception with the converter.

Danger from Inexperience

"I have acquired from a second-hand store an all-electric radio-gram. I have thoroughly examined the inside, and although it does not work it appears that the mains output is of the 500-volt type and the valve types are all indicated on a label, which is, unfortunately, torn. As the set used seven valves I wish to economise by cutting out two or three. Can you tell me the best ones to cut out and how to tell when it is safe to switch on?"—R. P. L. (Bow).

AS you appear to have had no experience with mains receivers, and in view of the high output from the mains section, we think it would be best to leave the modification to a good radio dealer. You may easily do serious damage to the components by an unwise change of circuit, and we cannot give you any indication of the most suitable modification without full circuit details. Furthermore, you may conceivably make some change which will easily result in your obtaining a shock during switching or other operation, and, therefore, if you do not know very much about wireless construction it would be safer, with a receiver of this description, to leave the work to somebody who is in a position to check the alterations and make quite certain that what has been done is theoretically sound.

Radiolympia

"I am not certain whether you have yet published the date of the Wireless Exhibition at Olympia. As in previous years I wish to come and see you on the Stand if you are there, but must arrange my holidays to coincide with the time. Can you give us any details yet?"—H. T. E. (Nottingham).

THE Exhibition is being held this year from August 14th to the 24th, and we shall again be exhibiting at the same spot, Stand No. 9, on the Ground Floor. We shall be pleased to see you during the Exhibition, and members of the Staff will again be in attendance throughout the ten days.

A Fuse Point

"I have a shop-built A.C. three-valver and a fuse is fitted on the chassis, but owing to the peculiar all-metal construction I cannot see what part of the circuit it is fitted in. What happens after about a fortnight is that the fuse blows when I switch on. After replacing it about four times I bought one of higher rating, and although this lasted longer it has also blown. It seems that the selection of the makers is too low and the surges cause it to go. My point is this—if I replace it again with a higher value which will not blow through the surge, will it still offer protection in the set?"—B. M. H. J. (Dalkeith).

IT is very unlikely that the manufacturers would have fitted a fuse of the wrong rating. It would appear, therefore, that some fault has developed in the circuit which causes an unnecessary surge when switching on, and this may be a faulty electrolytic condenser. After the passage of a certain current this automatically becomes sealed and thus the receiver works satisfactorily. Perhaps a good radio dealer could check this point for you. We would not advise the fitting of a larger fuse in view of the danger of damage.

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

PREMIER SUPPLY STORES

ANNOUNCE a City Branch at 165 and 165a, Fleet Street, E.C.4 (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High Street, Clapham.

OFFER the following Manufacturers' Unused Surplus goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra; I.F.S. and abroad, carriage extra; orders under 5/- cannot be sent C.O.D.; please send 1½d. stamp for large new illustrated catalogue.

WORLD Famous Continental Valve Manufacturer; mains types, 4/6 each, H.L., L. power; high and low magnification, screen grid; variable mu screen grid; 1, 3, and 4 watt A.C. output, directly heated pentodes; 250 volt 60 m.a. full wave rectifiers; A.C./D.C. types, 20 volts, 0.18 amp. filaments; screen grid; variable mu screen grid; H., H.L., power and pentodes.

THE following types, 5/6 each; 350v. 120 m.a. full wave rectifiers, 500v. 120 m.a. full wave rectifiers, 2½ watt indirectly heated pentodes.

2-volt H.F., L.F., 2/3; power, low consumption power, super power, 2/9; screened grid, variable mu screened grid, 5- or 4-pin pentodes.

THE following American Types, 4/6; 250, 210, 245, 47, 46, 24, 35, 51, 57, 58, 55, 37, 80, 6A7, 2A7, 27, 77, 78, 2A5, 281. All other types, 6/6.

B.T.H. Moving Coil Speakers, matched pairs, 8in. 1,500 ohms; 7,500 ohms. (1,500 speaker as choke; 7,500 speaker in parallel with H.T. supply), with output transformer for pentode, 15/6 per pair; A.C. kit for pair, 12/6.

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

A LARGE Selection of pedestal, table and radiogram cabinets at a fraction of original cost.

BLUE-SPOT 29P.M. P.M. Moving Coil multi-ratio transformers, 15/-; handles 4 watts. Sonochorde ditto. Ideal for Battery Sets.

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

PREMIER L.T. Charger kits, Westinghouse rectifier, input 200-250v. A.C., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

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(*Continued at top of column three*)

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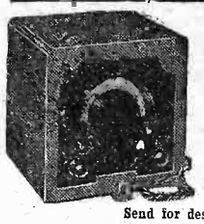

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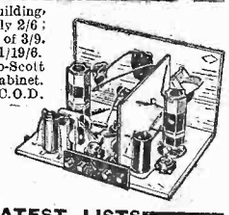

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(*Continued from foot of column one*)

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