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IMPROVING THE TWO-VALVER—

See page 363

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 250.
July 3rd, 1937.

ACCUMULATOR CHARGING

At Home

SUPERHET WHISTLES See page 366

Practical and Amateur Wireless

Edited by F. J. CAMM

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VOL. X. No. 250. July 3rd, 1937.

ROUND *the* WORLD *of* WIRELESS

Accumulator Charging

IT is not a difficult matter to charge your own accumulators where electric light mains are available, although it is essential to make sure that the process is carried out correctly. The charging rate is given by the manufacturers on the label attached to the accumulator, and if such points as correct acid level and strength, and periodic overhaul are attended to, the accumulator may be kept in very good condition and give uninterrupted service over a long period. On page 372 this week, we give details of chargers for use on D.C. and A.C. mains, and the reader who has mains supplies available will be able to make up a suitable charger from the information there given. Remember, however, to keep the accumulator in good condition by topping up periodically with distilled water (not acid), and at regular intervals send the battery to a good service station for overhaul and inspection. Ordinary acid should only be added if the contents of the accumulator have been spilled.

Car Radio and Interference

IT has been discovered that there are so many sources of interference from a normal car fitted with radio that a special model has been built in the U.S.A. in which every bearing is electrically short-circuited and special precautions are taken to earth all moving metallic parts. It is claimed that by this means over 90 per cent. of the interference is eliminated, and that spark-plug suppressors and similar devices are unnecessary.

Aerial Radio

IN the course of some tests in France special micro-wave transmitters for aircraft have given amazing success. These transmitters were tried out in all-metal craft where previous tests had proved that the metal surface of the 'plane had a limiting effect upon the efficiency of the radio apparatus.

The Lead-in

AN amateur who was carrying out tests with certain standard broadcast receivers in North London recently was amazed at the high performance of certain of these receivers compared with his own. After finding that so many of these receivers were so efficient, he again tried his own set only to find that this was also acting in a more-than-usually efficient manner. He eventually found that his lead-in had broken at the junction point with the horizontal wire, but was prevented from falling as it was twisted round an insulator. The far end of the horizontal wire was then discovered to be in contact with the metal supporting cable and thus he had been using an "earthed aerial" in the past.

Prime Minister to Broadcast

MR. NEVILLE CHAMBERLAIN, the first Birmingham man to become Prime Minister, will broadcast from the Council House, Birmingham, on Saturday, July 3rd. The occasion will mark the civic reception and banquet which is being given in his honour, but the broadcast will only be taken by the Midland transmitter.

ON OTHER PAGES

Scottish Radio Cartoon

A SPECIAL edition of "Scottish Radio Cartoon," including "The Nesting of Nessie," a serial thriller by John R. Allan, Jack House, Allan MacKinnon, and "The Gomerill," will be broadcast on July 5th. Nessie, of course, is Scotland's monster No. 1. The programme will also include a series of light-hearted commentaries on the news of the day.

From the Royal Show

ON July 7th Midland will provide for National programme a broadcast from the Royal Show, held this year at Wrottesley Park, Wolverhampton. The idea is to bring to the microphone several speakers who are attending the Show and have interesting points of view to express about new developments as seen at the Show or about agriculture generally.

Melody and Rhythm

A PROGRAMME of "Melody and Rhythm," to be presented by Martyn C. Webster on July 5th for Midland listeners, will be given by two combinations which have broadcast before—Martini and his Music, and Eric Jeffcote's Rhythm Quartet. Martini maintains that hot jazz tunes should not be played on the Hawaiian guitar, but believes there is wide scope for arrangements of the classics, especially the Viennese waltzes. His bass player is only sixteen. Eric Jeffcote has frequently broadcast as an accordion soloist. Three of his quartet play with Jack Wilson's Rhythm Band.

Tricks of the Trade

IN this programme for National on July 5th there will be three Midland speakers—Miss M. Guest, from a soft-toy factory in Shropshire; C. L. Homer, from a hard-toy factory at Tipton; and a chain-maker from the Cradley Heath district.

Stars for "Music Hall"

GOOD news for broadcast "Music Hall" listeners: John Sharman has arranged for Flanagan and Allen to appear in his show—their fourth recent appearance—on July 3rd, and, in the same programme, ever-popular Bébé Daniels and Ben Lyon will be making their last broadcast in this country before going on a tour of South Africa.

During the Variety performance on July 10th, John Sharman will introduce to listeners a new "team" of his own creation—Lupino Lane, a name known to every theatre-goer, and Mamie Souter, famous for her child impersonations, who will take part in a double act specially written by Douglas Furber, who, by the way, wrote the book of the B.B.C. Coronation Revue.

ROUND the WORLD of WIRELESS (Continued)

The Song is Broadcast

BEN FRANKEL, the well-known arranger of film and radio music, impressed with the number of requests from listeners asking band leaders to play popular melodies of recent years which have now gone out of vogue, conceived the idea of presenting a musical programme consisting of popular tunes of the past, but orchestrated and presented in the modern manner. Many favourite numbers of the past twenty years are "dated" as regards their tempo and orchestration, but are capable of rivalling the modern popular rhythm melodies if given modern treatment.

Ben Frankel will present this programme on the National on July 6th, and is using an interesting combination for this programme consisting of six strings, a rhythm section, one bass clarinet, one cor anglais, a flute and a piccolo. It will be observed that there is no brass.

Pau Casals during a recent recording session at the H.M.V. Studios.

Cardigan Mariners

SONGS and speeches from the Annual Dinner of the Cardigan Mariners' Association will be broadcast in the Welsh programme on June 30th from the Guildhall, Cardigan. A block and tackle will be rigged up in the centre of the room and after dinner the guests, all of whom are Master Mariners, will haul on the ropes, and sing the shanties which they learnt during their sailing days.

Variety in Children's Hour

MIDLAND Children's Hour request week will close on July 3rd with variety, which was near the top of listeners' preferences. The bill will include Henry Haynes in imitations, Vernon Adcock, xylophone, Marjorie Westbury and Alfred Butler in old time songs, Hugh Morton as "Professor Whup," and Harry Engleman's Quintet.

Star Variety

DAVE WILLIS, Tommy Morgan, and Harry Gordon will all be heard in an hour's Variety programme from the Scottish station on July 7th. With Dave Willis in the King's Theatre, Edinburgh, will be Cliff Harley, Florence Hunter, and company; with Tommy Morgan in the Craigburn Pavilion, Gourock, Tommy Yorke, Ina Harris, and an all-star cast; and Harry Gordon in the Beach Pavilion, Aberdeen, will be supported by his entire company.

INTERESTING and TOPICAL NEWS and NOTES

Bands Concert

NORTHERN Ireland listeners should note that a concert will be given on July 9th by First Prizewinners at the North of Ireland Bands' Association Championship Contest, held in the Ulster Hall, Belfast, last November. Pipe, Flute, Accordion, and Brass Bands will be represented. Each band will play its Test Piece, and the music will include marches and operatic selections from Mozart and Berlioz.

How a Pageant is Run

THE elaborate staff work which goes on before the production of a big historical pageant will be the subject of a little North Regional feature programme on July 5th. The Chester Pageant starts on that day, and in the evening various people connected with the pageant—a dress designer, a property man, an actor in one of the historical episodes and others—are coming to the microphone to tell listeners about their respective duties.

SOLVE THIS!

PROBLEM No. 250

Wilson's A.C./D.C. receiver gave good results when used in conjunction with an indoor aerial. Thinking of improving reception he fitted an outside aerial, but was surprised to find that the fuse in the mains supply lead blew as soon as the receiver was switched on. What was the fault and why did this cause the fuse to blow? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 250 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, July 5th, 1937.

Solution to Problem No. 249

The speaker should be of the 1,000 ohms, 15-watt type and the rectifier should have a rating of 350 volts 120 mA.

The following three readers successfully solved Problem No. 248, and books are accordingly being forwarded to them: V. F. Webster, 42, Popham Rd., Essex Rd., London, N.1; G. Wiseman, 68, Stanley Rd., West Bromwich; J. R. Dunsire, The Haugh, East Wemyss, Fife.

Derbyshire's Compleat Angler

CHARLES COTTON, of Beresford Hall, author of the second part of "The Compleat Angler," is the hero of D. G. Bridson's dramatic feature, "Dove Days," which is to be broadcast from the North in the National programme on July 5th. This famous fisherman and man of letters was born in 1630, and died in 1687; his literary works include a translation of Montaigne and a fantastic poem called "The Wonders of the Peake." Izaak Walton was his father-in-law, and the two "Compleat Anglers" spent much time together at Cotton's home, Beresford Hall, fishing in the River Dove. Bridson's programme, which was first broadcast in June last year, consists of a number of dramatic episodes, largely based on scenes from "The Compleat Angler." Songs and music specially composed by Crawford McNair will be rendered by Tom Case's Singers and the strings of the B.B.C. Northern Orchestra.

Bob and Alf Pearson, the well-known Canadian radio entertainers.

Leonardi and His Orchestra

UNTIL recently, Jack Leonardi was closely associated with Alfredo's Orchestra, and his old friends have all promised to listen very critically to his first broadcast from Bobby's Restaurant, Bournemouth, on July 5th. The artists will include Emilio, the boy accordionist; Harry Hemsley, with Elsie, Winnie and Johnnie, who have recently appeared in several television programmes; and Cecil Johnson, who will be heard in his comedy commentary on a dinner.

Improving the Two-valver

In the Past Three Issues Our Popular Contributors, the Experimenters, Have Described the Construction of a Simple Two-valve Receiver. In This, the Last of a Series of Four Articles, They Describe a Few Additions to the Set, and Also Tell You of a Few Simple Experiments which You Can Try

AS we have not heard from any readers who found difficulty in building the simple little set which we have been describing, we assume that the work has proved as straightforward as we hoped you would find it. If you have completed the amplifier portion dealt with last week, why not go a little further by making the receiver still more efficient and capable of a greater output? You can do this for an additional expenditure of a few shillings, and without disturbing any of the work so far carried out.

In the first place you will require a small low-frequency transformer with a step-up ratio of about 1 to 3.5. Such a component is available in various makes at a cost of six shillings or less. We are not going to specify a particular transformer because there are several on the market, all of which will prove equally suitable. If names must be mentioned, we can suggest the Bulgin L.F. 33, which costs four shillings, but there are others, and an ordinary type of component can be used if this is on hand.

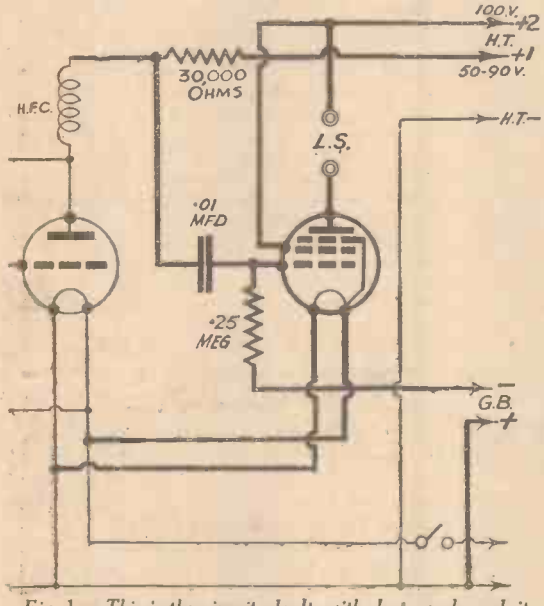


Fig. 1.—This is the circuit dealt with last week, and it should be compared with Fig. 2.

The Transformer

When considering L.F. transformers it is not unusual to think that the more you pay the better the quality of reproduction which can be obtained. Actually, there is some truth in this idea, but there are practical limitations to its application. For example, if you are building an elaborate and expensive receiver designed for the best possible reproduction, it is worth while to spend more than the amount suggested. Also, if the primary winding of the transformer is to be connected in series between the anode of the detector valve and H.T.+, a larger and more expensive component is to be preferred. But since this little set does not pretend to be a "quality" instrument, and since the transformer is to be resistance fed, there is little or nothing to be gained by spending appreciably more than the modest price given above.

by The Experimenters

Lest you might get the idea that the set will give only poor and "scratchy" reproduction, we had better make it clear that this is by no means the case. Judged by the standard of the average inexpensive battery set, this is a perfectly good job and capable of a fully satisfactory performance. If it is compared with sets built around some of the "quality" circuits which we have previously described, the comparison is simply odious and quite unfair.

What It Does

With that off our chests, we can continue. The transformer is to be placed between the low-frequency grid condenser and the grid of the pentode, as shown in Fig. 2; compare this circuit with that given in Fig. 1, which is the circuit dealt with last week. What is the advantage of the transformer, the newcomer to constructional work will probably ask. The answer is that it increases the amount of amplification obtainable. When using the original resistance-capacity coupling, the only low-frequency amplification obtained is that provided by the pentode valve itself. Now the valve is a voltage-operated device (technically speaking). That means that it amplifies the signal voltages applied to its grid; any current that might be "sculling about" in the L.F. grid circuit doesn't matter.

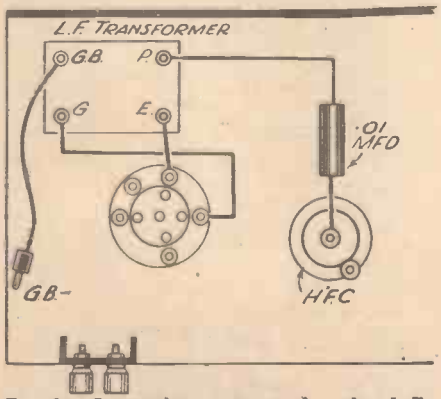


Fig. 3.—Practical connections for the L.F. transformer shown diagrammatically in Fig. 2.

The transformer has two windings of wire on a core made up of thin sheets of soft iron. One winding has fewer turns than the other and is connected between the coupling condenser and earth. That is the primary winding. The other—called the secondary—is connected between the grid of the pentode and grid-bias negative, and has a larger number of turns of wire. As a result, alternating signal voltages passing through the primary are increased in amount by the time they are drawn out of the secondary. Thus, if the transformer has a ratio of 1 to 3½, the voltage across the secondary is 3½ times as great as that across the primary. Result: increased voltage applied to the grid of the pentode. We hope that has not bored you, but we thought that some new readers might like to have the point made perfectly clear before getting along with the constructional work.

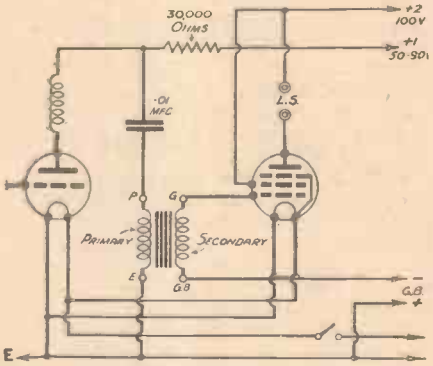


Fig. 2.—A modified form of the circuit shown in Fig. 1, where a transformer is used to feed the pentode.

New Connections

In Fig. 3 we show you how the transformer is wired into the set. For the time being the grid leak has been removed, the grid-bias lead which was joined to it being taken to the G.B. terminal of the transformer. Additionally, the wire-end lead from the .01-mfd. condenser has been taken off the grid terminal of the valveholder and connected to the P. terminal of the transformer. As to the other two transformer terminals, one (E) is joined to earth, and the other (G) is connected to the grid terminal of the pentode valveholder. At this point we ought to mention the connections to different transformers, because the markings vary to a certain extent. Fig. 4 shows you how the connections to a few suitable transformers compare. You will see, for example, that the terminals marked P., E., G. and G.B. shown in Fig. 3 correspond with those marked I.P., O.P., O.S. and I.S. on another transformer, whilst they also correspond with flexible leads coloured grey, yellow, green and red on the Bulgin L.F. 33 component. It can

(Continued overleaf)

IMPROVING THE TWO-VALVER

(Continued from previous page)

also be seen that, when using an ordinary type of L.F. transformer which the constructor might have on hand, the terminal marked H.T. or H.T.+ corresponds with that marked E. on the other transformer illustrated in Fig. 3.

Anyhow, after wiring in the transformer you can test the set again, operating it exactly as before, when it should be found that there is appreciably greater volume on all signals. It is just possible that reproduction might not appear to be as good as before—it might be rather more shrill—

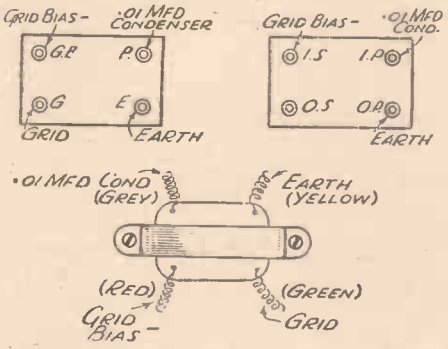


Fig. 4.—Alternative connections for different types of small L.F. transformer.

but you should ignore this for the moment, because we can easily correct that later.

Another Improvement

In most respects the receiver as it now stands is representative of good modern practice. The main difference is that a separate H.T. lead is used to supply the anode of the detector valve. Not only is this rather a nuisance, but when the H.T. battery begins to run down various forms of trouble are likely to occur. For example, reaction control might become difficult, and there might be a peculiar "groaning" noise just as the oscillation point is reached. As the battery loses still more of its power the noise will probably give way to an intermittent "plopping," which is commonly called "motor-boating," due to its resemblance to the noise of a motor-boat exhaust. The net result would be that the battery would need to be replaced before it was fully exhausted.

The troubles referred to can be completely overcome by what is known as decoupling the detector valve. You need not worry about the full meaning of this, as long as you can follow the simple alterations required to prevent the trouble. They are shown in Fig. 5, and you can see that the H.T.+1 lead has been removed from the end of the 30,000-ohm resistance, its place being taken by a 25,000-ohm resistance connected to that speaker terminal to which the full-voltage H.T. lead is attached. A 2-mfd. fixed condenser of any good type is connected between the junction of the two resistances and earth—actually to a valveholder filament terminal, which is in turn connected to the earth terminal.

With this arrangement the H.T. supply for both valves is obtained from a common point, and the voltage applied to the detector is reduced to a suitable figure by the two resistances which are in series. This will improve reaction control and increase the useful span of life of the high-tension battery.

Better Tone

We can now turn to the question of tone. If you do find it rather high-pitched, first try the effect of connecting the .25-megohm grid leak between the grid of the pentode and G.B.—. That will probably help matters, and if there has been a high-pitched whistle in the background, this should go a long way towards removing it. If the music is still rather shrill, you should obtain a .01-mfd. condenser—a tubular pattern is convenient—and connect the two ends of this to the two loudspeaker terminals. By this time there should be nothing much to complain of, provided that the most suitable loudspeaker tonnections have been chosen, according to the instructions supplied with it.

You can therefore set out in an attempt to see how many stations can be received. After dark you should be able to bring in at least 20 on 'phones, and four or five on the loudspeaker; in daylight the number might be less than half. Whatever else, remember what we told you about oscillating, and avoid causing interference with your neighbours' reception. Make a note of the stations received, and the condenser

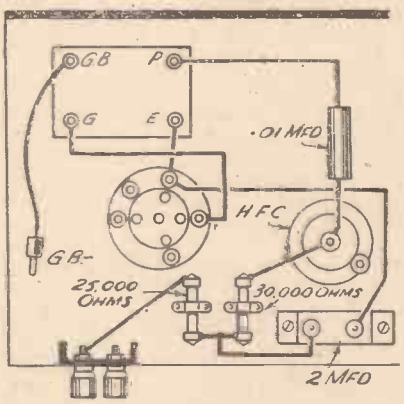


Fig. 5.—Here the connections shown in Fig. 3 have been modified to include a 25,000-ohm decoupling resistance and 2-mfd. condenser. The position of the 30,000-ohm resistance has also been changed.

settings, so that they can more easily be found again when wanted.

We shall be very glad to learn of the results obtained, so please don't hesitate to drop us a line, care of the Editor. If you favour the idea, it might be possible to to have a little competition later in the year, to see which reader has received the greatest number of stations, and who has been able to cover the greatest distance. In the meantime, we can assure those who have not previously made a receiver that there is great fun in store.

Cheerio for now, and good reception!

NOTES & NEWS

Radiovisiolympia

ONE trade paper has quite naively suggested that before long it may be necessary to change Radiolympia to Radiovisiolympia, to take cognisance of the advances which have been made in television, and the fact that a large number of well-known radio manufacturers propose putting sets on the market in addition to those which are already well established. In any case, the arrangements now being made for the television demonstrations indicate that the facilities will be better than last year. There will be no secrecy ban, and although the number of the public seeing pictures will be reduced, those who do witness the results will have a much longer viewing period. Incidentally, since Alexandra Palace will reopen its service just prior to the exhibition, there is every promise of greatly improved programmes. This will be due to overhaul of equipment, the installation of duplicates for vital sections of the apparatus, and larger studio facilities, which will avoid those annoying intervals between programme items. Added to this, the outside broadcast vans should then be in full use, and this will add very materially to the entertainment value of the broadcast fare. Those in charge of the B.B.C. television service have to satisfy a diversity of tastes and yet retain that intimacy which the screen of a home receiver demands. It is a matter of regret that Epsom was perhaps beyond the range of the O.B. wireless link, but no doubt events such as the Henley regatta will provide useful subjects, while looking further ahead next year's boat race will be an item too good to miss.

High Frequency of Television Signals

THE extremely high frequency of television transmission is generally realised, but it is seldom seen expressed in terms of the picture. It is interesting, therefore, to record that the width of the actual spot of the cathode-ray tube on the London standard transmission is equal to 22 cycles of the transmitted wave, or, alternatively, one line occupies approximately 4,400 cycles of the transmission.

Valve Fluorescence

MANY modern valves show a bright blue glow on the inside of the glass bulb. This fluorescence should not be confused with the blue glow originating inside the anode due to softness. The fluorescence is actually caused by a ray "knocked off" some part of the assembly by the impact of stray electrons. It will be found that this fluorescence can be moved about by quite a moderate magnetic field; it is in no way detrimental to the performance of the valve, but on the contrary, is the sign of a particularly hard valve.

Rome's New Directional Aerials

FOR its latest 100 kilowatt short-wave station which it is hoped to open in 1938, the E.I.A.R. propose to install an aerial system to permit broadcasts to all parts of the world. Its main feature consists of a revolving turntable completely equipped with the necessary high-power amplifiers to permit the operator to switch in, as required, apparatus working on the different channels suited to the particular quarter of the globe to which the broadcast is destined. The rotation of the turntable permits this rapid change of wavelength.

Parede Again in the Log

CTIGO, Parede (near Lisbon), Portugal, is again working on its old frequency of 12.396 mc/s (24.2 m.) nightly. Best time to tune in is towards G.M.T. 22.00.

Meteorological Bulletins from Washington

THE National Bureau of Standards station at Beltsville (near Washington), U.S.A., in addition to the transmission of calibrated signals now broadcasts reports on the condition of the ionosphere, and so on, every Wednesday by radio telephony according to the following time-table: G.M.T. 18.30-18.33 (on 30 m., 10 mc/s); 18.40-18.43 (on 60 m., 5 mc/s); and from 18.50-18.53 on 15 m. (20 mc/s).

TRANSMITTING TOPICS

Types of R.F. Power Amplifiers

By L. Ormond Sparks

I mentioned in the previous article that the P.A. stage could be likened to an ordinary L.F. amplifier because of the valves employed and the application of bias. Well, that is rather an "open" statement but, even so, I am going to take it a step further and say that the three forms or types of P.A. stages are nothing more than those used for L.F. work, in so far as valve operation is concerned. It will be obvious, I hope, to the average amateur, that the inter-valve couplings will differ from those used in L.F. stages. Power amplifiers can be classified under three headings, according to the conditions under which they are operated.

Class A

This is the most simple form. A triode valve is employed, the grid being biased so that the operating point is brought on to the straight portion of the grid volts/anode current curve. If a signal is applied to the grid, an exact—though magnified—variation is produced in the anode current. The graphic representation is shown in Fig. 1 "a."

With this type of amplifier it is absolutely essential that the grid is not allowed to become positive, otherwise grid current will flow and violent distortion will be produced.

From the R.F. point of view, Class A has certain disadvantages. In fact, it is not now widely used, but more about that later. With a single triode there is always the risk of considerable harmonic distortion unless particular attention is paid to the circuit design, operating conditions and component characteristics.

While with a single valve the efficiency is on the low side, it is possible to improve matters considerably by using two triodes in Class A push-pull and, what is even more important, such an arrangement practically eliminates distortion due to the even harmonics as they are cancelled out by virtue of the push-pull operation.

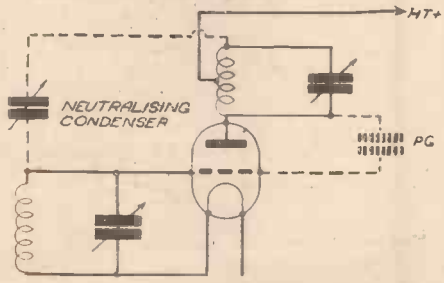


Fig. 2.—The inter-electrode capacity and method of balancing it out.

Class B

This method might be considered as another form of the above, providing one remembers that the valves are operated under very different conditions. To commence with, a valve in Class B is always biased right down to its cut-off point, i.e., when no anode current flows. Consequently, when a signal is applied across its grid circuit, only the positive half-wave has any effect on the anode current; the grid being rendered less negative by the application of the positive half-wave, thus bringing the operating point up the curve away from the cut-off value and allowing anode current to flow. This will be appreciated more readily by reference to the graphic representation Fig. 1 "b," where it will also be seen that the negative half-wave only helps to make the grid still more negative, so it is not possible for any anode current to flow during that period.

While the efficiency of such an amplifier is considered quite good, it must not be overlooked that grid current will be set up which immediately introduce losses across the grid circuit, and these losses *have* to be made good by the preceding or driver stage. It is quite usual to employ a small power valve as driver. The importance of the above becomes more apparent when it is realised that the output of a Class B amplifier is proportional to the square of the exciting grid voltages.

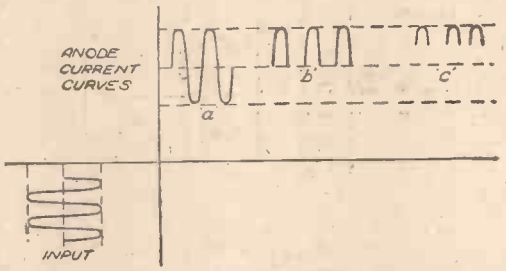


Fig. 1.—The different effects on a signal due to working on various parts of the grid-volts/anode-current curve.

When considering r.f. P.A. stages it is sometimes necessary to amplify the radio frequency *after* it has been modulated. An operation which calls for *linear* amplification, and when such requirements exist, a Class B amplifier can be used in the final stage.

I have mentioned only one valve which, while being quite suitable for r.f. P.A. circuits, is totally unsuitable for L.F. amplification. It is necessary, therefore, to use two valves—after the manner of Class A push-pull—each valve operating alternately on the positive half-waves of the input. The anodes of the two valves are fed with H.T. through a centre-tapped transformer and the resultant curve shape of the voltages induced in the secondary—from each half of the primary—is identical to that of the input.

Class C

This method is nothing more than a Class B amplifier with different bias values. I mention this, as one is sometimes confused by the many names associated with circuits, especially when the name or term is such that it sounds to those not too familiar with circuits as though it is something very weird and wonderful. With Class B the valve is biased down to cut-off point, whilst with Class C the bias is increased to at least twice the cut-off value.

The effect of this increase in bias is to allow anode current to flow during a part of the positive half-wave of the input only, as shown in "c," Fig. 1. By operating the valve under these conditions, it is possible to obtain a higher anode efficiency and greater power output, but the actual gain or amplification will be relatively low, as the excessive bias has to be made up by the drive to the grid; therefore it will be appreciated that ample power must be available for the drive if the full efficiency is to be obtained.

Neutralisation

It will be remembered, from my description of types of oscillators, that one type was known as T.P.T.G. or, in other words, Tuned Plate-Tuned Grid, the valve being brought to a state of oscillation by tuning the plate and grid circuits to the same frequency. When using a triode as a P.A. there is always the great danger that it will act in the same manner. In fact, if suitable steps were not taken to prevent such an occurrence the stage would become hopelessly unstable.

There always exists between the plate and grid of a three-electrode valve a certain capacity. One might think of it as a very minute condenser connected across those two electrodes and, while such capacity is not really serious when considering L.F. amplification, it can become a serious matter with R.F. stages. Its effect will be to allow some of the R.F. energy in the plate circuit to be passed back to the grid, and that, in the circumstances under consideration, would be sufficient to cause the valve to oscillate. A most detrimental factor in any amplifier. To overcome the plate/grid capacity feed-back a very simple and novel arrangement is used. It is novel inasmuch that no attempt is made to stop the feed-back, as will be shown below.

A triode complete with tuned grid and anode circuits is shown in Fig. 2. The inter-electrode capacity is represented by the condenser PG.

The anode of the valve receives its H.T. by means of the centre tap in the tank coil

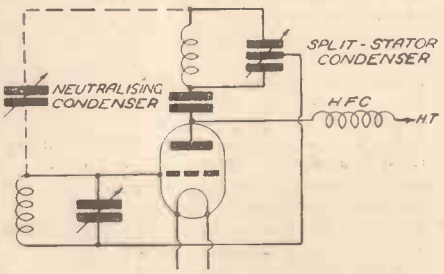


Fig. 3.—An alternative method of obtaining a centre-tapped anode load, utilising a split-stator condenser.

and that point, so far as H.F. currents are concerned, can be considered to be at zero potential. Each end of the tank coil and, of course, the tuning condenser, will be at high H.F. potential, and at any given instant the ends of the coil will be at opposite potentials—when the anode end is positive the other end will be negative, and so on. This phase difference is made use of to secure neutralisation by the simple method of connecting a small condenser—usually called a neutralising condenser—between the free end of the tank coil and the grid. The arrangement is shown in dotted lines.

(Continued on page 380)

Radio Fault Tracing—7

This Week We Deal With the Problem of Superhet Whistles and How They May Be Introduced by Faults in Design or Working.

WITH normal reception the I.F. amplifier of a superhet receiver is fed by the frequency-changing stage with a signal, the carrier frequency of which is the difference between the wanted signal carrier and the local oscillation fundamental frequencies. The I.F. stages, although selective, give no discrimination at all between an input signal properly produced as described above, and any other signal at intermediate frequency which may be produced by signal combinations other than that of the wanted carrier and the oscillator fundamental. For example, if the difference between an unwanted carrier and the local oscillation frequency comes within the range of the I.F. amplifier the latter will, unless prevented, amplify the resulting I.F. signal just as readily as the one produced by the wanted signal.

Thus, with the superhet principle of operation, there is the danger that undesirable frequency combinations may produce I.F. signals, and it is to be noted that the I.F. amplifier itself offers no protection, apart from its normal selectivity. It will be obvious, therefore, that the selectivity of the signal-frequency circuits (i.e., those in front of the frequency changer) is a matter of very considerable importance, in view of the fact that it governs to a great extent the number and amplitude of unwanted signal frequencies reaching the frequency changer.

If the I.F. amplifier does happen to be carrying more than one I.F. signal, then the beats between these will be taken by the second detector and L.F. section of the receiver to produce a whistle in the speaker.

Second-channel Interference

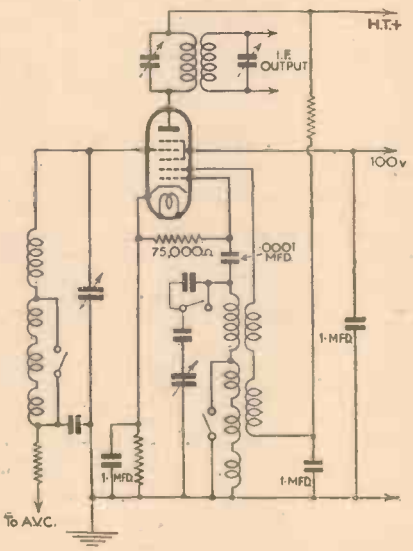
The interference case already mentioned, namely, that of an unwanted signal combining with the local oscillation fundamental frequency to produce an I.F. signal, is the well-known "Second Channel" case. When the receiver is tuned to a wanted station the frequency of the latter is, in all normal cases, below the local oscillation frequency by the amount of the I.F. value. Second-channel trouble, if present, will be caused by an unwanted station above the frequency of the local oscillations by the amount of the I.F. value.

There are a number of other whistle possibilities. If the oscillator has any pronounced harmonics an unwanted signal and an oscillator harmonic may combine to give an unwanted I.F. signal. Combinations of incoming signal frequencies may give unwanted I.F. signals (without the oscillator coming into account). Harmonics in the frequency changer open up further possibilities.

A great deal could be written on the subject, but as these articles do not form a theory course, the brief notes given must suffice, and we must proceed to what is much more to the point, namely, how to tackle the case of the superhet that is producing whistles. It must be noted that the progress of superhet design during the past few years has included whistle reduction among the improvements made, and that where a superhet of early design is concerned, the case may be one where it is not so much a matter of a fault as that of the "vintage" of the receiver.

Eliminating Whistles

First and foremost a ganging check is most important. As far as second-channel interference is concerned some receivers incorporate special suppression-coupling systems, so, in these cases, the suppression system should be very carefully gone over



A typical frequency-changing stage, which can give rise to troubles as mentioned in this article.

if second-channel trouble is experienced. This is really a case where it is important to have the receiver service manual in order that the exact signal frequency-coupling arrangements can be closely studied.

Valves and valve-operating voltages must (yet again) not be ignored, particularly as excessive harmonic generation is a fruitful source of whistle trouble. In view of what has been stated about the signal-frequency circuits, it will be realised that any faults which lower the selectivity of the signal-frequency side of the receiver will tend to cause trouble, so every care should be taken to make absolutely certain that the signal-frequency circuits are in order.

Apart from the causes of whistle generation already mentioned, there are two others. First, there is the "common or garden" case of H.F. instability, and this should be handled in the manner described in an earlier article. The remaining case is one that can be quite troublesome. The importance of keeping high frequency out of the L.F. section of any receiver, owing to the possibility of feed-back to the earlier stages, has already been emphasised. In the case of the superhet receiver it is not so much a feed-back of the fundamental intermediate frequency which will cause trouble as a feed-back of the harmonics of the I.F. Any H.F. filtering arrangements associated with the second detector are, therefore, items to suspect if there is trouble on the above score; also screening generally.

Mains Hum

In view of the fact that a mains receiver contains components (the smoothing components) specially concerned with the minimising of hum, it is obvious that, when hum is experienced, these are the very first items to check.

An open-circuited smoothing condenser is a simple fault that can cause hum. Shorting turns in a smoothing choke (or field winding, if this is used for smoothing) is another possibility. Both these faults can be easily checked by test. If the smoothing system is in order, valves should be the next to receive attention; in particular, an insulation failure between heater and cathode of an indirectly-heated valve may be the fault.

Other possibilities are a breakdown of one half of a centre-tapped filament potentiometer, or wrong adjustment if the latter is variable. Mains-transformer insulation defects can be responsible for hum, but it is to be expected that such a type of fault will come up for investigation upon some other score than hum (possibly smoke).

There are many possibilities involving inductive coupling between the mains transformer and an L.F. transformer, or even grid wiring, which need hardly be anticipated with commercially-built receivers, but the point may be worth considering if any non-standard replacements have been made in the receiver. There is one cause of hum which is particularly exasperating, and that is the case where excessive hum only comes on when a signal is tuned in. This case is called modulation hum, and will be considered in the next article.

NOTE THESE DATES.

Massed Band Concert

FOR some listeners the playing of the massed military bands will be the most enjoyable part of the Northern Command Tattoo broadcast on July 2nd. But the bands represent only one of many elements in that broadcast, and band music enthusiasts will have to wait until July 4th. On that day the massed military bands of the Northern Command will have the Tattoo Arena at Roundhay Park, Leeds, all to themselves. The concert will be broadcast.

A New Musical Series

ON July 5th the first of a fortnightly Midland programme entitled "Forgotten Rivalries" will deal with Spohr and Mendelssohn. Arranged and presented by A. Brent-Smith, who lives in Gloucestershire, these programmes will give an interesting sidelight on the musicians of other times as viewed and ranked by their contemporaries. Leslie Heward will conduct the B.B.C. Midland Singers and B.B.C. Midland Orchestra, and the soloists will be Geoffrey Dams (tenor) and Brosa (violin).

A Typist's Budget

IN his talk on July 8th on "How to make the best of . . . ." Moore Raymond will deal with the salary of an average typist and suggest how it may be spent to provide the maximum of pleasure and profit. Midland listeners should make a note of this date.

On Your Wavelength

BY THERMION

"Bunk About Rays"

IN our issue dated June 12th I dealt with the statement credited to a speaker at a recent meeting of the British Association of Chemists that high-frequency rays projected to sufficient strength could bring down a fleet of planes loaded with bombs and gas. In fact, without resorting to sophistry, I debunked it. I would add that I underline, underscore, accentuate, and emphasise what I wrote about that. My paragraph has, however, brought forth a letter from the British Association of Chemists, who ask me to point out that the work of this Association is concerned with the economic interest of the industrial chemists and scientists and has nothing to do with the retail pharmacist. They say that a number of their members hold high positions in the most important works manufacturing materials for the wireless industry. In referring to the daily Press reports of the meeting on which I commented, they remark that it is a little unfortunate that a certain section of the Press are only too ready to give undue prominence to the casual remark of a single individual who grasped the opportunity to speak at a public meeting.

I should have thought it would have been hotly repudiated as soon as it was mentioned, in order to prevent the reporters from streaking away from the meeting to the pavement of Fleet Street with an imagined scoop.

Television Plans for Olympia

THE plans for the television demonstrations at Olympia this year are, I learn, on a more generous scale than last, for accommodation will be provided for more "lookers," who will be able to watch the demonstrations seated. Sixteen demonstration rooms have been allotted to television manufacturers, each of whom will have their own demonstrations. The B.B.C. is making special arrangements for Show Time broadcasts of nine sessions daily. The television section will be situated near the theatre as last year. Fourteen television manufacturers have already taken space in this section, and these include H.M.V., Cossor, Ekco, R.G.D., Pye, Philips, Marconiphone, Ferranti, Ediswan, Baird, Halcyon, Ultra, Kolster Brandes, G.E.C. You will be enabled to locate the particular demonstration room by means of the name of the manufacturer which appears over the door. As I have said, there will be nine television transmissions daily during the exhibition, and each session will last for fifteen minutes, whilst each demonstration room will seat thirty people. Admission to the demonstration room will be by means of special tickets only, which will be available free on application to a special box office in the television section. Tickets will admit to one session, in one demonstration room only.

1,820,300 Receivers in 1935

I AM not going to tell you that if all the receivers made in one year were stretched end to end the result would be a perfect mess, nor if they were all switched on at once the resulting noise would be equal to the squawks and caterwauls from that horrible set owned by your neighbour next door who never seems able to tune in the programme quite so nicely as your little boy, Willie!

I merely wish with my usual veracity to set on record the fact (at least I must presume it is fact, since I have not counted them) that during 1935 the number of sets and radiograms produced in this country was 1,820,300, having a total value of £11,992,000. These figures are included in the census of production for 1935, which statistics are published by the Board of Trade. Now, at the end of 1935, the number of wireless licences in existence was 7,381,428, an increase during that year of 634,088 licences. This seems to indicate that some people must have more than one set. Of the grand total, 122,300 were radiograms. The total production value of all radio apparatus, excluding high-tension batteries, is stated to be £15,217,000. I notice that television receivers are included under the heading of transmitting sets, and that high-tension batteries to the total value of £951,000 were produced during this year. Thus, the grand total for 1935 is £18,379,000, whilst the number of valves produced in the same year was 12,790,000.

Novel H.M.V. Mickey Mouse Record

IF you 'phone the London office of Walt Disney—Mickey Mouse, Ltd., you will hear a piping voice say "Mickey Mou-use!" Joyce Hilder, the 21-year-old telephone operator, answers every call in this cheerful way, as it is the policy of the Walt Disney organisation to put everybody at ease.

But what will happen if a successor to Miss Hilder has to be found? In order to provide against this contingency, Mr. George Kamen, Walt Disney's European representative, has just paid a visit to the H.M.V. recording studios and made a special gramophone record in which he says "Mickey Mouse . . . Mickey Mouse . . . Mickey Mouse . . ." again and again in the pleasing lilting way he wants 'phone operators to adopt. This record will be kept on hand for the guidance of all 'phone girls employed by Walt Disney—Mickey Mouse, Ltd. A copy is being sent to the Mickey Mouse offices throughout the world, so that, wherever you may be, if you have occasion to ring the firm, you will be greeted by that same smile-in-the-voice "Mickey Mou-use!"

Alas, this unique His Master's Voice gramophone record cannot be added to the famous range of

H.M.V. Mickey Mouse recordings, for it is not for sale.

Radio for World's Loneliest Isle

I LEARN that Tristan da Cunha, "loneliest island in the world," is at last to enjoy proper radio equipment. This tiny island, in the centre of the South Atlantic, has no electric mains, no facilities for accumulator charging, and can obtain batteries only once a year when the annual mailboat calls. For these reasons, all previous attempts of the inhabitants to keep a radio set in operation have failed. Recently their problem was completely solved by a presentation made at the Southend-on-Sea Rotary Club luncheon.

The Rev. H. Wilde, on furlough from the island, was handed a specially devised set of equipment for the islanders as a gift from E. K. Cole, Ltd., manufacturers of "Ekco" radio sets, whose factory is at Southend. The radio set, an all-wave model, is of the "No H.T." type, introduced at the last Radio Exhibition by E. K. Cole, Ltd. It entirely obviates the difficulty of power supplies as it requires no high-tension batteries, and is operated entirely by small accumulators.

These will be kept fully charged on the island by means of a small generator operated by a wind-driven propeller mounted above the building in which the set will work. No reception difficulties are anticipated, as Tristan da Cunha, with thousands of miles of open ocean in every direction, will be free from freak conditions caused by intervening land, and the set is powerful enough to receive signals from almost any distance.

Arrangements have been made for E. K. Cole, Ltd., to receive reports on reception, in the hope that they will help in the future design of radio sets.

70,000,000 m.p.h. Action in Slow-motion

ONE of the most popular special exhibits on view at the Television Exhibition at the Science Museum, South Kensington, is an ingenious working model of the cathode-ray tube of a television receiver produced by the G.E.C. This model, which is being operated by crowds of visitors, shows how the invisible electric "cathode ray" beam is shot from a "gun" and is focused so as to build up the television picture on a screen inside the end of the large glass bulb of the cathode-ray tube. Cleverly-arranged devices are used to show in slow-motion the movements of the scanning beam, which normally travels towards the screen at the amazing speed of 70 million miles per hour.

Alongside the model an actual cathode-ray tube is mounted as in a television receiver. The controls, arranged for operation by the public, are "ganged" to the model as well as to the real tube. Alterations of currents and voltages to the tube electrodes can be observed on a number of meters at the same time as the consequent effects on the screen, whilst the model displays the same effects pictorially.

Other interesting G.E.C. exhibits in addition to their standard television receiver, include a number of vacuum-type photo-cells, showing the stages in the development of the latest type cell designed for television purposes. Among them are several thick-film cathode cells which were the only type available prior to 1929. The remaining cells all incorporate the modern thin-film caesium cathode, a far-reaching discovery which was first developed and applied in this country by the G.E.C.

The latest advances in photo-cell design are represented by the secondary emission cell, and the electron multiplier. The G.E.C. is exhibiting an example of the former which is now commercially available, and also an electron multiplier which is arranged with coatings of a fluorescent material on its plates to demonstrate to the public its method of operation.

Notes from the Test Bench

Speaker Wattage

MOST constructors seem to experience difficulty in deciding the correct wattage rating for various components. Calculating resistance values is a fairly easy matter, but finding the required wattage rating is somewhat more complicated. If resistances having too low a wattage rating are used, they become overheated and either vary in value or become permanently defective. Chokes, speaker field windings, and mains transformers can also be damaged in this way. A reader who had built his own A.C. receiver complained to us that quality deteriorated and volume dropped after the set had been switched on for about half an hour. When full details of his receiver were obtained it was found that a 7-watt speaker having a field winding resistance of 1,000 ohms was being used. A current of 120 mA was being passed through this winding and, therefore, although the resistance of the winding was of the correct value the wattage dissipation (approximately 15 watts) was much higher than the rated wattage (7 watts). This resulted in overheating and consequent distortion.

Vitesse Troubles

SEVERAL readers have written to us complaining that the volume from their home-constructed Vitesse is low and that they are troubled with a faint motor-boating interference. It has been found, in most cases, that the lack of volume is due to incorrect adjustment of the I.F. and coil-unit trimmers. If adjustment of the I.F. trimmers does not improve sensitivity the cover of the coil unit should be removed and the trimmers attached to the coils carefully adjusted—one trimmer is attached to each coil. It is emphasised, however, that these coil trimmers must not be touched if no signals can be heard.

Motor-boating

THE motor-boating and slight instability is due to I.F. oscillation and can be cured by shortening the leads from the I.F. transformers and keeping the two sets of leads from these two components well apart. If the lead joined to the cap of the 210 VPT is left unscreened or is passed near the grid lead of the same valve a reaction effect is produced and instability occurs, a whistle being then heard when tuned to a station. In exceptional cases it has been found advantageous to unsolder the two leads joined to the tags of terminals 1 and 3 of the second transformer passing these leads through the chassis, and leaving the terminals unused.

West of England Transmitter

I UNDERSTAND that the West of England Region will mark its first week of independent existence by a special series of programmes which will represent, as far as possible, all parts of the Region. Mr. G. C. Beadle, whose appointment as West of England Regional Director was announced recently, will inaugurate the new service by a talk on Sunday, July 4th, and on the same day a religious service will be broadcast from Bristol Cathedral, with an address by the Bishop of Bristol.

Two important feature programmes are to be given, as well as talks by many popular favourites, including S. P. B. Mais and A. L. Rowse. Bernard Fishwick, who has taken part in many feature programmes, will read a story by "Q."

Musical activities, variety, and light music, provided by Fred Winslow's Serenaders, Leonardi and his Orchestra from Bournemouth, and the Band of His Majesty's Royal Marines, Plymouth Division, will be included in the programmes.

Practical Television

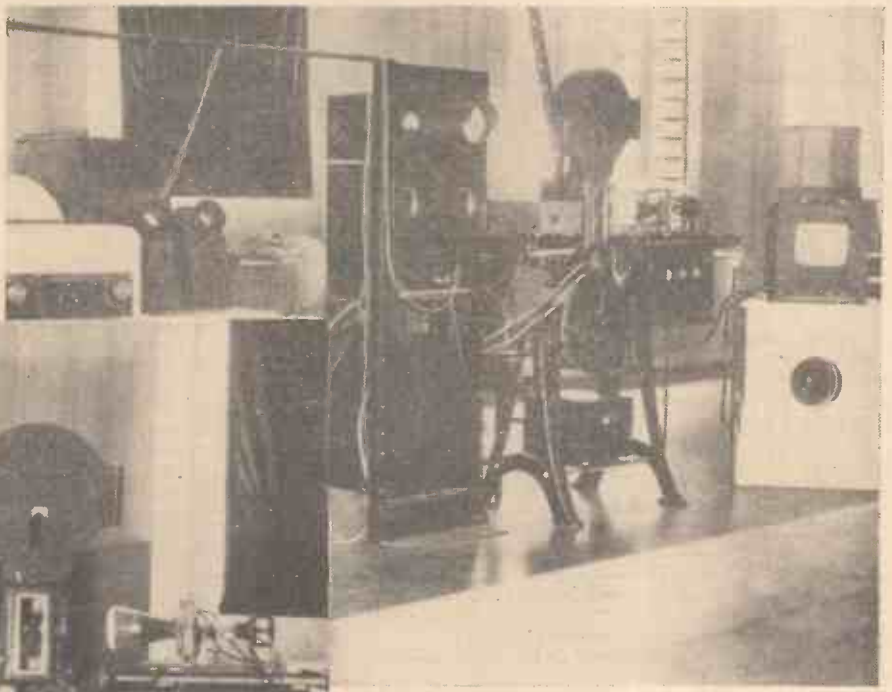
July 3rd, 1937. Vol. 3. No. 57.

Cossor Film Transmitter

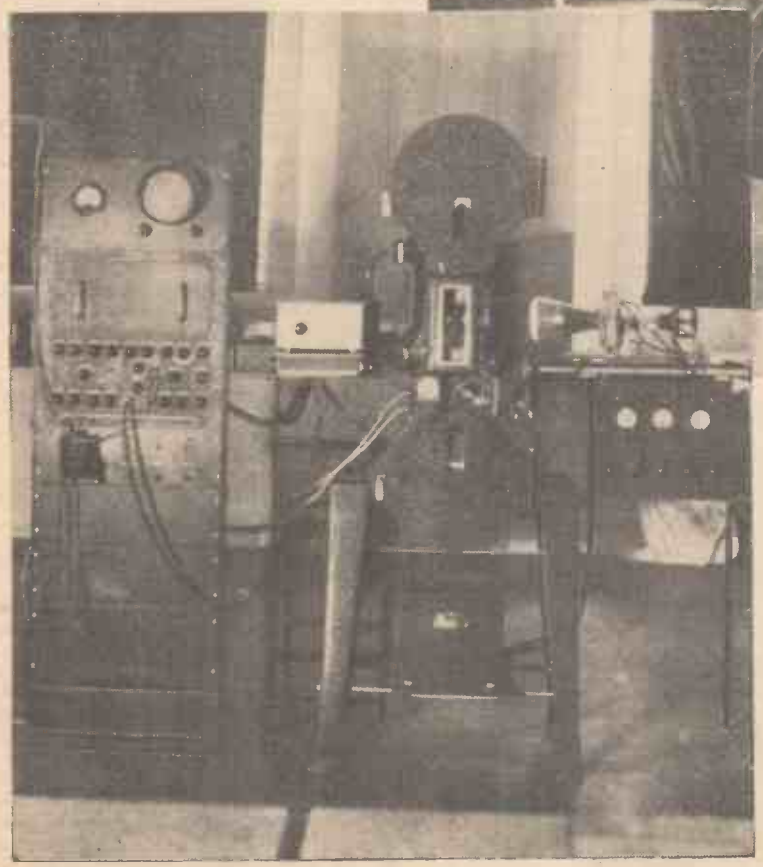
THE accompanying illustrations show the special Cossor film television transmitter which is installed at the Science Museum, South Kensington, in order to radiate a picture for demonstration purposes when the regular B.B.C. television transmissions are not available. This apparatus enables five different line frequencies to be radiated, namely, 405, 315, 243, 187, or 121 lines, with either sequential or interlaced scanning in each case. Thus it is possible to make instant comparisons between the advantages of any particular line frequency with either type of scanning. The apparatus also incorporates special time-base generators which enable the various advantages of different systems to be instantly ascertained. In the general view two small cathode-ray oscillographs may be seen on the table to the left, and in these members of the public may view the differences in results obtained by various circuit changes.

Picture-size Problems

IN many quarters discussions are taking place on questions of increased television picture size. Without thought of the prime and auxiliary problems associated with this, many people say that a larger picture is necessary before the popularity of the service will become apparent. The keen observer, however, looks at the whole aspect before voicing any opinion and finds that matters are not easy of solution. For example, the picture-viewing angle cannot be increased indiscriminately. In a cinema which has its best seats at the back of the theatre, the angle is of the order of 15 degrees, and this is comparable with that found in some of the present-day television sets when the pictures are watched from the correct distance. An increase in size with the standard of definition unaltered would bring to light the line formation and widen the angle of vision if the viewing distance was maintained. To lose the line formation the viewing distance must be increased, thus automatically restoring the old viewing angle, but there is a limit to this owing to the size of the room in which the set is accommodated. Increased standards of definition will allow a shorter viewing distance and wider angle, but there must be sufficient picture brilliance or eye fatigue will evidence itself, due to the strain in watching a dimly-lit picture. All these factors are being taken into consideration in the research laboratories which are investigating the larger picture problems, and before a satisfactory solution is arrived at a reasonable compromise must be found. In this connection it is interesting to note that Zworykin in America is attempting to apply the principles of the Iconoscope to the receiving end in order to achieve larger pictures. A semi-transparent mosaic is interposed in the path of a source of light and lens system which projects a beam on to a remote screen. The scanning beam, operated and modulated from the cathode-ray electrode section of the device, is made to pass over the mosaic and at the point of impact the mosaic allows light to pass through the elemental area in direct proportion to the degree of signal modulation extant at that moment. Just as in the early days of television suggestions, shutters at the receiving end were opened by an amount dependent on the received signal to give a coarse-grained picture of relative light and shade, so this electrical equivalent imparts a degree of transparency to each elemental window which will enable a complete picture to be observed of adequate brilliance and definition. Whether the scheme will prove successful only time will tell, but it is an indication of how the ingenuity of modern television engineers is being applied to meet the needs of the commercial world.



A general view of the transmitter, showing the cathode-ray oscillographs on the left, which may be viewed by visitors to see the effect of various adjustments.



A close-up view of the Cossor film television transmitter at the Science Museum, South Kensington.

A Useful Comparison

ALTHOUGH it has only been open a short time, the television exhibition at the Science Museum, South Kensington, has proved an unqualified success if judged by the number of people

(Continued overleaf)

(Continued from previous page)

who have paid it a visit. By means of infra-red light beams at each door entrance working in conjuction with photo-electric cells, counters record the number of times the beam is broken by persons passing into the hall where the exhibits are arranged, and for the first two days the total was in the neighbourhood of 10,000. The genuine co-operation of rival television firms is a marked feature, and the hard-working efforts of the organising committee are reflected in the friendly spirit which exists among the staffs responsible for the display of the equipment. Obviously, the most popular feature is the demonstration of television reception by radio and line on the eight cathode-ray tube sets, and the Scophony experiments with their 240-line picture radiated from their low-power experimental transmitter at Camden Hill, working on carrier frequencies of 49 and 47 megacycles respectively. This is the first time that the public have had an opportunity of comparing the results on sets when working from the same signal, and it is clear that one or two makes are outstanding in their performance. Seven of the receivers are standard commercial models, while the eighth is experimental, but may be on the market in time for Radiolympia. The line pictures derived from the Cossor film transmitter work on exactly the same standard as the Alexandra Palace transmissions, the films used being those employed by Baird Television, Ltd., for their Crystal Palace transmissions. There is no doubt that the exhibition will foster the widest possible public appreciation of television as a home entertainment, while, by learning something of the principles involved, the work of the research engineers will be better understood.

Britain Well Ahead

THAT Britain is well ahead of America in television development is confirmed in many quarters. After visiting research laboratories all over this country an American business men's delegation, numbering forty, admitted quite freely that not only had they been deeply impressed by what they had seen of television activities and the service now operating, but confirmed that American work had not yet reached such an advanced stage. This bears out the remarks of British engineers who have had an opportunity of visiting the United States recently. Although the standard of definition (441 lines) is slightly higher than in Britain and the frames per second 60 (interlaced), the method of synchronising and type of modulation is different, and so far has not proved as effective as that employed by the B.B.C. Plans are in progress for eventually establishing six transmitting stations, and it seems certain that the first two will be operated by the National Broadcasting Co. and the Columbia Broadcasting Corporation, while two others will be in the hands of Farnsworth and Philco. Confirmation has been received of the fact that both the sound and vision signals from Alexandra Palace have been heard and seen at Long Island by R.C.A. engineers, and although according to present knowledge this is regarded as a freak result, further research into the almost virgin field of ultra-short wave technique may reveal methods whereby consistent communication over this distance can be maintained.

Televiews

Meeting Rigorous Conditions

CABLES capable of handling television frequencies from zero to two and a half megacycles have been the subject of considerable research, for the problems involved are of a more rigorous character than telephony. According to the special purposes required, that is, local distribution as in the case of flat installations, small area coverage as exemplified by the "ring main" laid to vantage points in London, long-distance communication such as the London to Birmingham cable, so the type of cable employed differs in many of its characteristics and construction. That the design of the "ring main" cable has been satisfactory was borne out by the Coronation experiment, and the co-operative work of Siemens and E.M.I. in this connection is a matter for congratulation. The cable itself, which up to the present has a total route length of nearly fifteen miles, is of the balanced twin type, having two self-locating conductors, 0.08in. diameter, paper insulated and lead alloy sheathed. To fulfil the conditions of low specific inductive capacity and small loss at video frequencies, an air dielectric is used as much as possible. The Siemens-E.M.I. cable is centrally self-locating by crimping the conductor at intervals to a form closely resembling a complete sine wave, and allowing successive crimps to lie in planes at right angles to each other inside the insulating tube. The co-axial cable is surrounded by the metallic return conductor, while the separate cores are twisted together, and have a copper screening tape wound round them.

In California

THE California Institute of Technology recently staged a scientific exhibition, and foremost among the demonstrations was the television transmission and reception arranged by the Don Lee Broadcasting Co., from their station at Los Angeles, 10½ miles away. In the early low-definition days this station was among the first to provide experimental broadcasts, and their work has continued almost uninterrupted to the present time, stage by stage improvements being made periodically. On this occasion televised films were shown on cathode-ray tubes, but the picture size was only approximately 7ins. by 6ins., while the standard of definition gave 300 lines worked at 24 pictures per second. In spite of the hilly nature of the intervening country and the relatively low power employed, good results were obtained from the W6XAO transmitter, and before long it is hoped that the equipment will be altered to conform to the recommended U.S.A. standard of 441 lines interlaced. In that same district the Society of Motion Picture Engineers discussed some of the possible interacting effects of the film and television industries. One remark was to the effect that if the technical and programme requirements of the talking films and television were balanced, then it must be concluded that the former should have the advantage of leading in artistry, whereas the latter must depend upon the spontaneity of its presentations. Definite co-operation between the two industries was essential for the well-being of both, and the sooner this was put into effect the sooner would be removed the suspicion that television in its ultimate fulfilment was destined to ruin the film industry from the point of view of public entertainment.

THE HOGARTH PUPPETS

A puppet orchestra will be televised in the afternoon programmes on Saturday, July 3rd and 10th in the Hogarth Puppet Cabaret. This puppet show is the joint creation of Jan Bussell, one of the producers at Alexandra Palace, and his wife Ann Hogarth, who have made the small figures, measuring about 15ins. in height, and the miniature stage, together with all the scenery and dresses.

The five "players" in the puppet orchestra will be worked by three operators on an invisible rostrum. Among the turns in the cabaret will be an unusually realistic snake. This particular specimen has travelled the West Country and the Cotswolds, and is the oldest member of the troupe. At a charity fête it was actually worked by H.M. the Queen, then Duchess of York.

The Best Carrier Frequencies

EFFORTS are now being directed, especially in America, towards a determination of the best carrier frequency channels for television services. It is known that the American R.M.A. has asked the Federal Communications Commission to reserve 40 to 90 megacycles exclusively for television broadcasting, but among the experts doubt is expressed as to whether this is the best policy. This situation has arisen as a result of the vagaries of coverage of the wavelengths within this band. For example, in this country 45 megacycles was not expected to extend beyond 25 miles, but this has been more than doubled in many directions. Again, signals from Alexandra Palace have been received on the Continent, South Africa, and America, and although this may be as a result of the ionised layers discovered by Watson Watt, it has led to a complete revision of plans for establishing television stations in this country. Any extension beyond local areas is liable to give rise to all the selectivity and station wavelength allocation problems associated with sound broadcasting, a factor not in any way anticipated with a high-definition television service. With only one or two stations in operation all is well, but as soon as the demands of the provinces become too insistent to be ignored, difficulties are sure to arise.

Concurrent with this wavelength problem another difficulty is exercising the authorities in America. This is due to the sponsored programmes which are employed in that continent. With only one of the five human senses to cater for, namely, hearing, a nation-wide cable network can distribute the programme to the stations which broadcasts the "boosts" of a particular advertisers' products. Television signals do not lend themselves to this simple scheme, however, owing to the frequencies involved, and a new cable network is an expensive proposition to contemplate. It is doubtful whether advertisers will pay the full cost involved, and the commercial angle is likely to present some difficult problems.

A PAGE OF PRACTICAL HINTS

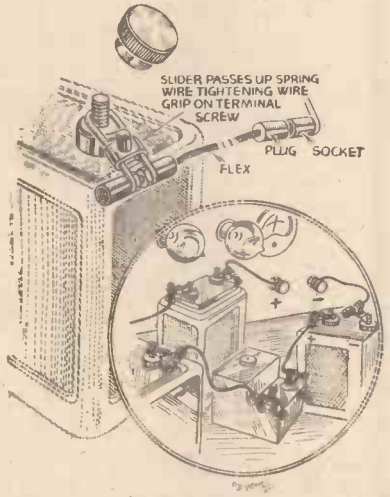
SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

Connecting Strips

TO facilitate the changing of accumulators while charging, I perfected and constructed a number of novel clips, as illustrated.

The material required for these strips was obtained from a length of heavy galvanised wire, a strip of about 20 gauge soft brass and a few insulated plug sleeves usually to be found in the junk box.

It will be seen that not only may the interchanging be simply effected owing to the plug and socket nature of the design, but longer connecting lengths are made possible at a moment's notice. This design I have found to be also useful when using H.T. accumulator packs.—C. O. MALTBY (Wolverhampton).



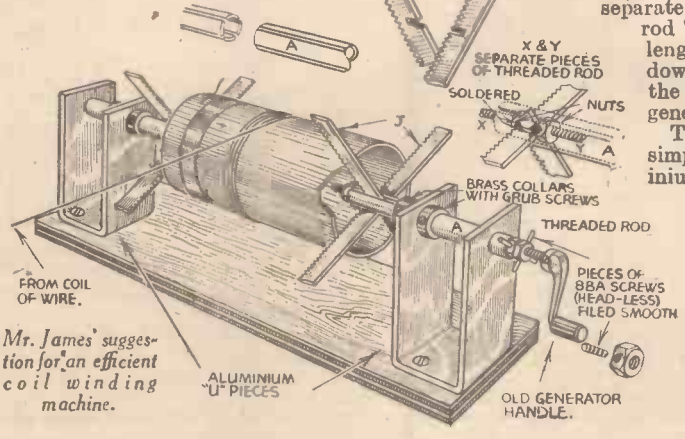
A simple and effective way of making good connection to terminals.

An Adjustable Coil Winder

THE accompanying diagram shows the simple construction of a very efficient adjustable coil winder which I have found to fulfil admirably such duties as simple layer and pile winding, with varying lengths and diameters of coils, thus affording considerable scope and facility in the designs of tuning inductances, H.F. chokes, transformers, etc.

The binding jaws "J" were constructed from strip brass, and I have actually used hacksaw blades, but these tend to bend with any degree of pressure should the assembly not be "true" to centre, however, the lengths of strips are determined, cut, then "toothed" by utilising the edge of a file.

The rotor tube "A," in my case, is of brass, but ebonite may be substituted if more convenient; the slots are made with a hacksaw, then filed smooth to permit ease of adjustment.



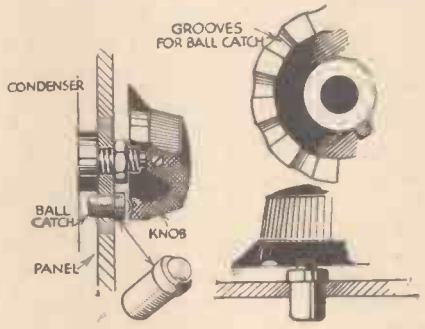
Mr. James' suggestion for an efficient coil winding machine.

The jaws are interlocked, as shown, and secured by soldering to two nuts and separate lengths of threaded rod "X" and "Y," the length "Y" continuing down the tube to receive the adjusting nuts and generator handle.

The "U" pieces were simply made from aluminium (⅛in. thick approximately) and the whole assembly aligned and fixed to a piece of 5-ply wood, the appearance being enhanced by carefully smoothing down sharp edges of metal with a fine file, and giving the wood a coat of varnish.—R. E. P. JAMES (Winchester).

THAT DODGE OF YOURS!

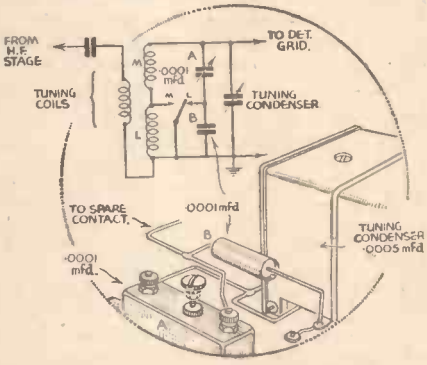
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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



A band-setting device for use with ordinary control knobs.

Switching Trimmer Condensers

WHILST fitting an external trimmer to the detector stage of a 2 H.F. receiver and finding that more capacity was required upon the "long" than "medium" waveband, and by utilisation of a spare (normally closed) contact upon the wavechange switch, I was able to overcome the difficulty by using the arrangement shown in the above diagram.—J. H. MAKINSON (Huyton, L'pool).



Trimming condensers may be switched by adopting the arrangement shown here.

Band-setting Condenser

HERE is a simple and efficient method of setting the positions of a band-setting condenser. It consists of a small spring ball-catch, as used for small doors and cabinets. A hole is drilled in the panel underneath the edge of the control knob of the condenser, large enough to enable the ball-catch to fit tightly into it. Half-round grooves are then filed in the edge of the knob in the required setting positions. The ball-catch engages with each notch as the knob is rotated. The diagram in the centre column makes the construction clear.—F. E. T.-PRATT (Birmingham 8).

ACCUMULATOR CH

How to Make Accumulator-charg for the L.T. and the H.T. Accumu

ONE of the greatest drawbacks to the battery-operated receiver is the continued visits which have to be paid to the accumulator-charging station, and every battery user knows the disappointment which often arises when the periodic visit is missed for some reason and an important broadcast has to be missed because the accumulator fails to deliver sufficient current to operate the valves.

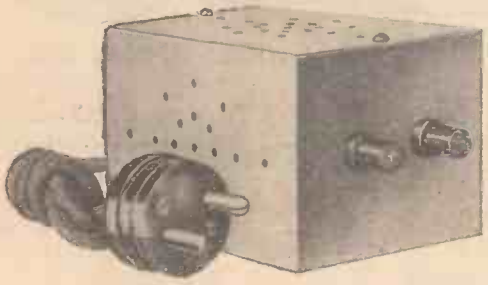


Fig. 1.—For those who do not wish to make a charger, a low-priced unit, such as the Heayberd Tom Thumb (12/6) may be used.

Of course, one good plan to avoid this trouble is to have two L.T. batteries and use them alternately, keeping one at the charging station whilst the other is in use, and many battery service stations now supply the listener with a "spare" whilst they are charging his own battery. Even so, where electric light mains are available it is not a difficult matter to keep your own batteries in good condition, although, with such facilities, there is no reason why a mains-operated receiver should not be used. Some listeners have a preference for the battery-operated set, however, and in other cases the acquisition of a mains set has to be delayed due to a question of expense or some other difficulty, and, therefore, the following notes will prove of value in enabling a suitable L.T. charging apparatus to be made up.

D.C. Mains

Where the electric mains are of the direct current or D.C. type, quite simple apparatus is required, although one important question arises. That is expense. The mains will have a voltage of 200 or more and to charge the accumulator only 2 volts will be required in the majority of cases. Therefore, 198 or more volts have to be disposed of before the accumulator can be connected, and this means that some sort of resistance has to be connected between the mains and the accumulator. The resistance will have to be chosen to pass the current required by the accumulator for charging purposes, and as every reader knows there will be a loss of power through the resistance, otherwise known as wattage dissipation. A lamp is the simplest form of resistance to use in this particular instance, and it will be obvious that the current taken by the lamp will have to be paid for. Thus D.C. charging in such a simple manner becomes expensive

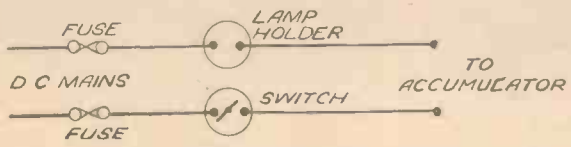


Fig. 2.—On D.C. Mains, quite a simple arrangement is called for, the circuit to be used being as shown here.

—depending upon the amount you are paying for your lighting supply. If, however, you can connect some useful apparatus in place of the lamp you can avoid the waste of electricity, and thus many listeners who use a D.C. supply only charge the accumulator during the evening when the lamp may be used for normal illumination in a reading lamp or for some similar purpose.

A small electric fire may be used in place of the lamp, or an electric iron or some similar device in order to avoid the waste, and Fig. 2 shows the general arrangement of the "charger."

The table A shows the lamps required for various current ratings.

Table A

Carbon Filament 200/260 volts.	Wattage	Current (Amps)
8 Candle Power..	36	.18 to .15
16 Candle Power..	66	.33 to .27
32 Candle Power..	136	.68 to .56

OTHER LAMPS
Voltage according to Supply:

40 at 200	.2
60 at 200	.3
75 at 200	.35
100 at 200	.5

Fuses should always be used when connecting apparatus with unprotected leads of this type, and it will be seen that a special fuse-holder is recommended so that a fuse may be included in each of the mains leads.

A.C. Mains

In the case of alternating current or A.C. mains, more difficulty is introduced due to the fact that the A.C. supply must first be rectified or converted into direct current, and this means that a special form of rectifier must be employed. These are available in several types to deliver various voltages from 2 to 12, and at various current rates, and thus the correct type of rectifier must be chosen to suit the accumulator which is to be charged. The accompanying table B shows the general types which are available, together with the input voltage (A.C.) which is required, and thus a transformer will have to be connected between the mains and the rectifier in order to step-down the voltage from that delivered by the mains to that required by the rectifier.

Table B

Type.	Output		Max. Input Volts.
	Volts.	Amps.	
LT2	6.0	0.5	11
LT4	6.0	1.0	11
LT5	12.0	1.0	22
LT6	6.0	2.0	11
A.4	9.0	2.0	14
A.6	6.0	3.0	9

Transformers for this purpose may be obtained from any of the well-known firms who specialise in this work, such as Messrs. Heayberd, Sound Sales, Varley, etc. As an additional requirement some form of regulator must also be included so that the current rate may be correctly adjusted, and for those listeners who require to make quite certain that the charging rate recommended by the makers is not being exceeded an ammeter should also be included. An instrument of this nature is quite cheap and may be obtained from Electradix Radios, whose advertisement appears in this issue. The circuit is shown in Fig. 3. The primary of the mains transformer is connected to the mains, using the tappings marked to correspond with the voltage of the mains supply, and a fuse should also be included in one lead as a safeguard. The simplest method of arranging for this is to use one of the specially-made plugs which contains a fuse ready wired. The output from the transformer is connected to the two A.C. terminals on the rectifier, again using the voltage rating according to the rectifier in use, and the positive and negative lugs on the rectifier must then be joined to the charging terminals with the regulating resistance and ammeter in series with the positive lead. If the ammeter is not being used the regulating resistance will be joined direct to the positive-charging terminal. On no account should this resistance be omitted, as it will act as a safeguard in preventing the flow of an injurious current should the accumulator be wrongly connected to the charging terminals. It will also act as a "ballast" and prevent damage which might arise as the battery becomes charged. When in a discharged condition the resistance of the battery is vastly different from its resistance when

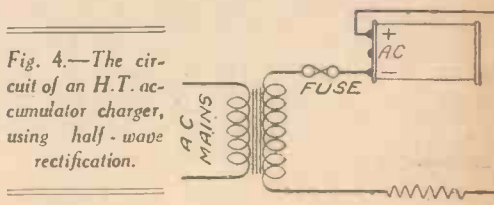
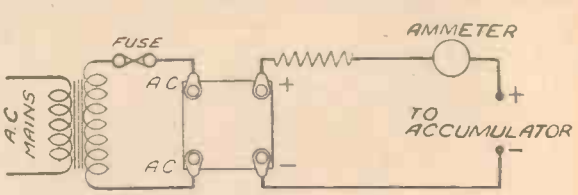


Fig. 4.—The circuit of an H.T. accumulator charger, using half-wave rectification.

Fig. 3.—For the A.C. mains supply, the L.T. accumulator-charging circuit is as shown here.



HARGING AT HOME

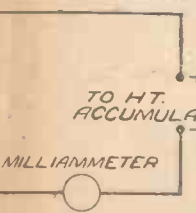
ing Units for A.C. and D.C. Mains,

ılator - - - By W. J. DELANEY

fully charged, and thus the current which will flow through it at the extremes will vary unless the resistance is included. The tables C and E show the value of the resistance which is required under different conditions with the rectifiers already mentioned, and to obtain the odd values of resistance required in a "Universal" charger, one of the simplest plans is to obtain a baseboard-mounting pre-set resistance of the type which is wound on a porcelain or china base. These may be obtained with maximum values of 2 or 6 ohms, and it is a fairly simple matter to divide the resistance element into divisions to obtain approximately the values required according to Table D.

Table C

Rectifier.	Charging Rate (Amps.).	Accumulator Voltage.	Resistance Ohms.
LT2	.5	2	10.0
LT4	1.0	2	5.25
LT5	1.0	6	7.0
LT6	2.0	2	2.5
A.4	2.0	2	3.5
A.6	3.0	2	1.5



H.T. Accumulators

It should be emphasised here that it is not possible to make a charger from a metal rectifier used in an old H.T. mains unit. Many listeners have old H.T. units which they no longer use or which have been picked up cheap at a "disposals" store, and often write to know whether they can tap the rectifier or otherwise adapt it in order to make an L.T. charger. It should be remembered that the current passed by the rectifier depends upon the size of the elements used in it, and for the H.T. unit the maximum current is generally of the order of 30 or 60 milliamps. This is .03 or .06 amps., and it will be noted from the table above that the minimum current needed for the L.T. charger is .5 amps or 500 milliamps, and thus it is not possible to make use of the H.T. rectifier.

For charging the H.T. accumulator units which are favoured by many listeners in preference to a dry H.T. battery, the procedure is exactly the same, except that a different type of rectifier is required. Here a standard H.T. rectifier may be employed

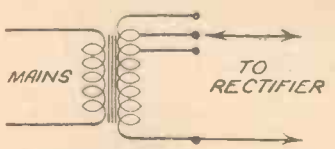


Fig. 5.—A tapped transformer will enable various accumulators to be charged.

and either the H.T.8, H.T.9, H.T.10 or H.T.12 units may be used, and the rectifier must be chosen according to the battery voltage and the value of the regulating resistance which must be used as in the case of the L.T. charger. Again, a meter should be included, this time a milliammeter, in order to ascertain that the correct current is flowing. Fig. 4 shows the rectifier connected on the half-wave principle, whilst Fig. 6 shows the rectifier connected in the voltage-doubler circuit, and, therefore, the correct connection must be chosen according to the table.

A Final Point

It is interesting to note that when charging the L.T. accumulator the charger may be made of "universal" application if a transformer with a tapped secondary winding is employed, and then it is possible to charge different types of L.T. battery. Thus, using the L.T.2 rectifier with a 2.5 ohm resistance, the transformer selected may have an 11-volt secondary winding, tapped to provide 7.5 and 9 volts. When the 7.5-volt tapping is connected to the rectifier a 2-volt battery may be charged; by using the 9-volt tapping to the rectifier a 4-volt battery may be charged, and by using the 11-volt tapping a 6-volt battery may be charged. The following table shows these points clearly.

Table D

Rectifier.	Accumulator Voltage.	A.C. Input (Transformer Tappiugs).	Fixed Resistance Value. (Ohms)
LT2	2	7.5	2.5
	4	9.0	
	6	11.0	
LT4	2	7.5	1.75
	4	9.0	
	6	11.0	
LT5	6	15.0	1.75
	10	18.0	
	12	22.0	
LT6	2	7.5	1.0
	4	9.0	
	6	11.0	
A.4	2	5.5	.5
	4	7.5	
	6	9.0	
	8	14.0	
A.6	2	4.5	.5
	4	6.5	
	6	9.0	

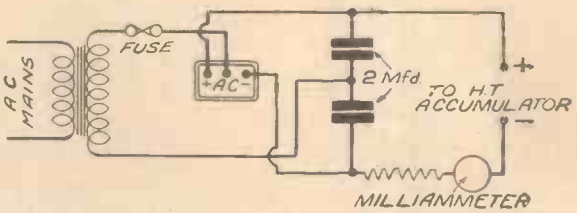
Fig. 7.—For the motorist, or those with larger accumulators, this Heayberd Model AO3, at 50/-, will prove of great value. It delivers 1 amp. at 2, 6 or 12 volts.

Table E

Rectifier.	Accumulator Voltage.	A.C. Input Fixed.	Resistance Values (Ohms.).
LT2	2	11	10.0
	4		6.5
	6		2.5
LT4	2	11	5.25
	4		3.25
	6		1.75
LT5	6	22	7.0
	10		3.5
	12		1.75
LT6	2	11	2.5
	4		1.75
	6		1.0
A.4	2	14	3.5
	4		3.0
	6		2.0
	8		1.5
A.6	2	9	1.5
	4		1.0
	6		0.5

from coming into contact with the metallic parts of the battery and leads. Therefore, when charging is completed all metallic parts should be cleaned with a piece of rag and thoroughly dried. The rag should be burnt afterwards to avoid risk of damage to other articles. A rubber mat should be placed beneath the battery, or a shallow rubber tray to avoid damage to the table or bench upon which the battery is placed during charging, and in the event of any acid being spilt it should be immediately

Fig. 6.—Full-wave rectification may be incorporated in an H.T. accumulator charger as shown in this illustration.

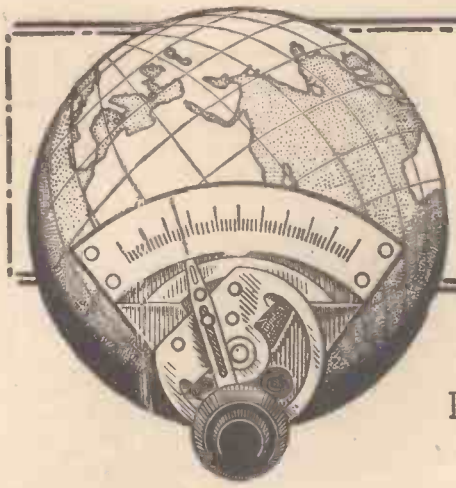


Care of the Accumulator

Before concluding this article a few words on the proper care of the accumulator must be added. Whilst the battery is being charged the vent plugs must be removed to allow the gas which is driven off to escape. Failure to do this may result in the battery exploding with resultant damage and perhaps fire. The bubbling which takes place when charging is nearly completed also results in a fine spray being driven out of the vent hole, and this will cause corrosion unless removed or prevented neutralised with an alkaline solution. A jar of soda should be kept handy for this purpose, and if the acid is spilt the soda should be immediately placed upon the spot and more added until it stops effervescing.

The skin will be burnt if strong acid is allowed to come into contact with it and, therefore, the hands should be carefully used.

To make up the loss due to evaporation only distilled water should be added and this may be obtained quite cheaply.



SHORT WAVE SECTION

MAN-MADE INTERFERENCE ON SHORT WAVES

Details of an Efficient Screened Aerial Coupling are Given in this Article. By PERCY RAY

READERS who are interested in short-wave work, and who have the misfortune to be troubled with interference from man-made static, will find the following screened aerial coupling of material assistance. The diagrams show connections for the doublet type of aerial, as it is assumed that the ordinary single-wire aerial will not be in use where man-made static is prevalent. The same arrangement can also

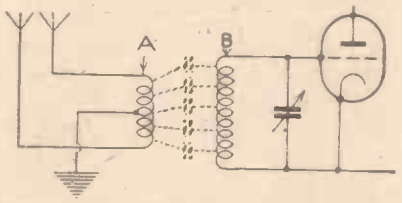


Fig. 1.—Diagram illustrating self-capacity between the grid and aerial coils.

be used where an ordinary conventional aerial is employed, but it is not so effective.

Coil Construction

Fig. 1 shows the conventional coupling for a doublet aerial, and readers' attention is directed to two points. The transference of energy from "A" to "B" is only considerable when "B" is tuned to the frequency of such energy, but the transference of any voltage by means of capacity between "A" and "B" will be quite considerable, irrespective of frequency considerations; consequently, if the transferred energy from "A" to "B" by virtue

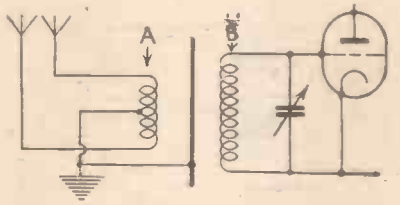


Fig. 2.—How the electro-static screen is interposed to prevent the capacity coupling.

of the capacity between them could be eliminated, a considerable amount of electrical interference would be avoided. The capacity existing between these two coils is diagrammatically represented by a series of condensers, shown dotted. Fig. 2 shows an earth screen interposed between coils "A" and "B," which reduces the capacity existing between them to a negligible extent while not greatly affecting the magnetic coupling between them.

The construction of such a coil is shown in Fig. 3 which shows both the end view, and the general make-up. The grid coil (coil "B") is wound on paxolin former, and wrapped round with insulating material, either thin sheet ebonite, or Empire cloth. The coil is then wrapped round with copper foil, and then round the centre the aerial coil with, of course, suitable insulating material between it and the copper foil. Where a coil of lower loss is desired, the conventional air spaced grid coil may be wound with sufficient glass beads threaded on the wire to form a stand-off insulator for the copper screen, which can be of sufficiently stout material to prevent it from getting out of shape and touching the grid coil between the glass beads. The writer has a series of very efficient coils made from circular copper screening cans, with the closed end cut off to form a tube, and the grid coil made to fit snugly inside supported by the glass beads above referred to. The aerial coil can be wound on the outside of the tubular screen by using glass beads once more as separators, the gauge, of course, being sufficiently thick to prevent the wire from sagging and touching the metal.

Copper Screen

The centre of the grid coil can be earthed direct on to the metal below it, an arrangement that is both convenient and efficient, and it should be specially noted that the length of the metal tube should be at least 50 per cent. longer than the grid coil. Copper is strongly recommended for the screen, although aluminium is a fairly efficient substitute. The glass beads referred to should be of considerable size to ensure reasonable spacing between the coil and shield, and also to allow of adequate gauge wire being threaded through them. Glass beads having a diameter of rather more than $\frac{1}{16}$in. were used by the writer, which permitted 18 gauge wire to be threaded through them, although 16 gauge wire could be threaded through the majority.

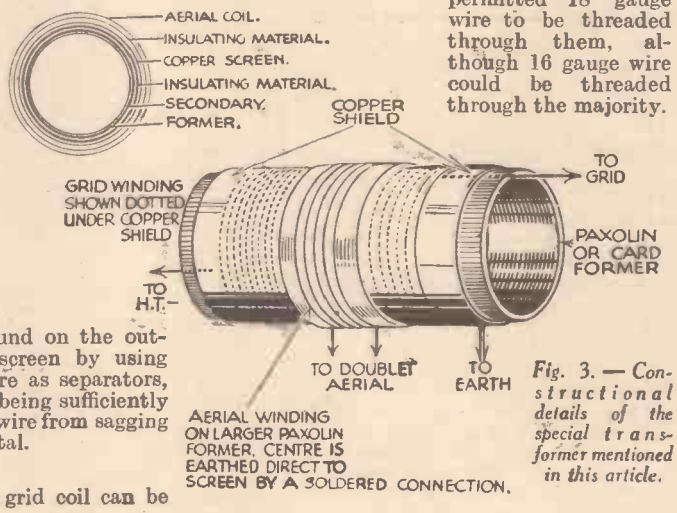


Fig. 3. — Constructional details of the special transformer mentioned in this article.

Leaves from a Short-wave Log

Denmark's New 5-Kilowatter

TESTS are being carried out almost nightly between G.M.T. 02.00-06.00 by the new 5-kilowatt station recently installed at Skamlebaek (Denmark). The channels used for the experimental transmissions are 49.5 m. (6.06 mc/s). and 31.5 m. (9.52 mc/s).

Tenerife Radio Club's New Schedule

Nightly on 28.93 m. (10.37 mc/s) the Radio Club of Tenerife (Canary Islands) transmits through the 20 kW. station EDR3, at el Tablero, war news bulletins in several languages. The times, at present, are as follows: G.M.T. 20.00-20.49 (Spanish); 20.50 (Russian); 21.00 (Italian); 21.10 (German); 21.20 (English); 21.30 (French); 21.40 (Portuguese); 00.00 (Spanish); 00.20 (German); 00.30 (English); 00.40 (French); and 00.50 (Portuguese). The call is: *Aqui Radio Santa Cruz de Tenerife*, and the station usually closes down with the Fascist hymn and the words: *Arriva España.*

New Polish Station on the Air

SPF, Gdynia, may now be heard testing on 24.34 m. (12.325 mc/s) between G.M.T. 19.00-20.00. Announcements preceding experimental transmissions are given out in Polish, German, English, French, Italian, and Spanish.

Is VUB, Bombay, Working?

Listeners state that for the past few weeks no signals have been picked up from the Bombay short-wave transmitter. According to one report broadcasts have been suspended pending the installation of the new 5-kilowatt plant.

BRIEF RADIO BIOGRAPHIES—13

By RUTH MASCHWITZ

The Two Leslies

IT is now nearly two years since Leslie Holmes and Leslie Sarony joined forces as the Two Leslies. Their act is a comprehensive one embodying singing, dancing, playing and comedy.

Leslie Sarony, who is well known as a writer of comedy song hits, did not know he possessed this gift until he was in Malta during the War, where he was invalided after serving with the London Scottish in France and Salonika. It was here that he discovered his ability to write and compose songs, which were performed with great success by the concert party at the hospital. After being demobilised, he determined to try to get some of them published, and after a long and hard struggle "Susie was a Real Wild Child" was accepted. After that he turned out winner after winner, which included "I Lift Up my Finger and I Say Tweet Tweet," which was published in nearly every language. Sarony's activities cover almost every branch of the profession, having been in concert party, pantomime, revue and many musical comedies. Recently he has been working in films.

Leslie Holmes has had a varied career, ranging from farm hand, railway clerk to traveller for biscuits. It is not generally known, but he played the piano in a cinema in his very youthful days, and after that he was drummer with Henry Hall at the famous Gleneagles Hotel and Midland Hotel at Manchester. He then went as professional manager to the well-known music publishers, Campbell and Connelly at Manchester, where he remained for some considerable time, after which he was transferred to their headquarters in London, where he took over the management for six years. It was through his broadcasting to America with one of the leading dance bands that he was discovered and designated as the Man with the Smiling Voice. He was immediately signed up by one of the most important gramophone companies. The Two Leslies between them have been responsible for such songs as "Wheezy Anna," "It Always Starts to Rain," "Come Pretty One," "Whistling Mary" and "Silly Girl."

Denier Warren

SINCE the early eighteenth century every generation of the Warren family has been represented on the stage, and Denier is carrying on the tradition.

He made his first theatrical tour when he was eight. His parents had a kind of concert party and they travelled through Africa with some of the first films which were ever sent out there. The natives could hardly believe their eyes. One old Kaffir was so excited at seeing the animals of the Paris Zoo march across the screen that he ran round behind to find out where they had gone! It was a hard life, for the company travelled from place to place in bullock carts and slept under the wagons. Denier's part in the performance was to sing the old favourite comic songs.

In the early music-hall days the Warrens came over to England. As his parents were not anxious for him to take up a theatrical career Denier was sent to Paris to open a music shop. He stayed there for several years at the same time doing journalistic work. Incidentally, it was through his agency that the Cake Walk was introduced to Paris. Eventually he came back to London to go on the stage.

Pantomime at Drury Lane was his first venture. He appeared as an Ugly Sister in "Cinderella" and stayed at the same theatre for eight years. He told me an amusing incident that happened during one of the rehearsals.

A young peer who was interested in the show used to make frequent visits to the theatre to see how things were progressing. The pantomime was "Beauty and the Beast," and in one of the scenes witches flew down to the Beauty's couch. The peer was particularly intrigued by the flying mechanism, so one day the producer suggested that he might like to try it. Without more ado he was buckled into the harness and hoisted into the flies.

"How do you like it?" shouted the producer.

"Fine!" was the enthusiastic reply.

"Right, we'll have a break for lunch!"

There was a general exodus, and in spite of the young peer's cries and entreaties for release he was left hanging for an hour and a half!

Denier has performed in every type of show from pantomime, revue, musical comedy to Shakespeare. He has also appeared in films and is a constant broadcaster.

Jack Payne

JACK PAYNE was born in Leamington in 1899. Always music mad, there is a story that when taken as a baby to listen to the band in Jefferson Gardens, Leamington, he was never happy unless given a rolled-up newspaper with which to conduct. At the age of twelve he was teaching his music mistress to play the piano!

His first stage appearance was as Juno in a school production of "The Tempest," when he lost his nerve and was only saved by Ariel remarking fiercely, "Spit it out, you silly young ass!"

He served with the R.F.C. and R.A.F. during the war, and had his first experience of dance-band work as pianist in a scratch band organised in the officers' mess at Scampton in Lincolnshire. After the Armistice he was led by the post-war dance boom to take up the work professionally, and organised dance bands round the country.

In 1923 he married Doris Pengree secretly, and came to London with £9 in his pocket where his wife did much to help him on the way to fame.

Jack maintains that 13 is his lucky number. It was the 13th day of the month and a Friday when he bearded the manager of the Hotel Cecil and suggested that the hotel should engage his dance band. It was from here that he first broadcast on Boxing Day, 1925, and continued to do so regularly during the years 1926-28. He then suggested to the B.B.C. that they ought to engage him and his dance orchestra, and was forthwith installed in Savoy Hill where he remained until the end of 1932.

Jack plays a dozen instruments and thinks the saxophone the easiest and the violin the hardest. He loves dogs, horses, flying and Edgar Wallace stories.

A New Three-valve Superhet

Details of the Interesting New Range of Cossor Receivers

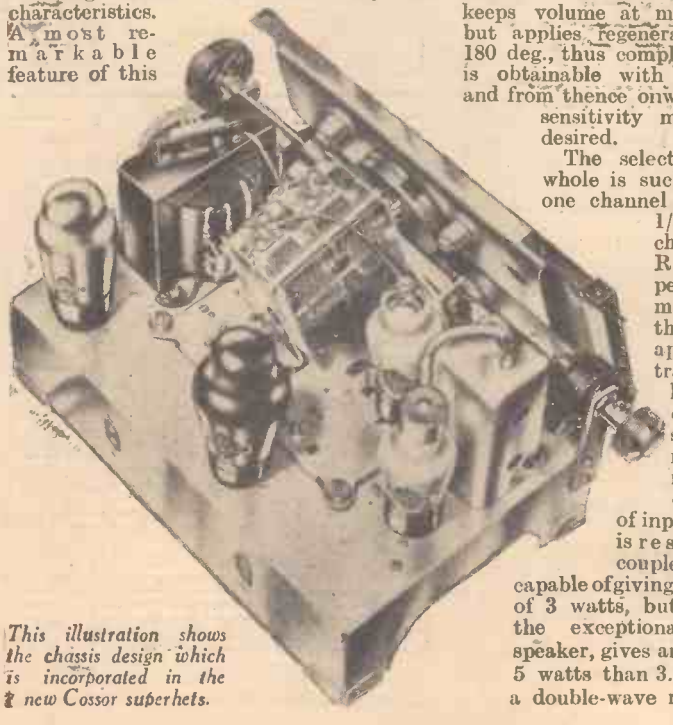
A. C. COSSOR, LIMITED, have just announced a new three-waveband superhet, or perhaps it would be more correct to say five new superhets, there being an A.C. model, a Universal model, two battery models, and a console. As these models are, in principle, similar, the following notes are based on Model 484, which is the A.C. version, and, therefore, one which will appeal to a very wide public.

Describing the circuit in its logical sequence, the aerial coupling first of all engages attention. The conventional bandpass tuning has been dispensed with, giving consequent gain in sensitivity; freedom from second-channel interference is obtained by the special design of the coils, which have very flat response over the tunable frequency and remarkably little response outside it; thus, with the frequency chosen for the I.F. coil, second-channel whistles do not arise, because their origin would necessarily be outside the tunable range, and, therefore, eliminated by the very small impedance of the aerial circuit to such frequencies. The first stage is conventionally a mixer valve making use of a screen triode hexode with a very special form of coil in the anode circuit.

Novel I.F. Units

It is well known that the overall performance of a superhet is positively decimated if the bandpass I.F. coil gets out of alignment, which it may very easily do by changing capacity of the trimmers. In this new Cossor coil, trimming condensers are a fixed capacity, being made of anodically deposited silver on mica, making change of capacity quite impossible. The alignment, or ganging, is accomplished by the iron cores, which are screwed into a moulded former so arranged that after accurate ganging on an oscillograph, the ends of the cores are sealed, and the most violent handling cannot afterwards vary the characteristics.

A most remarkable feature of this coil is that on medium and long waves it is a bandpass type, working on a frequency of 465 kc/s, whereas on the short waveband the I.F. coil becomes virtually a tuned anode, and works on a frequency of 1,363 kc/s. This results in a very large increased gain on the short-wave band. A frequency of 1,363 would, of course, give greater gain on medium and long waves, but its use is rendered impossible, as a frequency in this neighbourhood would make second-channel interference intolerable; but by this patented feature of a carefully chosen frequency on medium and long waves, and a more suitable frequency on short waves, freedom from second-channel whistles is obtained on the upper bands, and very high gain where it is wanted on the lower band.



This illustration shows the chassis design which is incorporated in the new Cossor superhets.

New Regeneration Control

The detector valve is a variable-mu screened pentode, with regeneration applied to its grid with a suitable coupling coil. This again has been so arranged that as regeneration is applied and the response narrowed, the centre of its characteristic response curve remains stationary, so that the coil remains tuned precisely to the intermediate frequency. This regeneration is applied by means of a combined volume and regeneration control, which works in the following manner. From 0 to approximately 180 deg. it functions as a volume control acting on the variable-mu characteristic of the hexode. Further rotation keeps volume at maximum, but applies regeneration over the final 180 deg., thus complete control of volume is obtainable with constant selectivity, and from thence onwards selectivity and sensitivity may be increased as desired.

The selectivity of a set as a whole is such that the gain over one channel off tune is down to 1/50, and over two channels off tune, 1/400. Reverting to the pentode detector, it may be mentioned that the screened voltage is applied through a trailer resistance of high value, which, combined with a self-biasing action, results in the output remaining constant over a wide change of input voltage. This stage is resistance-capacity coupled to an output valve capable of giving an undistorted output of 3 watts, but when combined with the exceptionally sensitive loudspeaker, gives an impression more like 5 watts than 3. The mains pack uses a double-wave rectifier, and is quite conventional, except, perhaps, for the rather large value of inductance and capacity in the smoothing arrangements.

Features of Design

Now a word about the mechanical features. The dial is a large affair—9½in. by 5½in. The pointer swings downwards in an arc, as shown in the illustration, the idea being to prevent the top edge of the escutcheon from screening the top of the dial should the eye level be appreciably above it. The condenser is driven by a combination of planetary gearing and drum driving, giving a spindle-for-spindle reduction of 60 to 1, or 30 turns of the tuning knob over the 180 deg. swing of the pointer. A convenient hollow is provided in the tuning control, in which the finger tip may be inserted to enable the knob to be rapidly spun. This knob, like the combined volume and regeneration control, and on-and-off switch, is sunk into the side of the cabinet, rendering it invisible when the set is viewed from the front. There are thus no controls to be seen, with the exception of the three-waveband switch, which forms the pattern at the bottom of the escutcheon, and appears to be a mere ornament.

Model 484 Cossor 3-valve superhet.

Wavelength Ranges

The wavebands covered are 16 to 53 metres on short waves, 190 to 590 on medium waves, and 800 to 2,300 on long waves for the three mains models, the battery models having precisely similar tuning ranges, except that the short-wave band tunes down to 19 metres. All three mains models are adjustable from 200 to 250 volts, 40 to 100 cycles.

Prices for the five models are shown below:—

A.C. Model 484, 9 guineas: D.C./A.C. Model 484 U, 9½ guineas. 3-valve Battery Model 483, £7 19s. 0d.; 4-valve Battery Model 485, 9 guineas. Console Model 438, 10½ guineas.

ARE WE MAKING PROGRESS?

By PERCY RAY

Our Contributor Discusses Modern Receivers and Technique, and Looks into the Future.

ALMOST every day we read in the newspapers of "progress," and in this respect radio is no exception. Admittedly some of the progress about which we read in the lay press should be taken with a grain of salt, or disregarded altogether, but even allowing for all this, radio is still apparently making progress. Taking into account the present standpoint of the science, it is extremely difficult to see in which direction we may look for progress—real progress—in the future. Take first of all what is nowadays the homely superheterodyne; this is extolled as the last thing in receivers, yet it was in 1913 that Major Armstrong invented and patented the superheterodyne principle. To-day there is a wealth of perfected detail, but the principle remains unchanged.

The reception on short wavelengths has received a certain amount of impetus by the requirements of television, but still further below these wavelengths it is difficult to see in what direction progress can be made until the arrival of a basically new invention, as all attempts at amplification at these high frequencies have proved a failure in some degree. Probably the most stubborn of all the components of radio science is the electron.

Valves

The steady march of mains sets over battery sets has pushed into the background the much talked of "cold valve" requiring no filament current to heat it. This, mark you, has not yet been invented, but the early cathode-ray tubes produced in the last century were of the cold cathode type, having no heated filament, and the modern dull-emitter valve which is such an advance on the bright-emitter valve of 1920, is after all only a modification of the White valve of pre-war days which was definitely of the dull-emitter type, making use of a lime-coated filament running below red heat.

In effect, the electron has been made the servant of mankind, but a somewhat unwilling one, and every advancement in the direction of conquering the little chap, which, after all, weighs only .0000000000000000000000000000000901 grams, is fought with greatest difficulty. Great praise be to those who have wrestled with it successfully so far, but it is really time some definite advance was made as far as the radio industry is concerned. There has been considerable detailed improvement—the slope of valves is very much greater than ten years ago; the screen-grid valve is mechanically and electrically a great improvement on the original types available; short-wave technique has advanced; but we are still beaten on the very short waves by the time the electron takes to travel from cathode to anode. In other words, we are circling round the inventions of anything from 20 to 50 years ago, and progress, however rapid, in a circle is not progress at all; in fact, as far as radio is concerned there will be no progress until we wake up one bright morning and find that somebody has invented something which is basically new.

"P. and A. W." Directory of Radio Clubs and Societies

Our Revised Directory of Radio Clubs. We Shall be Pleased to Receive Details of Any Other Clubs Not Included

A

Anglo-American Radio and Television S.W. Club (Uxbridge).
11, Hawthorn Drive, Willowbank, Uxbridge.

B

Battersea and District Radio Society.
Hon. Sec., S. F. Harris, 93, Salcott Road, Battersea, S.W.11.
Bec Radio Society.
9, West Way, Grand Drive, Raynes Park.
Bideford and District Short-wave Society.
Hon. Sec., E. K. Jensen, 5, Furzebeam Terrace, Bideford.
Blackpool and Fylde Radio Society.
Sec., H. Fenton, 25, Abbey Road, Blackpool.
Blackpool Short-wave Club.
E. Sutcliffe, The Wellbeck Hotel, North Promenade, Blackpool.
Blackwood Radio and Television Club.
Address required.
Bournville Radio Society.
Hon. Sec., C. L. Bastock, c/o Messrs. Cadbury Bros., Bournville.
Bradford Experimental Radio Society.
Hon. Sec., E. P. Burgess, 23, Baslow Grove, Heaton, Bradford.
Bradford Short-wave Club.
Hon. Sec., G. Walker (2AWR), 33, Napier Road, Thornbury, Bradford.
Brentwood Amateur Radio Society.
Hon. Sec., N. K. Read, Netherton, Herlington Grove, Hutton Mount, Brentwood, Essex.
Brighouse and District Short-wave Society.
Royal Hotel Buildings, Huddersfield Road, Brighouse.
Bristol Amateur Radio Society.
Hon. Sec., G. E. Williams (G8DP), Hortham Cottage, Almondsbury.
Bristol Listeners' Club.
21, Old Market Street, Bristol.
British Short-wave League.
Hon. Sec., F. A. Beane, Ridgewell, Halstead, Essex.
British Sound Recording Assoc.
Act. Sec., C. L. Appelby, 29, Valley Road, Shortlands, Kent.

C

Cambridge Short-wave Club.
C/o Mr. F. A. E. Porter, 19, Trafalgar Street, Cambridge.
Cardiff and District Short-wave Club.
Hon. Sec., H. H. Phillips, 132, Clare Road, Cardiff.
Chadwell Heath and District Radio Society.
Ralph's Café, Tram Terminus, Chadwell Heath, Essex.
City and Guilds Eng. College Radio Society.
Hon. Sec., R. H. Tanner, Exhibition Road, South Kensington, S.W.1.
City of Belfast Y.M.C.A. Radio Club.
C/o F. A. Robb, 46, Victoria Avenue, Sydenham, Belfast.
Clackmannanshire Short-wave Club.
Hon. Sec., D. McIntosh, 10, Cobblecrook Gardens, Alloa, Scotland.
Coventry Amateur Radio Society.
C/o H. J. Chater, 179, Alderman's Green, Coventry.
Cranwell Amateur Radio Transmitting Society.
Radio Block, E. and W. School, R.A.F., Cranwell, Lincs.
Croydon Radio Society.
Hon. Sec., E. L. Cumbers, Maycourt, 14, Campden Road, S. Croydon.
Croydon Wireless and Physical Society.
Hon. Sec., H. J. P. Gee, c/o Messrs. Gee & Co., Staple House, Chancery Lane, W.C.1.

D

Darenth Valley Radio Club.
Hon. Sec., K. N. Hollands, 14, Highfield Cottages, Wilmington, Dartford.
Deptford Men's Institute Short-wave Radio Club.
Hon. Sec., A. S. Wilson, 11, Bennett Street, London, S.E.13.
Derby Short-wave Radio and Experimental Society.
Sec. H. Turner, Nunsfield House, Boulton Lane, Alvaston, Derby.
Dollis Hill Radio Communication Society.
Hon. Sec., J. R. Hodgkyns, 102, Crest Road, Cricklewood, N.W.2.

E

Eastbourne and District Radio Society.
Hon. Sec., S. M. Thorpe, 74, Broderick Road, Hampden Park, Eastbourne.
East Sheen Radio Club (proposed).
N. G. Anslow, 35, Gilpin Avenue, East Sheen, S.W.14.
Empire Amateur Radio League.
Hon. Sec., E. N. Adcock (G2DV), 206, Atlantic Road, Erdington, Birmingham.
Exeter and District Wireless Society.
Hon. Sec., W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

F

Folkestone Radio Amateurs.
Hon. Sec., S. W. Thompson, 70, Sandgate Road, Folkestone.

G

Gateshead Wireless and Television Society.
C/o G. Wilkin, 4, Ravensdale Crescent, Low Fell, Gateshead.
Glasgow and District Radio Society.
Hon. Sec., J. Hair, 42, Maryland Drive, Glasgow, S.W.2.
Golders Green and Hendon Radio and Scientific Society.
Hon. Sec., Col. H. Ashby Scarlett, 60, Pattison Road, Hampstead.

H

Hackney and District Wireless Club.
Dist. Rep., E. Penrose, 2, Coopersale Road, Homerton, E.9.
Halifax Experimental Radio Society.
Hon. Sec., J. B. Bedford, Oak House, Triangle, Halifax.
Harco Radio Club.
Hon. Sec., C. W. Kemp, 124, River Way, Greenwich, S.E.10.
Hastings and St. Leonards Radio Society.
R. M. Sutherland, 59, Old Harrow Road, St. Leonards.
Heathfield Radio and Television Society.
Hon. Sec., R. J. Lee, 9, Theobalds Green, Heathfield, Sussex.
Hollywood and Whythall Radio Society.
Hon. Sec., J. Quilton, Fesmond-dene, Shawhurst Lane, Hollywood, nr. B'ham.

I

Ilford and District Radio Society.
Hon. Sec., C. E. Largen, 44, Trelawney Road, Barkingside, Essex.
International DX'ers Alliance.
9, Stanton Road, West Wimbledon, S.W.20.
International Short-wave Club (Brighton).
Sec., J. C. Bennett, 205, Braeside Avenue, Brighton, 6.
International Short-wave Club (Guernsey).
Hon. Sec., F. S. Le Pavoux (2BTP), 8, Upper Canichers, St. Peter-Port, Guernsey.
International Short-wave Club (London).
Hon. Sec., A. E. Bear, 100, Adams Gardens Estate, London, S.E.16.
International Short-wave Club (Manchester).
H. Wild, 1, Elm Street, Middleton, Manchester.
Ipswich and District Amateur Radio Society.
Hon. Sec., D. H. Barbrook (G8AN), Radio House, St. Peter's Street, Ipswich.
Irish Short-wave Club.
3, Clare Lane, Dublin.

J

Jersey Short-wave Club.
Sec., Martin G. Bonoke, Crediton, Samares, Jersey.

K

Kentish Town and District Radio Society.
Hon. Sec., P. Pidsley (G6PI), 27, Herbert Street, Queen's Crescent, N.W.5.
Kettering Radio and Physical Society.
Irving L. Holmes, "Miami." The Close, Headlands, Kettering.
Kew Ministry of Labour Radio Society.
Ministry of Labour, Ruskin Avenue, Kew.
Kidderminster and District Radio Club.
Hon. Sec., H. A. Brown, 12, Stourport Road, Kidderminster.
Kingston and District Amateur Radio Society.
Hon. Sec., R. K. Shergold, Reculver, Manor Lane, Sunbury-on-Thames.
Knutsford Amateur Radio Club.
Hon. Sec., J. McDermott, Shaw Heath Cottages, Mobberley Road, Knutsford, Cheshire.

L

Lambda Radio Society.
C. F. Lamb, 4, Howley Street, York Road, S.E.1.
Leamington and Warwick Amateur Radio Society.
C/o M. C. Bunting, Rhuaine, Clarendon Square, Leamington Spa.
Leeds and District Radio Society.
Hon. Sec., J. Kavanagh, 63, Dawlish Avenue, Leeds.
Leeds Radio Society.
Hon. Sec., G. F. Webster, 14, Birfed Crescent, Leeds, 4.
Leicester Amateur Radio Society.
A. Stimpson, 88, Welford Road, Leicester.
Liverpool Amateur Radio Society.
Hon. Sec., J. McLelland (2CIP), 38, Andrew Street, County Road, Walton, Liverpool.
Liverpool Short-wave Radio and Transmitting Club.
Hon. Sec., C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20.

M

Medway Amateurs Transmitting Society.
S. Howell, 124, Trafalgar Road, Gillingham, Kent.
Merchant Taylor's School Radio and Television Society.
Hon. Sec., R. B. Gardner, 91, Clarence Gate Gardens, London, N.W.1.
Midland Amateur Radio Society.
C/o D. A. G. Edwards, Selwyn House, Chester Road, Sutton Coldfield.
Milnes Radio and Television Society.
Hon. Sec., F. Ridley, 7, Royd Avenue, Gilstead, Bingley, Yorks.
Morpeth Amateur Radio Society.
Hon. Sec., C. L. Towers, 2, Edward Street, Morpeth.

N

Newark News Radio Club.
215, Market Street, Newark, New Jersey.
Newbury and District Short-wave Club.
Hon. Sec., L. Harden, 11, Highfield Avenue, Newbury, Berks.
Newcastle Radio Society.
Hon. Sec., G. C. Castle, 10, Henry Street, Gosforth, Newcastle 3.
New Eltham Ratepayers' Assoc. (Radio Section).
Hon. Sec., E. A. Gillborn, 87, Montbelle Road, New Eltham, S.E.9.
Newport and District Radio Club.
Address required.
New Zealand DX Radio Association.
Hon. Sec., E. Watson, 37, Chancellor Street, Christchurch, N.Z.
New Zealand Short-wave Radio Club.
Sec., A. B. McDonagh, 4, Queen Street, Wellington, E.1., New Zealand.
Nelson and District Radio Club.
Address required.
North Manchester Radio Society.
Hon. Sec., R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield.
North Middlesex Radio Society.
Sec., H. A. Crouch, 27, Middleton Park, Whetstone, N.20.
Newtownards Amateur Radio Club (N. Ireland).
Hon. Sec., T. L. Kirk, Chapel View, Newtownards, Ulster.
Northern Ireland Radio Society.
Hon. Sec., F. A. Robb, 46, Victoria Avenue, Sydenham, Belfast.
North Shields Radio Society.
Hon. Sec., G. A. Lee, 9a, Saville Street W., North Shields.

O

Oxford Short-wave Radio Club.
Hon. Sec., E. G. Arthurs (2BHP), 13, Walton Well Road, Oxford.

P

Perth Radio Society (proposed).
R. Adams, 2, Croft Park, Craigie, Perth.
Port Talbot Radio Club (proposed).
W. Ryan, 47, Margam Terrace, Port Talbot.
Peterborough and District Short-wave Club.
Jt. Hon. Sec., W. S. Cornwell (2ACP), 80, Elmfield Road, Peterborough.
Portsmouth and District Wireless and Television Society.
Hon. Sec., F. L. Moore, 78, Laburnum Grove, Portsmouth.
Prestatyn Short-wave Club.
Hon. Sec., R. J. Stellig, Romir, Victoria Road, Prestatyn.

R

Radio Physical and Television Society.
Hon. Sec., V. R. Walker, 49, Fitzjames Avenue, London, W.14.
Radio Society of Gt. Britain.
Sec., J. Clarricoats, 53, Victoria Street, London, S.W.1.
Radio Society of Northampton.
Hon. Sec., D. W. Harries (B.R.S. 2179), 99, Ardington Road, Northampton.
Radio Transmitters Union.
C/o W. H. Martin, Knockinagh, Cloughfern, Whiteabbey, N.I.
Reading Short-wave Club.
Address required.
Redhill and District Radio Society.
Hon. Sec., H. Cartwright, Radio House, Victoria Road, Horley, Surrey.
Redhill and District Short-wave Club.
Sec., S. Hassenauer, 139, Frenches Road, Redhill, Surrey.

S

Salisbury and District Short-wave Club.
Hon. Sec., C. A. Harley, 85, Fisherton Street, Salisbury, Wilts.
Scottish Short-wave Radio and Television League.
Sec., J. Nielson, 14, Bolivar Terrace, Glasgow, S.2.
Sheffield Short-wave Club.
Sec., D. H. Tomlin, 32, Moorsyde Avenue, Sheffield, 10.
Short-wave Radio and Television Society (Thornton Heath).
Hon. Sec., J. T. Webber, 368, Brigstock Road, Thornton Heath.
Slade Radio Society.
Hon. Sec., G. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham.
Slough (proposed).
J. Gilbert, 26, King Edward Street, Slough, Bucks.
Southall Radio Society.
Hon. Sec., H. F. Reeve, 26, Green Drive, Southall.
Southend and District Radio and Scientific Society.
Hon. Sec., F. S. Adams, Chippenham, Eastern Avenue, Southend-on-Sea.
South Hants Radio and Television Society.
Sec., E. J. Williams, B.Sc., Rochdale, London Road, Widley, Portsmouth.
South London and District Transmitters Society.
Sec., H. Cullen, 164, West Hill, Wandsworth, S.W.
Southport Amateur Radio Society.
Birch Villa, Lulworth Road, Southport.
S.T.C.
The Chief Instructor, Training Battalion, R. Signals, Catterick Camp, Yorks.
Stoke-on-Trent Radio Society (proposed).
H. Churton, 26, Victoria Street, Smallthorne, Stoke-on-Trent.
Surrey Radio Contact Club.
Hon. Sec., E. C. Taylor, 35, Grant Road, Addiscombe, Croydon.
Sutton-in-Ashfield Society.
Hon. Sec., A. W. Fowler, 78, Kirkby Road, Sutton-in-Ashfield.

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Swansea Radio Club.
Hon. Sec., R. J. Davies, Messrs. Watson and Davies, Mansel Lane, Swansea.

Swindon and District Short-wave Society.
Hon. Sec., W. C. Barnes, 7, Surrey Road, Swindon.

Smethwick Wireless Society.
Hon. Sec., E. Fisher, 33, Freeth Street, Oldbury, Nr. Birmingham.

T

Television Society,
Sec., G. Parr, 68, Compton Road, N.21.

Thames Valley Amateur Radio and Television Society.
Sec., J. N. Roe, 19a, The Barons, St. Margarets-on-Thames, Middlesex.

Tonyrefail Short-wave Club (proposed).
E. Powell, 44, Pritchard Street, Tonyrefail, Glam.

Torrington and District Short-wave Club.
Hon. Sec., A. E. Cornish, 1, Halsdon Road, Torrington, N. Devon.

Tottenham Wireless Society.
Hon. Sec., F. E. R. Neale, 17, Whitley Road, Tottenham, N.17.

Tottenham Short-wave Club.
Hon. Sec., S. Woodhouse, 57, Pembury Road, Bruce Grove, Tottenham, N.17.

Tunbridge Wells and District Amateur Transmitting Society.
Sec., W. H. Allen, 32, Earl's Road, Tunbridge Wells.

W

Waldron Radio Society.
Hon. Sec., W. E. Simmons, 35, Tranmere Road, Earlsfield, London, S.W.18.

Warwick School Radio Society.
Sec., P. N. G. Whitlam, Warwick School, Warwick.

Wellingborough and District Radio Society.
Hon. Sec., L. Parker, 127, Jubilee Crescent, Wellingborough.

West London Radio Society.
Hon. Sec., D. Reid, 15, Tring Avenue, Ealing Common, W.5.

Weymouth Short-wave Club (proposed).
W. E. G. Bartlett, 59a, Franchise Street, Weymouth, Dorset.

Willesden (proposed).
S. A. Reeve, 115, Willesden Lane, Kilburn, N.W.6.

Wirral Amateur Transmitting and Short-wave Club.
Hon. Sec., B. O'Brien, Caldy, Irby Road, Heswall.

World Friendship Society of Radio Amateurs.
Hon. Sec., A. H. Bird (G6AQ), 35, Bellwood Road, Waverley Park, Nunhead, S.E.15.

Wrexham and District Radio and Television Club.—Address required.

Hum and the Tuned-anode Coupling

An Important Point in Design Which is Often Overlooked

IN spite of much that has been written and discussed to the contrary, the tuned-anode coupling, or some modification of it, is still in use in many commercial and constructor-built receivers; furthermore, many of the popular kit receivers use tuned-anode couplings, and there must be tens of thousands of these still in use. The advantages or disadvantages of tuned-anode couplings from a point of view of stage gain and selectivity is another story, and it is the intention in this article to discuss it from the aspect of introducing mains hum. The use of the tuned-anode coupling is probably the very last circuit detail that the constructor would blame for mains hum.

If the smoothing arrangements in the power pack are perfect, or very nearly so, all well and good, but if, as is usually the case, they are short of this ideal to a greater or lesser extent, the tuned-anode coupling will produce a surprising hum level compared to that obtainable with any other coupling. Fig. 1 shows a skeleton diagram of a tuned-anode H.F. stage followed by the conventional detector. Now any unsmoothed ripple will be in the form of a voltage ripple across the points A-B. The impedance of the tuned-anode coil T will be negligible to mains frequency, so

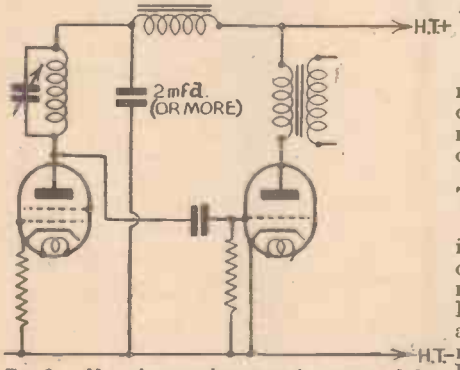

Fig. 2.—How the smoothing may be increased by including an L.F. choke.

the unsmoothed ripple in the H.T. voltage is, in effect, across the points D-B. The ripple voltage is therefore across D-B, and a proportion of it across the grid cathode of the detector valve G-B; in proportion to the resistance of the grid leak R and the impedance of condenser C. This considerable proportion of the mains ripple being fed into the detector valve will be duly amplified by it and the succeeding L.F. stage or stages. The detector valve transformer coupled to the power valve

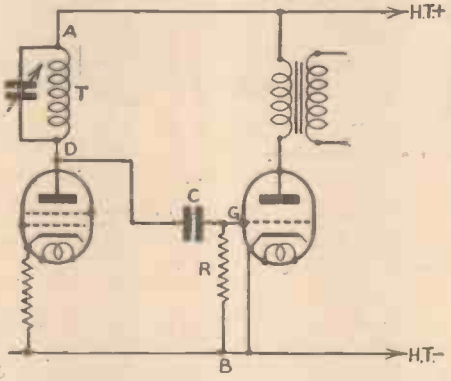

Fig. 1.—A standard tuned-anode circuit.

might easily give an amplification of 200 or more times; thus, it will be seen how necessary it is to keep hum out of the detector grid.

Tuned-grid is Safe

Except by gross carelessness, mains hum is not, of course, introduced into the grid of the H.F. valve, as the grid circuit has no connection whatsoever with positive H.T. Where hum is present in a set using a tuned-anode coupling, it is a simple matter to note the amount of the prevailing hum caused by ripple getting through the tuned-anode coil by merely shorting the detector grid to cathode (or in the case of a battery set with eliminator, to L.T.+).

If this simple test shows that considerable hum is emanating from this source, two courses are open. One is to increase the smoothing in the ordinary way by inserting a choke and condenser, as shown at Fig. 2, the reason for so positioning the choke being that the small anode current taken by the screen grid valve permits a choke of fine gauge wire to be used, with consequently greater inductance for a given size or cost. The other cure is to change the coupling to tuned-grid. The reason why this modification eradicates the hum is particularly interesting, and an explanation is thought worth while. Fig. 3 shows the skeleton circuit of a tuned-grid stage followed by the conventional detector. As in Fig. 1, mains hum would appear as an A.C. ripple voltage across A-B, and in consequence, will be across the choke K, the condenser C and the tuned grid coil T, the three being considered in series. Now, at mains ripple frequency, the impedance of T is negligible compared with the impedance of C and K, consequently, for practical purposes all ripple voltage will be across C and K, the grid cathode circuit of the detector valve being tapped across the coil T, which, as mentioned

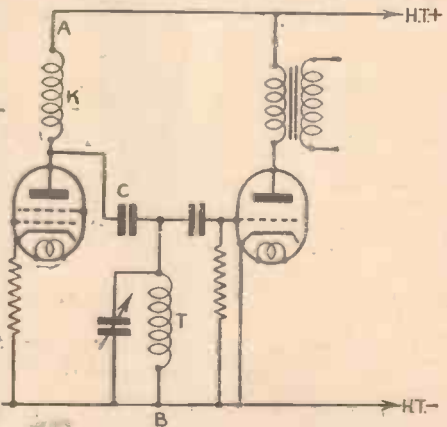

Fig. 3.—The tuned-grid circuit which overcomes the difficulties mentioned above.

above, has a negligible mains hum voltage developed across it; thus, no appreciable hum is introduced into the detector grid, with a very considerable decrease in the overall mains hum of the receiver.

Revue in Miniature

ON July 12th, from the Midland Regional, Martyn C. Webster will compère the second of his "Follow On" programmes—so called because each item suggests the subject of the next. Edward J. Mason has written the book and lyrics, and Basil Hempseed is the composer. The artists will be Dorothy Summers, Marjorie Westbury, Denis Folwell, John Bentley, and Godfrey Baseley, with the Revue Nonet, led by Norris Stanley.

PROGRAMME NOTES

"From the Esplanade"

THE Weston-super-Mare Municipal Orchestra, conducted by H. C. Burgess, will broadcast from the Rozel Bandstand, Weston-super-Mare, in a programme entitled "From the Esplanade," on July 14th, in the Western programme.

Morecambe Goes Gay

VICTOR SMYTHE, North Regional Outside Broadcast chief, will present another big composite variety feature from Morecambe on July 15th. This "Morecambe Night's Entertainment" will include variety from the Winter Gardens Theatre, dance music by Lionel Millard and his Band from the Winter Gardens Ballroom, and excerpts from concert party shows given by the Arcadian Follies and the Central Pier Revelry Troupe respectively.

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.

Bradford Short-wave Club

ON Sunday, June 13th, the above club held a week-end camp and field day at Dobrudden Farm, Baildon.

Radio G8JD was operating a portable transmitter and making tests, and he was assisted by the club members, who received his signals (C.W.) at different spots on Baildon Moor. The camp was pitched on Saturday afternoon, and the gear transported to the site. Consequently an early start was made at eight o'clock in the morning and a full day's experimenting accomplished. The project was so successful that it is hoped to hold another field day in the near future.

The trophy winners in the Southall Radio Society's Direction Finding contest. Mr. H. G. Swann (right) and his team.

The club has decided to build its transmitter in portable form, and this work is now proceeding at the headquarters. The morse instructor, Mr. K. Abbott, is away at present, but practice is continuing.

Anyone interested should write the Secretary or call at the club rooms on Friday evenings, where they will be welcomed. Hon. Secretary, G. Walker, 33, Napier Road, Thornbury, Bradford, Yorks.

Kentish Town and District Radio Society

MEMBERS of this society, in conjunction with the R.S.G.B., are holding a 5-metre field week-end on July 3rd and 4th. Superhet and quench receivers and a stabilised long lines transmitter, with directional radiating systems, comprise the major part of the equipment. Transmissions will commence at 8 p.m. on Saturday, and will be maintained throughout the ensuing 24 hours.

Readers are especially asked to send in reports on these transmissions, which will be acknowledged. Anyone who can reach the site will be welcomed, and there is certain to be much to interest them. The station will be situated at the highest point on Dunstable Downs, and can be reached by any service to Whipsnade. Hon. Sec., R. Pidsley (G6PI), 27, Herbert Street, Queen's Crescent, N.W.5.

Southall Radio Society

IN the Direction Finding contest, held on June 13th, near Oxford, the trophy was carried off by Mr. H. G. Swann (Southall), other leading teams being those of Messrs. Black (Golders Green), Lester (Golders Green), Rapsey (Southall), Childs (Golders Green), and Pye Radio (Cambridge).

In spite of torrential rain which fell almost continuously, some extremely useful data was accumulated concerning the practicability of accurate work on 40 metres, and the Southall Society is to conduct experiments in an attempt to explain some of the discrepancies which arose on this occasion.

Thanks must be given to the President of the Southall Society, Mr. Douglas Walters (G5CV), who operated the transmitter under considerable difficulty, not unconnected with belligerent farmers, and to Mr. George Exeter (G6YK), who acted as judge, assisted by Mr. Tyler.

Details of the society's activity can be obtained from the Hon Sec., Mr. H. F. Reeve, 26, Green Drive, Southall.

Proposed S.W. Club for Weymouth

IF sufficient support is forthcoming, an effort will be made to form a short-wave club in Weymouth. Readers in Weymouth and the surrounding districts, including Dorchester, may obtain particulars by writing to the address given below. William E. G. Bartlett, 59A, Franchise Street, Weymouth, Dorset.

TRANSMITTING TOPICS

(*Continued from page 365*)

It will be appreciated from the above that the grid is now receiving energy from the anode by two paths; one, the capacity between grid and anode, and the other by the neutralising condenser.

It has just been mentioned, however, that the free end of the tank coil is in phase opposition to the voltage at the anode end, and therefore the grid actually receives two opposite supplies which, if the circuits are balanced, will be equal and opposite and will cancel out or neutralise each other. Another popular arrangement is shown in Fig. 3, where it will be seen that the centre tap is obtained by means of a *split stator* tuning condenser, the H.T. being fed to the anode via a reliable H.F. choke.

There are many forms of neutralising arrangements, but the same principle applies throughout, and the subject forms an interesting item for experimental work. One point must be noted. It is absolutely essential that *complete* neutralisation is obtained, otherwise the P.A. stage will be hopelessly inefficient, and it must also be remembered that that applies to each frequency (waveband) to which the transmitter is adjusted.

THE RYDER CUP

THE biennial professional golf match between the United Kingdom and the United States—the struggle for the Ryder Cup—takes place on the Southport and Ainsdale Golf Course at the end of this month. On June 30th Bernard Darwin, that celebrated authority on golf, will broadcast an eye-witness account of the play from the scene of action. The broadcast will be available in the National programme. On the evening of June 30th Richard North is to give a running commentary on the ceremonial connected with the presentation of the trophies at the end of the match.

Letters from Readers

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

A Five-valver for Overseas!

SIR,—First of all, I must congratulate you on your fine weekly, PRACTICAL AND AMATEUR WIRELESS, which I think is the finest wireless weekly printed. I have taken it for two years, and eagerly look forward to each week's copy.

As regards a short-wave receiver for overseas, I think readers over the whole Empire have been waiting for PRACTICAL AND AMATEUR WIRELESS to bring forward details of a set as follows :—A 6-volt battery operated short-wave receiver, employing the Bulgin vibrator unit, and with continuous band-spread tuning from 4½ to 160 metres. It must have at least five valves to suit our ever-varying weather conditions here in Africa. The receiver is, of course, meant for the keen amateur. I think that if a set of this description was described in your journal it would prove very popular.

Before I close I once more congratulate PRACTICAL AND AMATEUR WIRELESS and also the contributors "who spill the beans."—D. D. WIGGILL (Cape Province, S. Africa.)

[*We shall be glad to know what other overseas readers think of Mr. Wiggill's suggestion.*—ED.]

Advanced Radio Theory

SIR,—Regarding Mr. A. M. Wilding's suggestion for an "Advanced Radio Theory" section, I would like to add that I completely agree with him. Such informative articles would refresh the memory of expert service-men, while at the same time, they teach the novice the whys and wherefores of the wide field of radio.—L. T. TYE (Penang, Straits Settlements).

Vernier Tuning Device

SIR,—Regarding my "Vernier Tuning Device," published under "Radio Wrinkles," in your issue of June 19th, 1937, I would like to draw attention to the fact that a draughtsman's error occurs in the illustration which is not in agreement with the text. The vernier scale should *cover only* 9 *divisions* of the moving circular scale—the illustration shows it lining up with 10 divisions. I should like this error pointed out for the benefit of fellow readers who adopt the device.—WM. V. HARRISON (Aintree).

Good Reception in South Yorkshire

SIR,—According to reports from the 20-metre American amateurs, conditions on that band have not been too favourable recently.

Here in South Yorkshire, I have had good loudspeaker signals from all parts of the globe, including :—

ASIA : KA1HS, PK1MX, VS2AK, VU2CQ, YI2BA.

AUSTRALIA : VK2XU.

AFRICA : CN8MB, OQ5AA, SU1SG, SU5NK.

SOUTH AMERICA : LU7AC, CX2AK, PY1DK, OA4AL, YV1AA.

CENTRAL AMERICA : TI2RC, HP1CE, VP5PZ, VP2CD, VP6YB, K4SA, CO2WW.

NORTH AMERICA : VE1LR, VE2BG, VE3HC, VE4BD, VE5BF, W1AXA, W2IIL, W3FSD, W4AZK, W5CTC, W6OAJ, W7VA, W8MPX, W9RUK.

EUROPE : U3BC, OZ3H, SV1KE, and the Yacht "Valdora" (Aegean Sea).

Perhaps these results will be of interest to other readers.—REGINALD H. GREENLAND, B.Sc. (Barnsley).

Canadian Correspondent Wanted

SIR,—I shall be very glad to correspond with a Canadian reader of my own age (17 years), who is interested in short-wave reception and transmission. I also wish to record my appreciation of the articles on "amateur transmitting."—C. DAWSON, 68, Roundwood Road, Willesden, London, N.W.10.

Radio Fault Tracing

SIR,—Many thanks for the new series "Radio Fault Tracing." The recent instalment (No. 5) is the best account I have ever read regarding the ganging and re-aligning of the superhet. I hope this series will be continued and will be as comprehensive.—F. GRIFFITHS (Birmingham).

CUT THIS OUT EACH WEEK

Do you know

—THAT in addition to a colour code for resistors a similar code is employed for ordinary fuses for radio sets.

—THAT some H.F. valves are now available with the grid connected to the top cap (not the anode), and, therefore, care must be taken when interchanging H.F. valves of different make and date.

—THAT when using an L.F. transformer and a higher current is passed than is recommended by the makers of the component the resistance-fed system may be adopted to avoid damage to the transformer.

—THAT some commercial receivers require the extension speaker to be of low resistance, and thus care is required when connecting such apparatus.

—THAT screening cans for H.F. coils and components should be of copper or aluminium.

—THAT for L.F. apparatus screening covers should be of iron.

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

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

G2ZO Please Note!

SIR,—I have a QSL card from CT1OO, for G2ZO, whose QRA is unknown to me. Will either 2ZO or any reader knowing his QRA, please send same to me, so that I can forward the QSL? I should also be very pleased to hear from any readers in this district (Isle of Thanet) who are interested in the formation of a Radio Club.—WM. S. CARTER, 188, Beacon Road, Broadstairs, Kent.

An Excellent 20-metre Log

SIR,—I hope I shall not be taking too great a liberty in sending you a second 20-metre log; however, it shows one interesting fact—the gradual increase in the number of South American amateurs.

The following were all received between Monday, May 17th and Monday, June 21st, inclusive, and are apart from those in my last log.

EUROPE : SM5QN, SM5YS, SM5QV, SM5WJ, 'LA2Z, LY1HB, I1II, CT1AI, CT1PA, CT1CW, CT1OO, SM5WK, I1FAC, and several G's.

AFRICA : FA8LC, CN8AJ, CN8AM.

N. AMERICA : VO2Z, 5VE's, 41 W's (including 6MWD, 6BKY, 6AQO).

CENTRAL AMERICA : K4ENY (St. Thomas), HI5X, VP5PZ (Jamaica).

S. AMERICA : Argentina : LU1UA, LU7AG, LU1DJ, LU4BL, LU5CZ, LU1EE. Brazil : PY5AQ, PY2AK, PY5QF, PY1CK, PY3BX, PY2DU, PY2LJ, PY1DS, PY8AD, PY2HK. Peru : OA4AL. Uruguay : CX2AK. Venezuela : YV1AA.

ASIA : Iraq : YI2BA (Basra). Dutch E. Indies : PK4DG, PK1ZZ, PK1MX. China: XG3BY. Federated Malay States : VS2AK. Philippines : KA1ME.

OCEANIA : Australia : VK3RW, VK4PK, VK4JU. Hawaii : K6BAZ.

Odd reception reports : June 18th, 18.59 B.S.T.—W2XGB (Hicksville, 17.33 m.). was R6-7/SF/N QSA5 with records and close-down at 19.00. June 19th, 20.45 VQ7LO R6/RF/X QSA5 QRM0 Dance Music (3-valve and spkr.). June 21st, 05.52 OAX4Z (Lima) R7-8/N/N close down with call, etc. in English, French. and Spanish. June 20th, 08.55 VK5AW (amateur) R6 QSA5 (on o-v-1-pen and speaker). June 21st, 06.15 VK2XU (. . .) R6-7 Q5 ('phones) announced power as 30 watts. June 19th, 20.45 JZK (19.79 m.) R7-8/RRF/N QSA4 on 3 v. and speaker. Neither JVM nor JZJ have been heard recently.—N. J. RUTTER (Swindon).

Station W2XGB

SIR,—Being a keen short-wave listener and a regular reader of your paper, I heard the other day a new station, the details of which I give below.

On Thursday, June 10th, at about 4 p.m., I was tuning around 16 metres when I heard the following announcement : "This is Station W2XGB, W2XGB of the Press Radio Incorporated, Hicksville, New York, testing on 17,310 kc/s.

"We will proceed with phonograph recordings." These consisted of dance music.

The above announcement was made every alternate record, and this continued until 6 p.m. I also heard it again on June 11th, with the same announcements, and the strength of station was R6-7. I should be glad to hear if any other reader has heard this station.—S. H. WARE (Exeter).

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are drawn full size.

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

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

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

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

PRACTICAL WIRELESS

	Date of Issue.	No. of Blueprint.
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1937 Crystal Receiver	9.1.37	PW71
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Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen)) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
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Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B.)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
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A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
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A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull	9.2.35	PW47
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Battery Sets : Blueprints, 1s. each.		
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Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.9.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES		
Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	16.5.36	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

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Four-station Crystal Set	12.12.36	AW427
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One-valve : Blueprints, 1s. each.		
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Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
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New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
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Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
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1934 Ether Searcher: Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
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Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
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Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (S.G. D. Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen)	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM370
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D. Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimeuter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	*Jan.* 19 '35	AW463
The Carrier Short-waver (SG, D, P.)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-Wave World-Beater (H.F. Pen, D, RC, Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D. Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v). for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New-Style Short-Waver Adaptor (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Signal Surges

"Would you please explain why when a battery receiver is switched off, the music or whatever one is listening to comes momentarily louder and then fades away? If the set is near the reaction point when working, it bursts into oscillation when turned off."—R. G. T. (Norfolk).

THIS point is often cropping up, and from various tests we have made there appear to be a number of reasons, although it is possible to obtain the effect without any possible explanation in some circumstances. One of the commonest causes is to be found in the fact that the filaments of some battery valves give a greater emission at a point slightly lower than the stipulated 2 volts. Thus, when switched off, the filament commences to cool off and reaches this maximum emission point before extinguishing, giving rise to the effect you mention. Another common cause is to be found in the fact that large capacity condensers used for H.T. smoothing discharge when the H.T. is disconnected and before the filament has cooled (or even before the L.T. is switched off) and this surge voltage exceeds the normal H.T. voltage. Other readers may have discovered other reasons for the effect, and we should be pleased to hear of any definite details which they may be able to let us have.

Using Two Loudspeakers

"I have fitted an M/C speaker in parallel with an energised one in my commercial receiver. My M/C speaker is of good make, with universal transformer, but results are far from satisfactory, even with only three feet of flex. Is there any better way of connection to my receiver?"—E. Y. (H.M.S. "Penelope.")

ASSUMING that your energised speaker is fed from the receiver through a transformer, the extra speaker would be best connected by the parallel-feed method. That is, the primary winding of the existing speaker transformer may be regarded as the anode choke, and the primary of your new speaker should then be joined between earth (chassis) and the anode of the output valve, with a 2 mfd. or 4 mfd. condenser between the anode and the transformer. The tappings on the universal transformer will have to be adjusted to provide the correct load.

Faulty Wave-change Switch

"I have been having a lot of trouble with my receiver wave-change switch. When you touch it it makes a very bad grating noise and also affects the wavelength about a metre and a half. I have had it attended to on three occasions and the service people say that nothing can be done. A new switch would make very little difference. Only cleaning it when it goes wrong can do any good. The set in question is an AC/DC 1935 set."—S. S. S. (Sheffield).

AS the receiver is a commercial model it is possible that there is some fault in the actual component, although it is recognised that the switch is the most prolific cause of trouble in the modern receiver. Apart from the fact that the switch can get dirty and cause the trouble, there is also the possibility that springs can become weakened and give rise to the trouble. One suggestion that has been made and found to prove very satisfactory is to take the switch down and clean it very thoroughly. Do not use emery or other abrasive whilst the switch is in the set, as metallic dust which will thereby be obtained will undoubtedly give rise to further troubles. When thoroughly cleaned, carefully smear a trace of colloidal graphite over all moving parts, or a very thin coating of vaseline. This will prevent corrosion. It is also often desirable to earth all metallic parts of the switch which do not come into the normal electrical circuits.

Pick-up Adapter

"Please would you inform me where I can obtain, and the price of, a pick-up adapter for plugging under the detector valve (4-pin) of a battery receiver? Also, is the grid connection split, or just tapped?" A. P. (Chesham).

THE adapter you require may be obtained from A. F. Bulgin, Abbey Road, Barking, and the price is now 1s. 8d. The grid connection is split; that is, the pin which goes into the valveholder does not continue to the top and form one with the socket as in the case of the remaining three pins. A terminal on the side of the adapter is connected to the pin, with another terminal immediately above it connected to the grid socket, and thus when the pick-up leads are joined to the two terminals the pick-up is joined in the grid circuit. A shorting switch will be required to bring into circuit the radio section, or the pick-up may be removed and the two terminals bridged for that purpose. An alternative arrangement is to join one side of the pick-up to the upper terminal on the adapter and connect the other side of the pick-up to the grid-biasing battery. This is probably the most satisfactory form of connection with the ordinary battery receiver.

RULES

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

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

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

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

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

A Crystal Set

"I have started to make a crystal set and have got earphones, the condenser and a detector, but I don't know what gauge of wire or what type is used for the coil. Please could you tell me this and how much I will need, or how much it will cost and where I could pick up a complete coil?"—J. W. (N.10).

DETAILS of the construction of a tuning coil for a crystal set are given in our issue dated January 9th last, and the wire (22 gauge D.C.C.) and coil former may be obtained from Messrs. Peto-Scott of 77, City Road, London. Alternatively this firm can supply the coil ready made if you so desire.

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.

G. A. H. (Lambeth). If no current is indicated in the H.T. negative lead, then the H.T. circuit is incomplete, and we suspect one of the return leads made to the metallised chassis. Link all such leads with a heavy gauge wire, and if a fuse is included make quite certain that this is not broken.

A. A. (Wood Green). Any simple L.F. amplifier of two or three stages could be used, but we have no blueprints. The various articles on L.F. amplifiers which we have published should be of use to you in designing the instrument you require.

D. L. (Aberbeeg). Including the crystal, but excluding valves, the cost should be in the neighbourhood of £3.

N. E. C. (Friern Park). The electrons are emitted from the cathode, and this gives the electronic stream which has the effect mentioned in your letter.

A. G. S. (Edinburgh). The choke may be obtained from Messrs. Bulgin, type H.F.10, price 4s. 8d. The most suitable aerial would probably be a vertical wire about 20 feet in length.

P. K. (Slough). Messrs. Peto-Scott can supply the coil ready made.

R. W. M. (Leyton, E.). I.F. instability and incorrectly trimmed coils may be responsible for your difficulties. The notes in this week's Test Bench may prove of use to you.

H. S. J. (Prestatyn). The reaction difficulties may not be due to the winding, but to the circuit or H.T. employed. We cannot give coil-winding data in the form of a reply.

B. B. (Castleisland). We cannot identify the unit referred to in your card. Can you give some fuller details as we have published several instruments which might come under the description given by you?

P. S. (Wolverhampton). We cannot supply details or blueprints of commercial receivers.

M. C. (Romford). The leads to the tuning circuit must be kept as short as possible—the remaining leads are not so important. The metal panel should be earthed by connecting a wire from it to the earth terminal.

E. G. D. (Wallasey). We are unable to give you the data as you omit to give full details of the transformer. As the winding is already rated at 4 volts it is only necessary to include a resistance across it to absorb the extra current and prevent a voltage rise. A value of 2 ohms is indicated.

D. R. H. (Penrhiwceiber).—For a good voltmeter the resistance should be high. For the milliammeter it should be low, as the additional resistance will otherwise affect the working characteristics of the valve and in some cases may introduce instability.

W. F. C. (Copmanthorpe).—You could build the set in the form of a portable, but a throw-out aerial should be used and a frame would not prove effective with this particular receiver.

D. R. M. (Rock Ferry).—The valves should prove quite suitable if correctly arranged, but values of coupling components must be carefully chosen to obtain maximum amplification and full efficiency. The transformer ratio is quite suitable.

A. M. (Alloa).—We cannot recommend a blueprint to use the parts named in your letter. The nearest receiver (employing the coils in question) is the Leader Three, PW35.

T. A. T. (Rhos).—We have no details but suggest you obtain a copy of the Radio Control of Mechanism, published by Percival Marshall.

J. G. (Oldham).—The coils were Ferrocart Type G, and the valves: two Type VP.4, one 354V and one PM24M (Mullard).

The coupon on page 384 must be attached to every query.

Miscellaneous Advertisements

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

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIOMART

SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

1937 Short-wave Catalogue only (3 times enlarged) price 1½d., post free.

44, HOLLOWAY HEAD, BIRMINGHAM 1

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

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watts output as £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted or rewound. Fields altered. Prices Quoted including Eliminators, Loudspeakers, Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service. Estimates Free. L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

ALL goods previously advertised are standard lines, still available. Post card for list free. **VAUXHALL UTILITIES**, 163a, Strand, W.C.2. Over Denny's the Booksellers. Temple Bar 9338.

BANKRUPT Bargains. List Free. Over 50 receivers and large stock of valves and components at very keen prices. All new goods,—Butlin, 6, Stanford Avenue, Brighton.

EXTENSION SPEAKERS. Brown's permanent magnet. Walnut cabinet, 15/-. With Volume Control, 17/6. **RADIOFIX COMPACT AERIAL.** Size of match-box. Equals aerial 75ft. long, 7/6. Agents wanted.—Sunbeam, 10, The Pavement, Clapham, London.

GRAMOPHONE attachments for Radio, electric motors, 30/-; pick-ups, 9/6; portable gramophones, 15/-; spring motors, 4/6, dozen, 36/-; pedestal Anexagram, £5; soundboxes, tone-arms, horns, cabinets, needles, gears, springs, Violins, and Accordions, accessories, cheapest. Trade supplied. Catalogue free. —Regentam, 120, Old Street, London, E.C.1.

VALVES

NOTHING better available. SIX MONTHS' GUARANTEE, complete range of BATTERY, A.C. MAINS, RECTIFIERS, always in stock, 2 volt Det., H.F., L.F., 2/3. POWER, 2/9. SCREEN GRID PENTODE, H.F. PENTODE, 5/-. American types, six months' guarantee, 5/6 each. Nos. 18, 24A, 35, 42, 43, 45, 47, 56, 57, 58, 75, 77, 78, 80, 2A5, 2A6, 2A7, 6A7, 2B7, 6B7, 6C6, 6D6, 25Z5, 25Y5. Write for other prices to Dulci Electrical Co., Devonshire Works, Duke's Avenue, Chiswick, London, W.4.

6L6 Beam Power Tubes, 3/9. All other Popular American Types, 3/-. British D.C. Valves, Marconi, Cossor, Mullard, etc., 3/- each. Huge stock of Components at the right prices. Write for Lists.—Radiographic, Ltd., 66, Osborne Street, Glasgow, C.1. Bell 848.

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All goods guaranteed perfect; carr. paid over 5/-; under 5/- postage 6d. extra.

***ALL POST ORDERS TO* JUBILEE WORKS, 167, LOWER CLAPTON RD., LONDON, E.5.**
'Phone: Amherst 4723.

CALLERS, AS USUAL, TO 165 & 165a, FLEET ST., E.C.4 (Next door to Anderton's Hotel), **Central 2833. New Branch: 50, HIGH ST., CLAPHAM, S.W.4** (Macaulay 2381).

Have you had our GIANT ILLUSTRATED CATALOGUE AND VALVE LIST? Send 4d. IN STAMPS FOR THIS BARGAIN LIST.

NEW 1937 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT 13 to 86 Metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!** **DE LUXE MODEL** 14 to 150 Metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

SUPERHET CONVERTER KIT. 12/6. De Luxe Model, 18/6. **S.W. SUPERHET CONVERTER KIT** for A.C. Mains Receivers, 20/-. A.C. Valve given **FREE!**

NEW 1937 2-VALVE S.W. KIT, 13 to 86 Metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE. DE LUXE MODEL,** 14 to 150 Metres, complete Kit and Chassis, 4 Coils and all parts, 25/- **VALVES GIVEN FREE. 3-VALVE S.W. KIT.** S.G. Det. and Pen., 42/-. **VALVES GIVEN FREE!**

SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils. 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

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

The New **"Premier" Short Wave CONDENSERS,** with Trolitul Insulation. **Certified superior to Ceramic.** All-brass Construction. 15 mmfd. 1/4; 40 mmfd. 1/7; 100 mmfd. 1/10; 160 mmfd., 250 mmfd. 2/6. S.W. H.F. Chokes, 9d.; screened, 1/6.

MAINS VALVES, famous Europa 4 v. A.C. tyes, 4/6 each, H.L., L., S.G., Var-Mu-S.G., H.F. Pens., Var-Mu-H.F. Pens. 1, 3 and 4-watt A.C. directly heated output Pentodes. Full-wave rectifiers 250 v. 60 m.a. A.C./D.C. types. 20-volt. .18 amp. S.G. Var-Mu-S.G., H., H.L., Power and Pen. Following types all 5/6 each. Full-wave rectifiers, 350 v. 120 ma. and 500 v. 120 m.a. 2½ watt indirectly-heated Pentodes, Octode Frequency Changers.

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

AMERICAN VALVES. Genuine American **HYTRON** and **TRIAD** first-grade Valves. 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves all types, 6/6 each. Genuine American **DUOTRON** Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. **OCTOL** bases, 9d. each.

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

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

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each. **PICK-UP HEADS** only, 4/6 each.

PREMIER MAINS TRANSFORMERS, wire-end type with screened primaries, tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. H.T. 8 & 9 or H.T.10 with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., 8/6. 250-250 v. 60 m.a., 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 8/6. 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 10/6. Any of these transformers with engraved panel and N.P. terminals 1/6 extra. 500-500 v. 150 m.a., 4 v., 2-3 a., 4 v., 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 17/6 **SPECIAL OFFER PHILIPS MAINS TRANSFORMERS.** 250-250 v. or 300-300 v. at 800 m.a., 4 v. 5 a., C.T.; 4 v. 1 a. Tapped Primary 100-250 volts 6/11. 450-450 v. at 150 m.a. or 500-500 v. 100 m.a., 4 v., 4 a. C.T. 4 v. 4 a. and 4 v. 3 a. Screened Primary. Tapped input 100-250 v., 12/6. **AUTO TRANSFORMERS,** step up or down, 60 watts, 7/6; 100 watts, 10/-. **SMOOTHING CHOKES** 25 m.a., 2/9; 40 m.a., 4/-; 60 m.a., 5/6; 150 m.a., 10/6. 2,500 ohms, 60 m.a. Speaker Replacement Chokes, 5/6.

Electric **SOLDERING IRONS,** 200-250 v., A.C./D.C., 2/3.

SPECIAL OFFER LISSEN TWO-GANG SCREENED ALL-WAVE COILS, 12 to 2,000 metres, complete with switching and wiring diagrams, 6/11 per set.

Special Offer **BTH Energised Moving Coils** 10in. diam. 1,650 ohms field Power or Pentode transformer (state which), 14/6.

ROLA latest type P.M.s, 15/-. R. & A. mains energised 2,500 ohms field, 10/6 each; Jensen P.M.s, 10/6.

W.B. 1936 STENTORIAN SPEAKERS. Standard model (list, 32/6), 22/6. Senior model (list, 42/-), 27/6. Brand new in original sealed cartons.

OUTPUT TRANSFORMERS for Power or Pentode, 2/6; Multi-Ratio, 4/6.

TUBULAR CONDENSERS, non-inductive all values up to 3 mfd., 6d. each. 1 Watt Resistors, 6d. 4 Watts, 1/-.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIO CLEARANCE

63, HIGH HOLBORN, W.C.1.

HOLBORN 4631.

Huge purchase of ALBA A.C. MAINS AND UNIVERSAL A.C./D.C. MAINS ALL-WAVE RECEIVERS. Originally listed at 16 and 17gns., respectively, these receivers represent the best in modern Superhet design. They cover 3 Wave Bands: Short Wave 19-49 metres, Medium Wave 200-550 metres, and Long Wave 800-2,000 metres. 2-Speed Drive is incorporated, really first-class Visual Tuning fitted one side of the main tuning dial, the other side is balanced by an illuminated window showing the various positions of the Wave Change Switch, i.e., Short Wave, Medium Wave, Long Wave and 'gram. Combined Volume Control and Mains On/Off Switch, Provision for Extension Loudspeaker, and of course Pick-up, which, as explained above, is switched, Mains Aerial, etc. The following Valves are incorporated in the A.C. Model: FC4, VP4B, VP4B, ZD4A, Pen 4VB, and IW3. The Cabinet is finished in two shades of Walnut, and is a really magnificent job.

In regard to the A.C./D.C. circuit, details, etc., are as above, but of course Universal Valves are fitted as follows: URIC, C1, Pen 36C, 2D13C, VP13C, VP13C, FC13C.

Here is your chance to buy a really first-class All Mains, All-Wave Receiver at a reasonable price.
A.C. Model, £8 7s. 6d. A.C./D.C. Model, £8 12s. 6d.

All Bryce Mains Transformers and Chokes recently advertised are still available from stock.

SPECIAL OFFER.

4-Valve A.C. Mains Chassis as follows, V.M. Pen., Detector, Pentode Output, Valve Rectification. A first-class Chassis complete with Valves as enumerated above, **57/6, Carriage Paid, Aerial tested. Few Only.**

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LISSEN 4-Valve Universal Receiver, fitted in Handsome Walnut Cabinet, Clock Face Tuning, etc. A really fine receiver equally efficient on A.C. or D.C., 74/6.

Enquiries 1½d. stamp if reply expected. Hours of business, 9 a.m. to 7 p.m. Saturdays, 9 a.m. to 1 p.m. All Orders 5/- or over Post Free, orders under 5/- must be accompanied by a reasonable amount for postage. C.O.D. Orders under 5/- cannot be accepted. Orders from Ireland and special parts of Scotland are subject to certain increased postage rates and customers are advised to apply for details of postage before ordering.

Radio Clearance, 63, High Holborn, W.C.1. Holborn 4631.

MISCELLANEOUS

PHOTOGRAPHIC MATERIALS.—Films, Plates, Papers, Postcards, Mounts, Chemicals, etc. Superb quality. Economically priced. Factory fresh always. Money-saving lists free.—"Kimber's," 105, Queen's Road, Brighton.

ADVENTURES and Experiences in **DETECTION.** "Revolutionary"—R.S.G.B. Bulletin. 1/1.—D'Arcy Ford, Gandy Street, Exeter.

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"NEWNES TOURIST ATLAS of Great Britain and Route Guide." Edited by John Bartholomew & Son, Ltd., 120 pages of fully coloured contour maps for the whole of England, Scotland, Ireland and Channel Islands, with Index to the principal Motoring and Cycling centres and distances, 2s. 6d. from all Booksellers.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

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COUPON

This coupon is available until July 10th, 1937, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 3/7/37.

ADVERTISEMENT INDEX

Build this CANVAS CANOE

HERE is an opportunity you must not miss—your chance to construct quickly and cheaply a splendid canoe that will give you endless pleasure this summer and for years to come. Be sure to follow the constructional details in this month's PRACTICAL MECHANICS, out to-day.

Everyone wants to know how to perform marvellous conjuring tricks—and this month Mr. Norman Hunter, the clever illusionist, tells the secrets of puzzling tricks with hats.

The hat illustrated has a hinged partition enabling articles miraculously to vanish and appear.

An illustration from "THE EMPIRE'S WINGS."

These nineteen fire-engines are projecting 100 tons of water a minute. (From the special article "THE STORY OF THE FIRE-ENGINE," in which you will read how firemen have mastered the menace of great conflagrations.)

* * *

The July PRACTICAL MECHANICS also contains special contributions on such absorbing topics as:—

LAND SURVEYING, MAKING A SIMPLE OSCILLOGRAPH, MAKING SENSITISED PAPER, STARGAZING, THE WORLD OF SCIENCE AND INVENTION, THE CENTENARY OF THE TELEGRAPH, MODEL AEROPLANES, THE STORY BEHIND GLASS, WIRELESS EXPERIMENTING.

IN THE JULY

PRACTICAL MECHANICS

THE MAGAZINE OF MODERN MARVELS

6D.

Of all Newsagents and Bookstalls, or by post 8d. from the Publisher, George Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2.

George Newnes, Ltd.

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12/rame

RADIOGRAM IMPROVISATIONS—

See page 393.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 252. July 10th, 1937.

Build the MULTUMETER

OTHER CONTENTS :

- The H.T. Problem
- Tone Control Circuits
- Large Television Section
- Experimental Chassis Construction

etc. etc. etc.

A word on making Model Aeroplanes by F. J. Camm

I can recommend no hobby with more enthusiasm to the modern handyman or his son than Model Aeroplane Building, for there is no other hobby which can be followed at such small cost, and with such a minimum of tool equipment. Profitable jobs await those with technical knowledge. You cannot obtain this in any better or more rapid way than by building and flying models.

Some books for aero-modellers . . . .

MODEL AEROPLANES and AIRSHIPS

By F. J. CAMM. With Special Chapters on Gliders, Helicopters, Wing-flapping Models, Kites, and Full-size Gliding. Everything the novice or expert wants to know clearly and lucidly set down by a man who is not only a theorist of repute but who has actually himself made and flown many thousands of models, and whose designs are known by model experts everywhere. A complete index makes it an immediate and handy reference for every handyman's workshop. With over 120 illustrations, including photographs and diagrams. 1/- net, or 1/2 post free.

POWER-DRIVEN MODEL AIRCRAFT

By F. J. CAMM. The growing interest in model aircraft propelled by some form of engine, such as compressed air, steam, or petrol, has induced Mr. Camm to produce this volume, which is supplementary to his "Model Aeroplanes and Airships." He deals extensively with the older-fashioned rubber-driven type and although pointing out the disadvantages of this method of propulsion gives ample instructions for the construction of models employing it. He is, however, more interested in the compressed air, steam, and petrol engines which have been produced in recent years. These units are thoroughly reliable and simple to make. The book consists of 96 pages, fully packed with up-to-date information for all aero-modellers, and includes over 130 illustrations. 1/- net, or 1/2 post free.

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By F. J. CAMM. This book gives full constructional details for really expert modellers and is intended for the use of the expert or really ambitious novice. The lavish illustrations on each page would enable anyone with a reasonable flair for handicrafts to proceed right away to the construction and assembly of a workmanlike scale model reproducing in its evolutions and appearance the latest types of British and foreign aircraft. The book contains 10 extensive and detailed chapters. Handsomely bound, and printed on fine art paper. 3/6 net, or 4/- post free.

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JULY NUMBER OUT NOW

George Newnes, Ltd.

THIS H.T. BUSINESS—See page 387.

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. X. No. 251. July 10th, 1937.

ROUND *the* WORLD *of* WIRELESS

Build the "Multumeter"

FOR the successful servicing of any type of wireless apparatus a good meter is the first essential. Many keen experimenters carry out quite intricate measurements and tests with a single small instrument, adapting it as required for the job in hand. The efficient service-man, on the other hand, utilises an all-purpose instrument in which the various ranges which are required are brought into use by means of switches. Such an instrument can prove of the utmost value, not only in saving time but in making every measurement and test an efficient one. The basis for an instrument of this nature is a simple milliammeter and the various shunts and series resistances which are required are connected to different switches on lines which have often been detailed in these pages. In this week's issue we describe another all-purpose meter of this type, in which not only D.C. but A.C. ranges may be read, a small instrument type rectifier being provided for the purpose of converting the A.C. into D.C. An instrument of this kind should be kept on the experimenter's bench and will prove time and time again worth its weight in gold. It is hardly necessary to add that care should be taken when using an all-purpose instrument to make quite certain that the correct range has been selected by the switches, as there will otherwise be a risk of burning out the meter.

Electric Clock Standards

MANY listeners are fitting synchronous electric clocks in their radio receivers as this forms not only a neat and novel piece of furniture but adds a measure of safeguard against missing important programmes, and the clock is in its most useful position when selecting programmes. The British Clock Manufacturers' Association and the Synchronised Clock Conference are, with the approval of the Board of Trade, arranging for the British Horological Institute to test electric clocks in order that definite standards of efficiency may be set up.

Philips Transmitter for India

THE British Indian Government have ordered a 250-watt transmitter from Philips Radio for use in Madras. This transmitter is to work on a wavelength of 200 metres and is in addition to the other receivers already ordered or installed for All-India Radio.

Trolleybus Interference

FOLLOWING complaints by listeners and radio dealers in Bournemouth, the authorities are arranging to fit "slipper" contacts to the arms of trolleybuses in place of the wheels now used at this point. This will reduce sparking and eliminate a great deal of the interference, and the remaining electrical equipment of the buses is to be subjected to expert opinion in order that means may be taken to diminish interference.

B.B.C. and Cinema Talks

THE B.B.C. is anxious to find what the public think of the broadcast talks about the cinema. A new series of six such talks will be broadcast on alternate Sunday evenings at about 6 o'clock during July, August and September, commencing on July 18th. Listeners who are prepared to listen to them and express their views should send their name and address on a postcard addressed to the B.B.C. at Broadcasting House, W.1. They are asked to state their occupations so that a representative "research panel" may be formed. Special forms will be issued with business reply envelopes to all the members of the "panel" on which they can express their views on the talks to which they listen.

Piping at Edinburgh Castle

ON July 10th Pipe-Major Ross and the brass section of the B.B.C. Scottish Orchestra, directed by Guy Warrack, will broadcast (weather permitting) from the battlements of Edinburgh Castle. This will be followed by a special feature in the Scottish Regional programme entitled "The Royal Visit in Retrospect," largely composed of recordings of the main events during the week.

Café Colette again

ON July 13th in the National programme the Café Colette will again be the scene of a broadcast. Nicolina, the international singer, is coming specially from Paris to take part in the programme, which will also bring to the microphone for his first broadcast here Charles Vadja, the Hungarian singer who sang in C. B. Cochran's "Home and Beauty" Revue.

Reginald Foort's Music Library

ALTHOUGH this popular organist has a tremendous library of musical works of all kinds he recently stated that he could, if necessary, play for twenty-four hours from memory without repeating any piece of music, and the recital would include no fewer than thirty different overtures. During his "spare time" he is busy cross-indexing his library which he thinks includes a copy of practically everything that anyone could possibly ask him to play—with or without reason!

Shows from the Seaside

AS a result of Harry S. Pepper's talent-spotting tour among the coastal concert parties a preliminary series of seaside broadcasts has been arranged. On July 8th in the National programme Richard Jerome's "Gay Parade" concert party will be broadcast from the Pier Pavilion, Worthing. On July 15th in the National, Gwen Lewis Entertainers, in "Southsea Revels," will be heard from the New Castle Corner Pavilion, Southsea, and in the Regional programmes on July 23rd and 29th the relays will consist of "Dazzle," by Eric Ross, from Pierrot Land, Bognor, and George Hay's Concert Party, from the Pavilion, Littlehampton.

ROUND the WORLD of WIRELESS (Continued)

S.S. *Berengaria*

"DUE to Berth at 9.30 p.m." is the title of a broadcast from Southampton on July 9th, when listeners will hear an impression of the Ocean Dock, Southampton, before and during the berthing of the s.s. *Berengaria*.

Midland Symphony Concert

ON July 10th Leslie Heward will conduct the B.B.C. Midland Orchestra in a programme which will include Paul Lacombe's Hungarian Parade, and unpublished works by Felix White and Herbert Stephen.

"Bon Accord"

THIS is the title of a light variety programme which will be broadcast from Aberdeen on July 10th. Taking part will be Nellie Norman, the Rhythm Singer; Gus Stratton in comedy character songs; Jean Stewart, the Scots Accordionist; Roland Smith in "Mrs. McHaggis at the Coronation"; Tom Forbes, Flossie Miller, Alan Munro, and Lambert Wilson's Quartet.

Vaughan Williams Programme

THE B.B.C. Midland Orchestra, conducted by Eric Warr, the B.B.C. Midland Singers, and Arnold Matters, baritone, will be heard in "Five Mystical Songs," by Vaughan Williams, on July 11th. The programme will open with the overture to "The Wasps," and the Orchestra will also play the "Old King Cole" ballet.

In last week's issue we published an interesting note concerning the world's loneliest island, Tristan da Cunha. The above illustration shows the Rev. H. Wilde with the special radio equipment presented to him by E. K. Cole, Ltd., to enable the islanders to receive all-the-year-round radio. Mr. Wilde is taking the equipment back with him when he returns to the island in November, and it will be the first time the islanders have been able to receive musical programmes from abroad.

INTERESTING and TOPICAL NEWS and NOTES

New Appointment

WE are informed that Messrs. Gambrell Radio Communications, Limited, have appointed Mr. H. Francis White as Marine General Manager. Mr. White was one of the early pioneers of wireless, and has had a long and distinguished career. In his 34 years' experience he has filled with distinction practically every known post in his profession, from operator on the maiden voyage of the s.s. *Coronia*, through Travelling and Shore Inspector, Chief Instructor, Contract Manager, and Marine Superintendent to General Manager. His services will be of especial value to Gambrell Radio Communications, Limited, in their present rapid expansion and development.

Cyclists Please Note

WE understand that an interesting discussion will be broadcast at 9 p.m. on August 7th in the Regional programme, when the question, "Is the Cyclist a Public Nuisance" will be debated.

Variety from Coventry Hippodrome

A STRONG bill of variety will come from the Hippodrome Theatre, Coventry, on July 15th. The programme is entitled "Radio View," and is devised and produced by S. H. Newsome, manager of the theatre, and Pat Aza. The artists will include Elsie Carlisle, assisted by her two pianists, Freddie Aspinall and Ronnie Aldridge; Herschel Henlere; Janet Joye, in impersonations; Murray and Mooney, comedians; Raymond Bennett, who will compère the show; and the Coventry Hippodrome Orchestra, directed by William Pethers.

"Show of Shows"

THE "Show of Shows," 1937 Edition, presented by Gerald Palmer and Caspar Middleton, is to be broadcast from the Knightstone Pavilion, Weston-super-Mare, on July 7th, in the Western programme. This show is doing its second season at Weston-super-Mare, and the cast includes: Peggy Ford-Carrington (the New Zealand soprano), a discovery of the late Dame Nellie Melba; Michael Ivan (Russian tenor), who came to England with the Cossack Choir, and has remained here ever since with the exception of two visits to South Africa and a short visit to the United States; Marion Dawson (comedienne); Billy Bernhart and Partner (comedians); Isna Riselli and her six Girls (dancers); and Hal Moss's Mayfair Broadcasters, augmented by Al Lever's Winter Gardens Band.

Tommy Farr, Great Britain and Empire heavy-weight boxing champion, with his newly acquired Philco all-wave receiver.

SOLVE THIS!

PROBLEM No. 251

Hemsley bought a 120-volt wet H.T. battery for supplying H.T. to his battery receiver, and as he had a 200-volt D.C. supply available he decided to charge the battery at home. A charging rate of 500 mA was suggested by the manufacturers so he used a 100-watt 200-volt lamp for limiting the current to this value. Although the battery seemed to be in good condition it took much longer than he anticipated to become fully charged. Why was this? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 251 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 12th, 1937.

Solution to Problem No. 250

There was a leakage to earth from the outside aerial, and as the positive main was earthed on the supply there was a short circuit across the mains when the new aerial was connected up.

The following three readers successfully solved Problem No. 249, and books are accordingly being forwarded to them: H. Giles, 9, Prince Albert Sq., Earlswood, Surrey; W. D. John, Brookville, Pembrey, Carms.; R. S. Pace, School House, Lazonby, Penrith.

This H.T. Business

It is Possible to Run the Ordinary Battery Receiver Without an H.T. Battery, and the Most Modern Method is Explained in This Week's Article

by The Experimenters

OUR post-bag is growing weekly, and it looks as though we shall have a job to describe everything that our readers are wanting. We are glad to note, however, that the beginner's articles are so widely appreciated, and will remember that the modest type of apparatus is so popular, but this week we want to deal with a problem which is now assuming greater interest in the minds of the majority of our readers than the choice of the receiver. We refer to the H.T. battery problem. You all know what a costly item this part of the outfit is, and how annoying it is to find that when you particularly want to hear certain programmes the H.T. battery is just on the point of giving up the ghost. (What about the volt-meter, says the expert? Well, just at the moment we are dealing with the beginner, and we will assume that he is not yet aware of the importance of this instrument.) In the early days we used to make up our H.T. batteries as we required them, simply by obtaining the standard 4.5-volt flash-lamp batteries, and connecting them in series with paper clips, or the special little spring clips which were sold for the purpose. By this means we found that as the battery became old, a test of each separate battery would reveal that some had depreciated more than others. We accordingly cut them out and put new batteries in their place, and the expense thus seemed to be kept quite small. Actually, of course, we were paying much more for a complete H.T. unit than the listener of to-day pays, but the small cost of separate batteries which we could buy at odd times was less noticeable than 15s. or so spent at once.

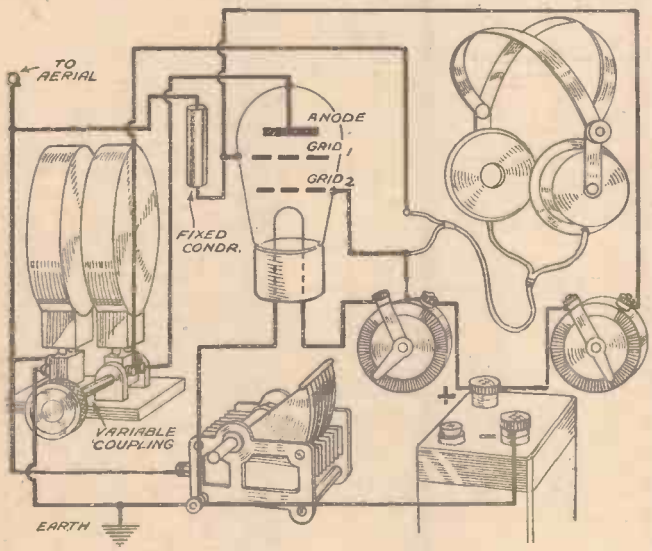


Fig. 1.—This is one of the earliest circuits designed to dispense with the H.T. Battery. A special 2-grid valve was employed with the connections shown here

H.T. Generators

However, to get back to our problem of the week. Several ingenious suggestions have been made from time to time to eliminate entirely the large H.T. battery which is required to operate the modern wireless valve. A minimum of 50 volts is necessary in order to operate a single-valve set reasonably well, although in a midget portable or some other type of what might be called a "freak" set, it is possible to use only 10 volts or so and still obtain satisfactory results. Indeed, the modern Hivac Midget valve will operate quite efficiently on 45 volts even in the L.F. stages, but this is hardly the problem with which we are now dealing.

Many years ago certain inventors got down to this problem and found that it was possible, by putting another grid in the valve and by connecting this in a certain way, to obtain effective results with no H.T. battery at all. The circuit which was eventually perfected is shown in Fig. 1, and for those who cannot yet read a circuit diagram easily, this is given in pictorial form.

As you will see a two-grid (or bi-grid) valve was used for this circuit, but the modern screen-grid does not lend itself very well to this arrangement. We have made it work, but not like the old circuit. To continue—this was a circuit arrangement designed to eliminate the H.T. battery, but experiments were continued with a view to finding some source of high voltage which could be obtained outside of the circuit. Several schemes were suggested, including the building-up of pieces of dissimilar metals into a unit to place over an ordinary gas-ring. Another idea was once put on the market in the form of a number of small flower-pots in which various chemicals and pieces of metal had to be placed and filled with water. But they all turned out to be merely compromises and did not give exactly the same results as are obtained from a good H.T. battery unit.

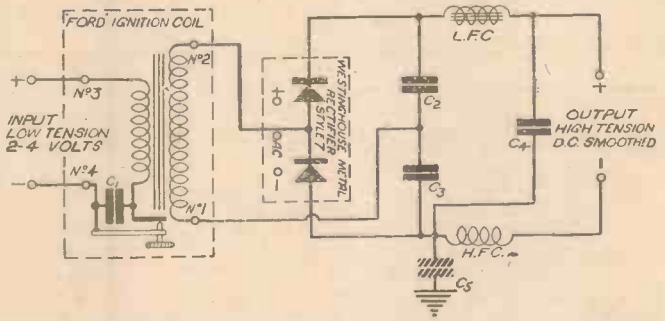


Fig. 2.—This is the early form of H.T. generator using a dismantled Ford car spark coil.

The Ford Coil

Way back in 1933 details were given in this journal for a scheme which had great promise and which utilises a vibrator and ordinary L.T. accumulator. The idea in brief is that the vibrator, or interrupter, chops up the direct current provided by the accumulator, and this alternating current, as it is called, is then fed to a transformer and stepped up to the desired value. The theoretical circuit is given in Fig. 2. The vibrator was obtained from an old Ford coil, such as was used in the Ford car. For those

(Continued overleaf)

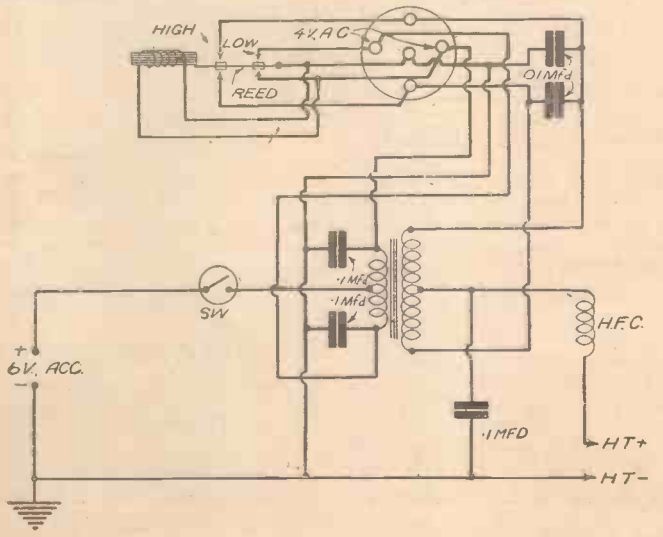


Fig. 3.—Circuit of the modern H.T. generator using the new Bulgin self-rectifying vibrator. No smoothing is shown in this circuit, but will be given in next week's constructional article.

THIS H.T. BUSINESS

(Continued from previous page)

who are still interested in this arrangement the following are the main details.

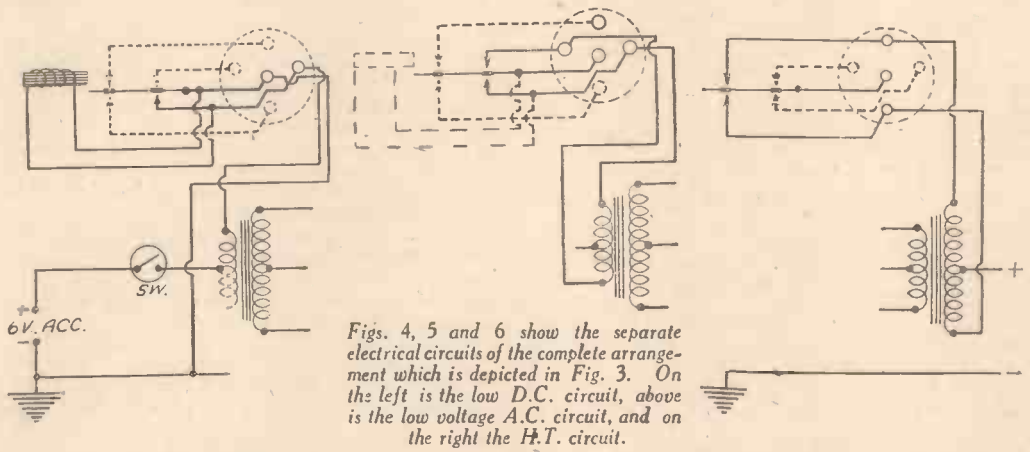
The case containing the ignition coil must be broken open and the wire which is joined to segment No. 1 must be broken away, taking care to leave the other wire from the secondary winding joined to No. 1. The wire from the contact breaker is brought out and numbered 4. This wire is joined to the metal rectifier, as shown in the diagram.

It should be emphasised, however, that the ignition coils all seem to differ, and where one reader has obtained wonderful results, another may obtain nothing at all. One reader recently wrote and said that although he was getting a good high-tension supply it was impossible to use it because of the terrific interference which it gave and which drowned all signals. This could, of course, be avoided to a large extent by putting the entire unit in a metal box and earthing the box.

The Bulgin Vibrator

However, experiments have been carried further with this type of device and it is now in such a perfected form that it is to-day possible to buy complete wireless receivers into which a special device of a similar nature is built, and which enables the set to be operated from a single 6-volt accumulator. The main essential of this arrangement is a vibratory rectifier, or, if you prefer it, a combined interrupter and rectifier. Diagrammatically, it is shown as at Fig. 3, and it will be seen that it consists of a vibrating reed having two pairs of contacts. The low-tension supply is fed to one pair and becomes chopped up or converted into A.C. This is fed to the primary of a special mains transformer and the higher voltage obtained from the other side is fed to the other pair of contacts on the unit, and this rectifies or more correctly provides a uni-directional current at the higher voltage.

It must be emphasised for those who are not well up in electrical knowledge that it is impossible to obtain something for nothing, and consequently there are always some losses to be found. For instance, the 6 volts which is applied from the accumulator, when converted into A.C., has a value of approximately only 4 volts. The amperage is, however, very high, owing to the fact that the accumulator amperage is high (remember that the amperage is the current which is supplied). When the 4 volts A.C. is stepped up to 100 or more the current will naturally have to fall, as the resultant wattage will have to be lower than the original. Remember that wattage is the product of volts and current. In spite of the losses, however, it is possible to obtain ample current for the H.T. supply of even a mains receiver from a 6-volt accumulator, a good standard being 60 milliamps at 250 volts. This may be used for a home mains radio or a car radio, and in our next article we will describe the construction of a complete unit of this type. In the meantime, to keep you amused, we show in Figs. 4 to 6 the separate voltage feeds in the complete unit, so that you can follow how the complete high-tension supply is obtained. In these diagrams connections to the special vibratory rectifier are shown in the actual form they take on the finished article. To facilitate connection, this is built in a small cylindrical case fitted with five pins arranged as in a standard 5-pin valve. A special 5-pin valveholder is supplied with the instrument and thus the constructional work may be carried out and the instrument inserted when this has been completed. Next week we will give the complete circuit and all the constructional notes.



Figs. 4, 5 and 6 show the separate electrical circuits of the complete arrangement which is depicted in Fig. 3. On the left is the low D.C. circuit, above is the low voltage A.C. circuit, and on the right the H.T. circuit.

Important Broadcasts of the Week

NATIONAL

Wednesday, July 7th.—Bluebeard, a musical play.
Thursday, July 8th.—Concert Party programme, from Worthing.
Friday, July 9th.—A Visit of the King and Queen to Empire Exhibition, Glasgow.
Saturday, July 10th.—Music Hall programme.

REGIONAL

Wednesday, July 7th.—Kaleidoscope, a musical mélange.
Thursday, July 8th.—A Storm in a Tea Cup, a play.
Friday, July 9th.—Bluebeard, a musical play.
Saturday, July 10th.—Ship-Shape and Bristol Fashion, the romantic story of enterprising and adventurous traders.

MIDLAND

Wednesday, July 7th.—Orchestral programme.
Thursday, July 8th.—"How to make the best of a Typist's salary," a talk.
Friday, July 9th.—Poems by W. H. Davies, read by the Author.
Saturday, July 10th.—Light Romantic German Opera—I, presented by Max Robertson.

WELSH

Wednesday, July 7th.—Sailing the Seven Seas—The ports of Nevin and Portdinllaen, talks feature programme.
Thursday, July 8th.—Address of the Chairman of the Welsh Congregational Union, from Whitefield's Tabernacle, Tottenham Court Road, London.
Friday, July 9th.—A Welsh Variety programme.
Saturday, July 10th.—Long Ago, a radio play by Tom Anthony.

WEST

Wednesday, July 7th.—Concert Party programme, from Weston-super-Mare.
Thursday, July 8th.—Choral programme.
Friday, July 9th.—"Due to Berth 9.30 p.m.," an impression of the Ocean Dock, Southampton, before and during the the berthing of the s.s. Berengaria.
Saturday, July 10th.—Ship-Shape and Bristol Fashion, the romantic story of enterprising and adventurous traders.

NORTHERN

Wednesday, July 7th.—Brass Band Programme.
Thursday, July 8th.—Variety programme, from the Alexandra Theatre, Hull.
Friday, July 9th.—The Brooklands Lawn Tennis Tournament, an eye-witness account.
Saturday, July 10th.—A vocal recital.

SCOTTISH

Wednesday, July 7th.—Summer Shows—Excerpts from "Half Past Eight," from The King's Theatre, Edinburgh; and Concert party programmes from Cragburn Pavilion, Gourock and the Beach Pavilion, Aberdeen.
Thursday, July 8th.—Royal Visit to Scotland. A description of the King and Queen attending the Rally of Youth at Murrayfield. Storm in a Teacup, a play.
Friday, July 9th.—An Orchestral Concert.
Saturday, July 10th.—Pride o' the Green, a comic opera in two acts by A. F. Hyslop.

NORTHERN IRELAND

Wednesday, July 7th.—Choral and instrumental programme.
Thursday, July 8th.—"Village concert," a short concert from the Church Hall, Ballycastle, County Antrim.
Friday, July 9th.—First Prizewinners (Intermediate and Junior) North of Ireland Bands' Association Championship Contest, held in the Ulster Hall, Belfast, November, 1936.
Saturday, July 10th.—A running commentary on the Swimming Gala, from Pickie Pool, Bangor, County Down.

TONE-CONTROL CIRCUITS

This Article Specially Written for Beginners, Describes Some Simple Tone-correcting Circuits, and how to Apply Them to a Modern Receiver

LET us suppose that, having listened critically to your set, you have decided that it is deficient in those higher tones that give life and brilliance to a performance. You want to remedy matters, but are uncertain what to do. The measures you must take are really very simple, and will involve no greater expense than the cost of a few resistances

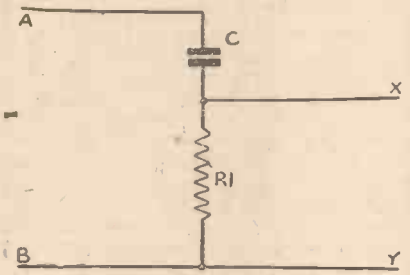


Fig. 1.—Circuit to illustrate reactance of a condenser and resistance.

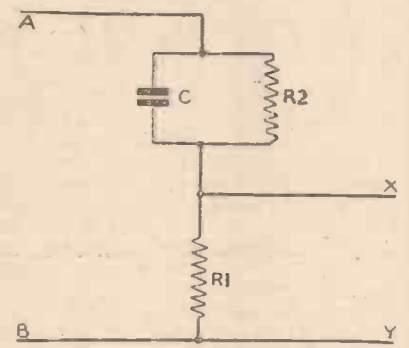


Fig. 2.—In this arrangement high notes will be boosted.

and condensers. But before going into practical details we must understand the principles on which the cure is based.

The symptom we have observed is a lack of brilliance due, we have surmised, to a deficiency of higher tones in the reproduction—in particular, to an insufficient rendering of the higher overtones compared with their fundamentals. In scientific talk, the receiving set is defective in its amplification of the higher frequencies; but if we can introduce into it a modification that will produce a boost of those frequencies we shall restore matters to normal. Now a circuit that boosts the "upper" frequencies is much the same thing as one that suppresses the "lower" frequencies; and it is quite easy to design a piece of apparatus to do the latter, as we shall see.

Condenser Properties

To accomplish our purpose we shall make use of one of the properties of a condenser. A condenser, as you know, consists of a number of interleaved metal plates separated by insulation, and its fundamental property is that, when the two sets of plates are connected to the terminals of a battery, a momentary surge of current flows and charges the condenser If the condenser is now disconnected from the battery and the plates connected together, another surge of current flows, in the opposite direction to the first, and the condenser discharges. It follows from this that, if a condenser is connected to a source of alternating voltage, it will discharge and recharge with opposite polarity every time the voltage reverses. The voltage reverses twice in every cycle: therefore current flows into and out of the condenser twice in every cycle. If we double the frequency we double the number of times the condenser charges and discharges in a second; and that is the same thing as saying we double the current that flows through the condenser. Two facts then emerge: that a condenser connected across a source of alternating voltage conducts a current much as though it were an ordinary resistance; that the higher the frequency of the alternating supply, the greater is the current that flows in the condenser. A third fact, more or less self-evident from what has been said, is that the higher we make the capacity of the condenser, the greater is the current that flows.

Since a condenser behaves as a conductor to alternating current we can apply Ohm's Law to it. If we divide the current into the voltage applied between the plates we get a quantity that corresponds to resistance. We call it the *reactance* of the condenser, but it is not a constant, like resistance, but becomes smaller as the frequency increases. We can, however, measure its equivalent resistance value in ohms for a given frequency; and this value is equal to $1{,}000{,}000/2\pi fC$, or roughly 160,000/fC, where f is frequency, and C capacity in microfarads.

On referring to Fig. 1 it will be seen that a condenser is arranged in series with a resistance. If the points A and B are connected to a source of alternating voltage, then a current will flow in C and R1, and a voltage will be developed across R1 at X and Y. If the frequency is low, the reactance of C will be high, and the condenser will let very little current through to R1; consequently the voltage across R1 will be small. If the frequency is high, the reactance of C will be low, and the PD across R1 will be nearly as great as that applied at A and B. Of course, it can never be higher than the applied voltage. Thus, if we apply a constant voltage between A and B but gradually increase its frequency, we get to begin with a very small voltage across XY, but as the frequency rises this voltage rises, too, and at high frequencies becomes nearly equal to the full value applied at A and B.

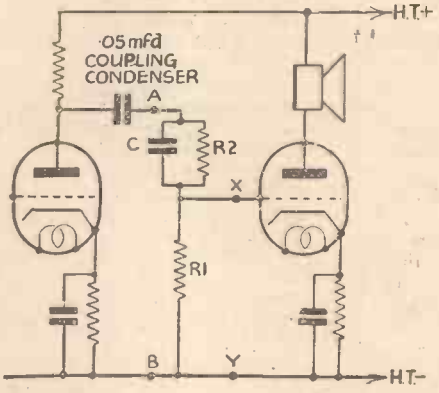


Fig. 3.—Standard R.C. circuit with high-note booster.

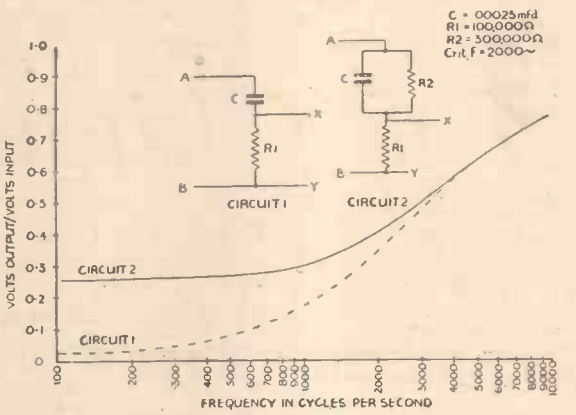


Fig. 4.—Graph illustrating the effects of high- and low-note boosters.

Boosting the High Notes

Such a simple circuit could be used to compensate for the loss of high notes in our set. Unfortunately it does not provide quite the type of restitution needed; it carries the correction too far in the bass and cuts out most of the deep tones. What is needed is a circuit to give all notes below a certain frequency a constant reduction, and notes above this frequency a reduction that becomes progressively less as the frequency increases.

This is accomplished by using the circuit shown in Fig. 2. Here, if C were absent, R2 and R1 would form a simple potentiometer, and a proportion equal to R1/(R1+R2) of the PD applied between AB would always appear across XY. At very low frequencies the circuit behaves in that manner, for the reactance of C is so high that the current flowing through it remains a very small fraction of what flows through R2. Round about a certain

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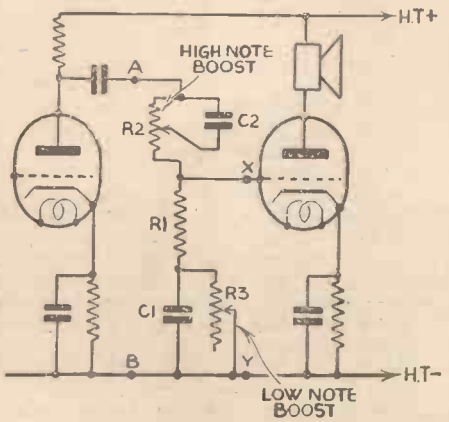


Fig. 5.—Complete circuit diagram of L.F. stage with both high- and low-note compensators.

TONE-CONTROL CIRCUITS

(*Continued from previous page*)

frequency the reactance of C becomes comparable with R2; as the frequency is further increased C passes still more current, and ultimately the current flowing in R2 becomes, in its turn, small compared to that in C. Hence, above this critical frequency, where the reactance of C equals the resistance of R2, the PD across XY will increase rapidly with frequency, until at high frequencies it is practically as high as that applied at AB, as was the case with the circuit shown in Fig. 1. Expressed numerically, this "critical frequency" is that which makes $160,000/fC=R2$; or f (critical)$=160,000/C.R2$.

The graph in Fig. 4 shows the relationship between the voltages across XY, and AB, as the frequency is varied, for both the Fig. 1 and the Fig. 2 circuits. The critical frequency was chosen to be 2,000c, and the ratio of the highest and lowest values of PD across XY, with a constant voltage of varying frequency applied at A and B, was made 3/1. This ratio is roughly equal to the fraction R2/R1.

Voltage Ratios

The problem remaining to be solved is how to apply our tone correcting circuit (Fig. 2) to a receiver. You will notice that the circuit operates by causing the ratio of volts output (across XY)/volts input (across AB) to become greater as the frequency rises. If we connect across X and Y any device that consumes a current the behaviour of the simple circuit would be altered, and would no longer conform to the calculated result. But if we connect across XY a device that requires voltage only to operate it, without consuming any current, then the Fig. 2 circuit will behave exactly as we have calculated. Such a device is the grid-cathode circuit of an L.F. amplifying valve; hence the circuit should be connected in the set immediately prior to the output valve or

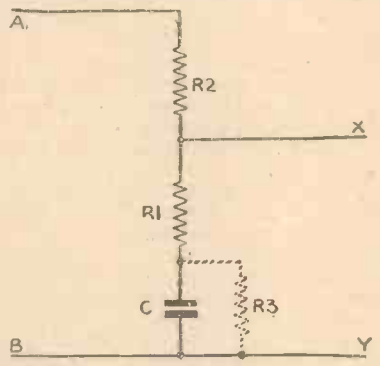


Fig. 6.—How the bass booster is connected and its method of working.

an earlier L.F. amplifying valve, and the method of doing this is illustrated in Fig. 3.

These simple tone-correcting circuits are readily adapted to other purposes besides boosting the treble. For instance, they can be easily designed to give a boost to the bass, which is very often to be desired when a moving-coil speaker is used, due to domestic pressure, with only a small baffle or baffle-cabinet. In Fig. 6 a bass-boost circuit is shown, the lettering being made to correspond with Fig. 2. In this circuit the "critical" frequency, below which the boost is to take place (this frequency can normally be taken as 150c), is the frequency at which $160,000/fC=R1$, and the maximum amount of boost is, as before, roughly in the ratio of R2/R1. When the bass-boost circuit is put in a valve amplifier or receiver an exactly parallel procedure to that adopted for Fig. 2 is used; merely substitute the arrangement shown in Fig. 6 for the Fig. 2 arrangement in the practical circuit (Fig. 3). It becomes necessary, however, to provide a grid-leak in shunt with C so that the grid of the valve may get its proper bias. The method of connecting this leak is shown in dotted lines in Fig. 6, and the resistance of the leak (R3) must be at least ten times as great as R1.

Finally, it is possible to combine the treble- and bass-boosts to make a variable tone-control that will augment either bass or treble as desired, or both together, two control knobs providing the dual adjustment. The method of accomplishing this, together with the component values that have been found satisfactory in practice, is shown in Fig. 5.

The Chilowski Light-relay

Details of a New and Interesting Form of Light-control Device

DURING the past twenty years a considerable amount of time and money has been spent in endeavouring to produce an electric relay, operated by light, in a cheap and practical form which could be generally available for a number of commercial applications. One of the most obvious of these applications is the automatic switching on and off of lighting systems.

At present there are two principal methods in use. The first method employs either a photo-electric cell or a selenium resistance bridge, and both necessitate the use of a valve amplifier and a relay. A second relay is often necessary when large currents have to be dealt with. A unit of this type is much too costly for general application, and as it consists of three or four elements which require delicate adjustment it is comparatively easily put out of action.

The second method employs clockwork mechanisms which are also somewhat complicated and subject to the usual mechanical defects. Apart from being rather costly their operation does not depend on the surrounding degree of illumination, and they must be set in advance to operate at a definite time.

The Chilowski light-relay is a device which appears to be destined to fulfil a number of industrial applications because of its relatively low cost, absolute simplicity, completely automatic operation, and also because it requires neither periodical inspection nor servicing.

Photo-chemical Reaction

Its action is based on a photo-chemical reaction long known to chemists. If a glass container filled with equal volumes of hydrogen and chlorine gas be exposed to sunlight the two gases combine instantly. If the light is subdued the rate of combination is slower, and in darkness the two gases do not combine.

Chilowski uses this simple reaction as the basis for his relay. A very small glass bulb is half-filled with aqueous hydrochloric acid and two electrodes are sealed through this container. In one ingeniously devised example of its applications—the Tubest Automatic Parking Light Control—these are connected to the battery of a car.

Electrolysis of the acid takes place, hydrogen and chlorine gases being produced within the glass bulb. If this bulb is in darkness the two gases do not combine, and a considerable gas pressure is built up in the bulb.

Operating Details

One side of this bulb consists of a thin, flexible membrane which bends slightly with the increasing gas pressure. The bending motion either operates a direct acting switch or moves a mercury column which closes a circuit, automatically switching on any lights with which the device is connected—in this case the parking light of a car.

When the glass bulb containing the two gases is exposed to light of a certain intensity the gases re-combine, dissolve in the acid, and the pressure is reduced. The glass membrane returns to normal, and the circuit is broken, thus switching off the parking lights.

The above is a brief outline of the principle underlying the new relay. After three years of continuous effort the whole instrument has been assembled within a glass disc roughly 2in. diameter by ¼in. long and weighing about 2 ounces. This highly compact yet practical and robust unit will switch on and off a current at 150 watts, the lag in operation being of the order of ½ second. It requires no attention, and once installed should function well indefinitely. Its cost is low and the complete unit for automatically operating car parking lights should be within the reach of practically every motorist.

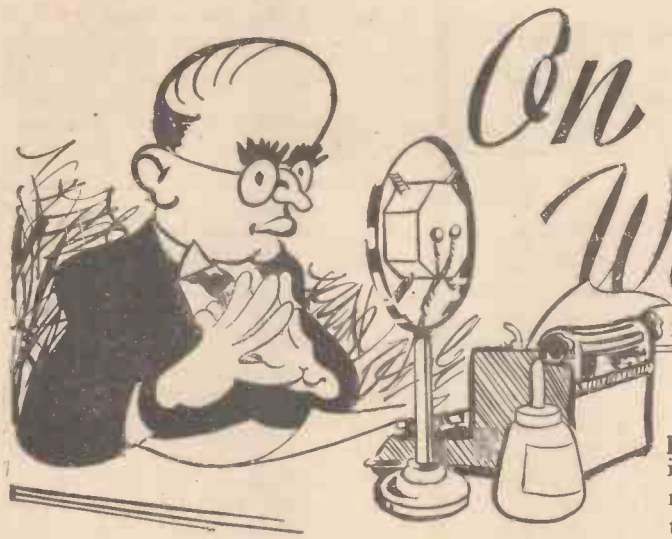
This device includes an ingenious cut-out which is operated by the driver on entering his garage, or in any other circumstance where he may wish to put the automatic parking light out of action. On starting up his car the following morning, or after the first acceleration, this cut-out switch is automatically released and the light-relay is once more ready to function without further intervention on the part of the driver.

Various Uses

A very important application is the automatic switching on and off of the electric lighting of railway coaches, etc., and a particularly robust unit has been designed for this purpose. This is now operating with entire satisfaction on certain of the French railway systems.

Other uses to which it is being applied include the automatic switching on of public lighting systems, lighting in telephone booths, display windows, as well as for a variety of publicity purposes, road signs, traffic lights, aerodrome beacons, buoys, harbour lights, etc., etc.

The Chilowski photo-relay is patented in all principal countries and its commercial development and manufacture is in the hands of the well-known French firm, Société Tubest, of Fere-en-Tardenois. Further particulars may be obtained from International Technical Developments, Ltd., Thames House, S.W.1.



On Your Wavelength

By THERMION

The Component Position

THIS journal, as in so many other things, took the lead in drawing attention to the unsatisfactory state of the component industry as it relates not only to the quality of the products, but also as it affects the time taken in delivery. Several articles have appeared in this journal during the past two years, and we are pleased, therefore, to observe that an esteemed contemporary has seen fit to lend power to our efforts by also drawing attention to this unsatisfactory position. We should be lacking in our duty to our readers, as well as to the trade, if we did not voice our opinion on a matter which vitally affects both. I would preface my remarks by saying that I am speaking generally and not specifically, and I am prepared to concede that there are many old-established firms in the wireless trade who continue to give prompt service, and to supply reliable components. That position is by no means general, and the large amount of correspondence we receive from constructors indicates that the component manufacturer no longer wishes to court their custom, but prefers to flirt with the complete set manufacturer who is prepared to place large contracts in return for the courtship. The radio industry was built upon the solid foundations of the amateur experimenter. The demand for components on the part of the latter supported the wireless trade, and the interest of the constructor was really created by the technical press. It is one of the few examples of the press creating an industry. Having developed from the sapling stage into a tree with roots deeply planted in the pockets of the listener, the industry now seeks to transplant itself into soil more alluvial in character which it anticipates will provide it with rare and refreshing fruit in the form of large turnovers, and even larger profits for shareholders. Thus, the constructor has been shanghaied, and lies between the Scylla of his hobby, and the Charybdis of a passive industry which wants him no more. I will exclude the few faithful firms whose advertisements still decorate our columns, and it is nice to know that they are now reaping the reward of their early work.

A Vast Public

BUT the industry is all wrong in this dereliction of duty towards a still vast public, for its attitude, I am quite sure, is deliberately designed to decimate it, if not to exterminate it altogether. I am quite sure of my facts here ; component manufacturers will argue that they elect not to bother with home constructors as they prefer to make in tens of thousands for manufacturers instead of in thousands for home constructors. This is a piece of illogical reasoning, for if you go out to kill a market you must not complain if the market is unresponsive. You cannot eat your cake and have it, and I say that if home construction were encouraged with the same enthusiasm which bleats the supposed advantages of some most inefficient commercial receiver, it would still provide profit for many companies instead of at present the profit of a few.

The circulation of this journal continues to lead the field by many thousands, which is surely sufficiently indicative of the interest in home construction. The receivers described in these pages have been built in their thousands, but in nearly every case we receive complaints of lack of delivery in spite of the efforts we make to ensure that the goods can be delivered, and to obtain assurances from the manufacturers.

Distribution

THE distribution of components is one of the main difficulties, for you have the apathy of a dealer who prefers to supply a complete set to a parcel of components. These dealers are really the provincial ambassadors of the industry, and if they collectively do not feed the manufacturers with an order which in the aggregate makes it worth while to get into production, the manufacturer can excuse himself on that score. The manufacturer does not control the dealer, except that he can by offering high discounts induce the dealer to stock sets instead of components.

Quite apart from this question of delivery is the somewhat half-hearted manner in which such manufacturers to whom these remarks apply tackle the question of manufacturing for the home constructor. Everyone is aware of the somewhat unsatisfactory state in which certain components are supplied—weakly designed, of poor finish, and of low efficiency. In this respect tuning coils seem to be the worst offenders.

Now there are at least half a million people in this country interested in home construction. If this were not so the sales of wireless periodicals would vanish, and I can assure my readers that the publishers of PRACTICAL AND AMATEUR WIRELESS have no intention of stopping its publication. That being so our duty to our readers impels us to make the suggestion that there is room for a new batch of manufacturers who will specially cater for home constructors, and keep their fingers out of the set market. We can assure them that a large reward awaits them. The present position of component shortage and disinterestedness is one deliberately designed by certain manufacturers to kill home construction in the hope that constructors will purchase ready-made receivers. This they will not do for, like photography, it is a hobby in which the devotee prefers to obtain his own results.

Cheaper Components

I SUGGEST that the time is ripe for the production of a range of cheaper components, and that the design of tuning coils needs a considerable amount of attention, since this is one of the most fruitful sources of trouble. If the work of matching could be made easier by the production of a range of testing equipment at a price within the pocket of the home constructor, so much the better. A cheap oscillator is badly needed. Most manufacturers seem to forget that the home constructor spends more in a year on wireless than the purchaser of a complete set. The latter is made to last for two or three years, whereas the constructor is always experimenting, and adding to his stock of parts. I repeat that it is a healthy market which would respond to the right action on the part of the trade. Television is being kept out of the way of the home constructor deliberately — fortunately, without success.

The Hard Lot of an Editor

NOW in order to clean up some of the objections formerly levelled against home construction, when this journal started it inaugurated a policy which was in the best interests of the trade and the consumer. It did not specify alternative parts, for we believe that it is impossible to design a receiver in which any make of component can be used. Whether that is so or not is, I am prepared to agree, a matter of opinion, but where only one part is specified we are easily able to diagnose faults, and to help the reader should he strike a snag. We know the performance of the receiver when the specified parts are used, whereas it would be quite impossible to do so if we permitted any make of parts to be used. We do not say that other parts will not work; we merely say that we have not tried them in that particular set. It is in the interests therefore of the user to stick to our specification. We also undertook to service receivers free of charge, knowing that most constructors would be without the equipment necessary to locate obscure faults, particularly as regards matching and inductance. We are the only journal to undertake this service, and this was the only journal to inaugurate a free advice bureau for helpfully answering readers' questions.

Our Technical Handbooks

THE Editor also produced a series of practical volumes which are still on sale for a nominal sum. These books contain all that the constructor needs to know, and the fact that they have broken all records for the sale of technical books is sufficient index of their quality and the authority of their contents. Now and again, however, we receive a letter from a reader stating that he is unable to get a receiver to work, and asking whether we will check it for him. We agree, but when the receiver arrives we sometimes find that the reader has not even completed the assembly, or else that it has been so badly packed that it arrives smashed. In such a case we are unable to help, and we return the receiver with the request that it should be completed and tested before application is made for our service, or in the case of a set which has arrived damaged that the matter be taken up with the carriers. A particular reader to which these remarks apply is S. B., who says that he built a Record All-Wave Three and sent it to us for test. I have just looked up the test report book and find the following entry :—

"No control of volume due to defective volume control potentiometer; faulty 15,000-ohm resistance; volume control potentiometer control to be returned to manufacturers and condenser to be replaced."

The set arrived smashed; although we generously interpret our guarantee, we cannot encourage readers to be careless by slinging the set into any old cardboard box, and holding us responsible for its safe transit. If you are careless in packing the receiver you must, unfortunately, bear the brunt of your carelessness. So S. B. of Tipton, Staffs, if you care to assemble your receiver and submit it in a strong box, it will come back to you properly adjusted and tested.

C.W. on Vitesse

SEVERAL readers who have built the Vitesse have written to ask whether any modification can be made to enable them to receive continuous-wave morse transmissions. In order to receive C.W. signals on a superhet the intermediate frequency amplifying valve or the second detector must be made to oscillate in the same way as the detector valve in the straight type of receiver. This can easily be done in the Vitesse by running the grid and anode leads of the 210 VPT valve near each other. By this means a feedback occurs from the anode to the grid and the valve is made to oscillate. When this valve is in an oscillating condition, however, telephony programmes cannot be heard and therefore it is essential to provide a control for this oscillation so that telephony and C.W. signals can be received at will.

Wiring C.W. Control

THE tone-control potentiometer fitted to the Vitesse can be used for this purpose, the following modifications being necessary. Disconnect the .01 mfd. condenser (C 13) from the 50,000-ohm tone-control and connect it to the metal chassis. Remove the other lead from the control, and then re-wire the control as follows. Centre tag to the junction of C7 and R2, one end tag to the GB terminal of the L.F. transformer, and the other end tag to the metal chassis. The leads connected to the grid and cap of V2 should be moved near enough to each other to produce oscillation when the control is at maximum setting—the best position can easily be found by experiment. The 50,000-ohm potentiometer then becomes a very useful volume and oscillation control—a refinement which is not found on commercial receivers.

Aerial Leakage in D.C. Sets

CONSTRUCTORS are often being warned to connect a condenser between the earth socket and the earth lead when a receiver is being supplied from D.C. mains. This precaution must be taken to avoid a short-circuit across the mains in cases where the positive main is earthed. It is seldom realised, however, that a short-circuit of the same nature can occur if the aerial is not well insulated. If there is a leakage from the aerial lead to earth the negative main will be connected to earth through the primary winding of the aerial coil. To prevent damage from a leakage of this type, a condenser having a capacity of approximately .001 mfd. should therefore be connected between the aerial lead and the aerial socket of the set.

Television Seen 90 Miles Away

I LEARN that for the first time, the entire television programme from Alexandra Palace was received at Coventry, ninety miles away, more than three times the official reception range. This is by far the greatest distance, so far, at which television has ever been received satisfactorily in this country. The programme was received by the G.E.C. works at Coventry, and the set was a standard G.E.C. receiver with some small modifications, including the use of a different type of high efficiency valve. A perfectly standard aerial assembly was used.

Although they have often received signals and snatches of programmes, this is the first time they have held synchronisation throughout.

Radiogram Improvisations

Various Methods of Arranging the Gramophone Equipment When It Is Not Very Frequently Employed : Modifying a Table : Using a Drawer : Gramo. Connections

By FRANK PRESTON

Fig. 1.—The Ad-a-gram playing desk.

THERE must be many readers who require to use gramophone equipment with their wireless receiver very infrequently, so that a complete radiogram receiver would be an unnecessary elaboration. Then, again, when a complete radiogram is built, it is not always an easy matter to fit another set in place of the original one when the time for modernising arrives.

This leads us to consider the advantages of a type of equipment designed and built mainly as a plain radio receiver, but which can easily be used as a gramophone amplifier on those comparatively rare occasions when record reproduction is desired. One very simple method which the constructor can follow is to obtain one of those units sold under such names as "Ad-a-Gram," playing desk, and the like. These consist of a neat container in which is fitted a gramophone motor, pick-up, needle cups, and, in some cases, a container for record storage. The gramophone unit can be obtained as either a table or a console

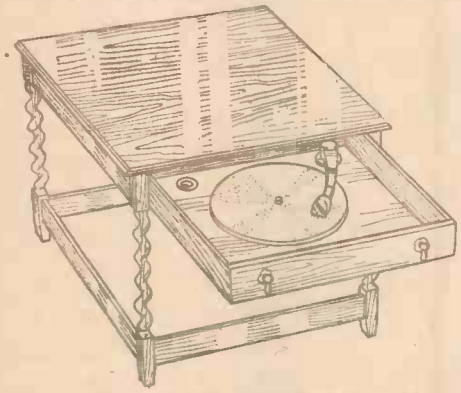


Fig. 2.—When the table is fitted with a drawer, it it is often a simple matter to install the turntable. The drawer must be long, so that it is supported and kept in a horizontal position when partly open to make the pick-up accessible.

model, and serves both as a stand for the receiver, and as a turntable outfit. An example of this type of device is shown in Fig. 1, where the popular Cosmocord device is illustrated.

Split-top Table

But there are many constructors who would prefer to make their own "playing desk," and various methods are open to them. One very satisfactory one is that shown in Fig. 3, where an ordinary type of small table is used. It is assumed that the table has been used as a stand for a table-type receiver, and that the top is appreciably bigger than the set itself. The modification consists of sawing the top in two and making one portion to hinge upward. Inside the part of the table with the hinged lid is fitted a multi-ply motor-board, on which can be mounted a synchronous-type motor and a suitable pick-up arm.

The work of removing the top, sawing it and refitting is probably of too skilled a nature to be tackled by the average constructor, who will generally prefer to leave it to a reliable joiner or cabinet maker, especially if the table is a very good one with a high finish. In that case, all that the

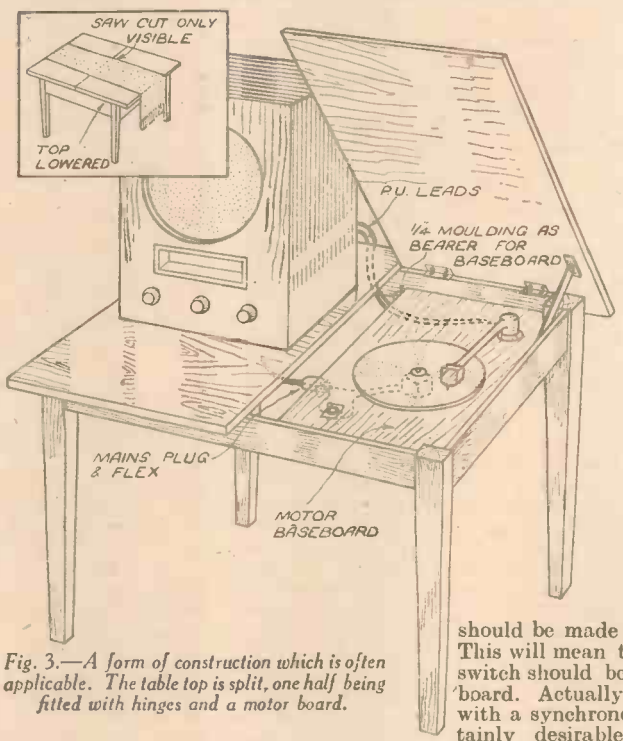


Fig. 3.—A form of construction which is often applicable. The table top is split, one half being fitted with hinges and a motor board.

constructor has to do is fit a stout sheet of multi-ply board within the top frame of the table, and make the necessary connections. The board can well be fitted after screwing four metal angle brackets to the inside of the upper framing, and then attaching the board with long bolts. A suitable method is illustrated in Fig. 4, where it will be seen that soft rubber washers are placed above and below the board, so that a certain amount of "float" is permitted.

Suitable Motor

In most instances, limitations of space will necessitate the use of a synchronous motor, which has an overall depth of only about 2in. Of this, about half is taken up by the central bush which serves for single-hole mounting. Thus, the method is suitable even when the side members of the table are quite shallow. When mounting the pick-up, it is important that the template supplied with it should be used to ensure correct positioning in relation to the turntable.

An advantage of this method of modification is that the table can be used in the

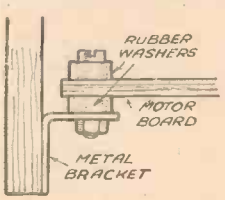


Fig. 4.—It is a good plan to fit rubber washers above and below the motor board to permit a small amount of "float."

normal manner when the gramophone portion is not in use, and that the turntable can be employed simply by sliding the receiver towards one end of the table and raising the lid. It is preferable that a stay should be fitted at one end of the lid, and that permanent connections should be made to the motor and pick-up. This will mean that a long-throat Q.M.B. switch should be mounted on the motor-board. Actually, a switch is not essential with a synchronous motor, but it is certainly desirable, particularly when the motor will be used only infrequently.

Using a Drawer

When the table is fitted with a drawer, as shown in Fig. 2, the modification is

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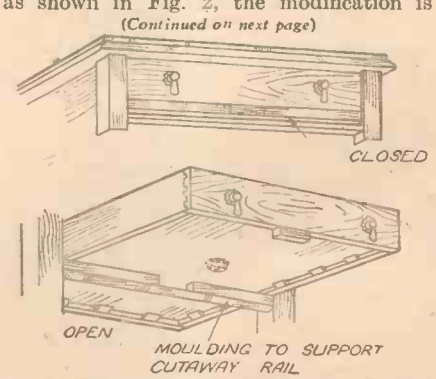


Fig. 5.—This form of construction can be used when the drawer is fairly shallow.

RADIOGRAM IMPROVISATIONS

(Continued from previous page)

simpler still, and it will then be unnecessary to call in the assistance of a joiner. The motor and pick-up can be mounted on the bottom of the drawer if this is sufficiently stout. If not, it can be reinforced by screwing a sheet of five-ply wood to it, or a new bottom of stouter plywood can be used to replace the original. Flexible connections can easily be taken from the back of the drawer to the receiver and mains-supply plug.

If there is a rail running along the front of the table and underneath the drawer, the procedure must be modified, because the downward-projecting mounting bush of the motor would then prevent the drawer from opening. The most suitable method depends very largely on the depth of the drawer, because if it is sufficiently deep (say, 4in. or more) the motor board can be mounted inside it so that the motor-mounting bush does not project beyond the bottom of the drawer. It can be mounted on rubber washers, a hole being made in the drawer bottom if necessary, or small brackets can be fitted, as suggested above, for another form of construction.

When the drawer is too shallow to permit of a motor-board inside it, the front rail can be cut, as shown in Fig. 5, provided that the table will not be unduly weakened by this alteration. The small piece of wood cut away from the rail can be glued on to the front of the drawer, so that it draws forward as the drawer is opened. Should there be a danger of the table being weakened by this modification, a narrow strip of wood with a rounded or beaded edge can be glued and pinned to the lower edge of the rail, as illustrated. Thus, the projection of the motor bush beyond the base of the drawer will not cause any obstruction.

A Neat Alteration

Another modification of a table such as that shown in Fig. 2 is illustrated in Fig. 6, where the front board of the table is cut to provide a front for a drawer, built up as shown inset from ½in. boards, and a multi-ply base. The form of construction for the drawer must depend upon the skill of the reader, but a fairly rigid job can be made by securing the corners with triangular blocks of wood securely glued; the whole is strengthened by the ply-wood base which is screwed on to the side and back pieces of the drawer. Square fillets must also be screwed to the sides of the drawer, whilst suitable runners must be screwed to the underside of the table, as shown. These support the drawer, and can be made to strengthen the table if triangular blocks are glued between them and the two remaining parts of the front member. If the work is neatly carried out, the table will appear to be unaltered when the drawer is closed. Here again, however, it will generally be considered wise to have the assistance of a joiner if the table is not to be disfigured.

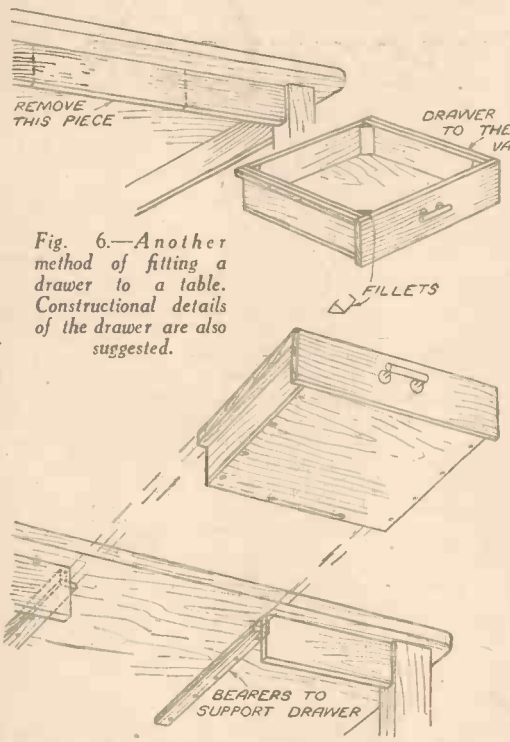


Fig. 6.—Another method of fitting a drawer to a table. Constructional details of the drawer are also suggested.

If the table is one of the very modern flat-top type mounted on a plated, tubular frame, a rather similar method of modification can be followed as shown in Fig. 7. Here again, runners are fitted to the underside of the table, but they do not come right to the front, and are therefore invisible. Instead of using a drawer, the motor and pick-up are mounted on a long ply-wood board, which can be fitted into the runners when the gramophone is in use, and removed completely at other times. This is by no means an ideal method, because the gramophone motor-board has to be removed completely from the table and stored when not in use. Nevertheless, it has the advantage that it can be used with different sets in different rooms if desired.

Plug-in Connections

A refinement might consist of mounting two twin plugs at the back edge of the board, one connected to the motor and the other to the pick-up. If corresponding twin sockets are fitted at the rear underside of the table, the connections will automatically be made as the motor-board is slid into place. If this arrangement is adopted, great care must be taken to ensure that the plugs and sockets are accurately in line, so that perfect contact is obtained; if this is not done, there might be arcing between the contacts from the mains supply, which would result in sparks and, possibility of a fire.

Although there are many other methods of improvisation, those described and illustrated are typical, and one or other of them should be adaptable to most requirements. No matter which is used, there are a few points which should receive careful attention. For example, the leads from the pick-up will, of necessity, be fairly long. In consequence, screened wire should be used, a good earth connection being made to the screening braid. Additionally, the pick-up and motor leads should be spaced as far apart as convenient on the motor-board.

Radiogram Switch

It has been assumed that the receiver is fitted with a radiogram switch. If it is not, a suitable switch should be mounted on the set itself, so that the leads from it can be kept as short as possible. The mounting of a radiogram switch on the gramophone motor-board is not advised, since the long grid lead from the set to the switch, and back again to the set, would almost certainly result in serious instability.

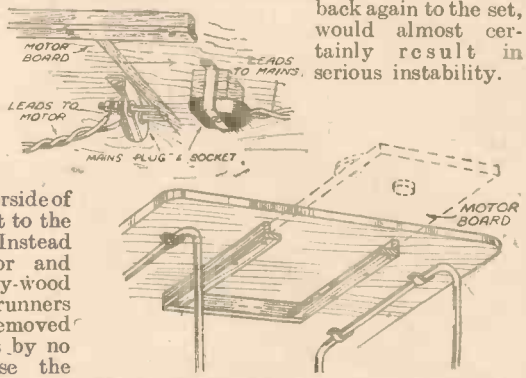


Fig. 7.—A detachable motor-board and pick-up unit fitted to a table of modern style. Inset is shown a method of providing "plug-in" connections.

RADIOCHRON CLOCK-RADIO

THE accompanying illustration shows the new Byron Model of the Radiochron Clock-radio, in which a modern 5-valve superhet is combined in a cabinet with a synchronous clock. The clock face is of perforated metal and is the covering for the moving-coil speaker, the spindle for the clock hands passing through the speaker. A smaller pointer is used for tuning, and no direct tuning indications are provided, the normal clock figures serving as indicating points and being intended for use in conjunction with a calibrated chart supplied with each model.

The receiver is of the A.C. type, employing a modern superhet circuit with a patented input arrangement in which a frame aerial is included. A socket at the rear of the cabinet is provided for a throw-out aerial and provides all the pick-up that is required. The speaker is of the energised type and the field is employed for H.T. smoothing. The receiver is of very compact form and incorporates modern midget valves.

There are only three controls, the left-hand knob operating a combined on-off and volume control component, the centre operating a tone control and the right-hand one the tuning control. The mains consumption is about 30 watts, and the clock is, of course, always connected to the mains input and is not switched off by the radio switch on the front. The price is 15 guineas.

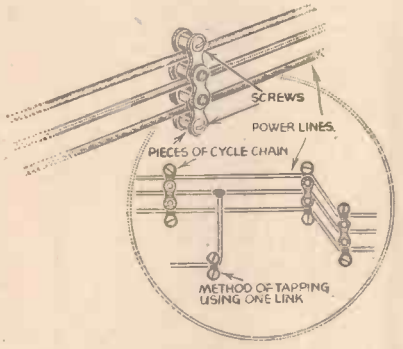
Here is the clock-radio receiver. It measures 12in. by 5in. by 9¾in. high.

A PAGE OF PRACTICAL HINTS

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

Wire Supports

IN carrying the mains supply to my shed I hit upon this idea, which not only enhances the appearance of the wiring but serves to facilitate the "drawing" of heavy gauge wiring. The idea is adaptable to a number of outdoor uses



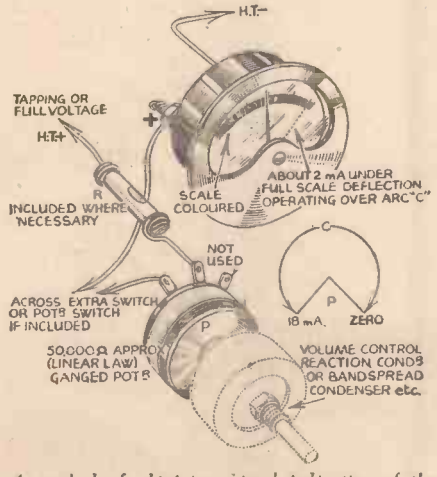
A method of using odd pieces of cycle chain for supporting outdoor wiring.

such as extension speaker (shielded) wiring, remote control, rotary converter wiring, etc., and owing to the wiring being kept away from the wall "tapping off" may be simply effected.

Single links of the chain may also serve a further purpose, namely, in the carrying of wire lengths round sharp corners, and many different adaptations will suggest themselves to the keen experimenter.—T. H. W. WHITE (New Cross).

A Visual Indicator

ANY form of circuit modication which affords some method of visual indication of the respective functions of that circuit is always a welcome feature, particularly in short-wave work, and the accompanying sketch shows one such adaptation which I have employed to advantage.



A method of obtaining visual indication of the functions of a circuit.

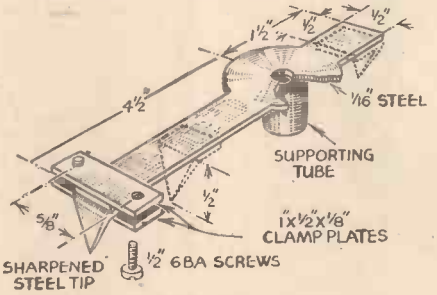
THAT DODGE OF YOURS!

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

The milliammeter was first dismantled, and the scale coloured, as indicated. The voltage and appropriate resistance value "R" were then calculated to meet the requirements of the type of meter being used—in my case 0–20 mA moving iron—and the potentiometer of suitable value was ganged to the component being visually checked or operated. The full-scale deflection of the needle is not advisable owing to possible voltage fluctuation, but this is, of course, an optional point, the illustration showing clearly the simplicity of one circuit arrangement.—H. N. LEWIS (Coventry).

Tool for Cutting Baffles and Panels

A DISC-CUTTING tool is an expensive tool for the radio amateur, and I have used the tool shown in the diagram for cutting materials such as thin sheet-copper, aluminium, plywood baffles, ebonite panels, and fibre with success. A double-



A handy tool for cutting thin sheet-metal, plywood or ebonite.

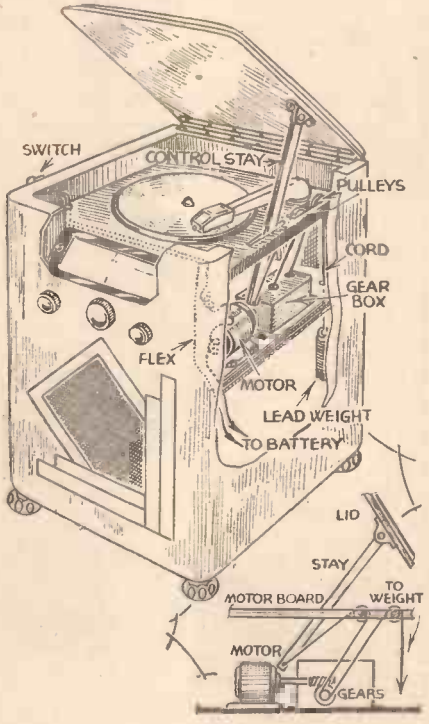
ended carrier arm of ½in. by $\frac{1}{16}$in. mild steel is drilled with a central pivoting hole; the cutter clamps (1in. by ½in. by ½in. plates) are drilled and tapped to take two 6BA steel screws, which if placed ⅝in. apart, give a good secure fixing and prevent any displacement during cutting.

The steel tips are angle-shaped pieces of ½in. by $\frac{1}{16}$in. steel, pointed, tempered and ground as shown.

Before cutting, set the tip at the required distance from the pivot and firmly clamp it to the radial arm: drill the centre of the aperture, support the tool upon a distance tube and clamp by means of a suitable screw and lock nuts. Rotate the tool and press into the material, and a good clean hole will be easily cut. By using two cutters, large insulating discs and washers, etc. may be cut to a variety of sizes. It should be noted that in this instance the cutters should, if possible, be clamped to the opposite arms of the tool to ensure a good balance.—WM. A. HARRISON (Aintree).

Raising a Radiogram Lid Electrically

THE accompanying sketches show how a radiogram lid can be raised by an electric motor and suitable gearing. The components required are: 1 brass strip, 15in. by ½in. by ½in. for the lid stay; 1 reversible electric motor (6–8 volts); 3 small pulley wheels; wheels for gearing the motor down, and cord (not too thick) for the pulleys; about 2yds. of twin flex for wiring; lead for the weight. The lid stay should be fixed first, and the weight of the lid found. The motor should be geared down to requirements, and a pulley wheel fixed to the slow-moving spindle. Next fix the motor to the gearing, place the other two pulley wheels in position, and fix the motor to the baseboard, as shown in the



Raising a radiogram lid by means of a small electric motor.

sketches. Fix the weight and cord next and make sure that it counterbalances the lid, after which the switch can be fitted and battery connected. By using a double-pole change-over switch, the lid can be raised or lowered at will.—R. DRAKE (Poole).

The complete meter ready for use.

THE "MULTUME

The Design and Construction of a Measuring Set

Resistance Measurements, Watts and Dec

ONE of the most useful pieces of apparatus that a wireless enthusiast can possess is a universal meter capable of measuring a wide range of voltages and currents, and the instrument herein described is simple to construct, is reasonably cheap, and has a reasonable degree of accuracy.

The meter covers 7 ranges of D.C. volts, 6 ranges of D.C. current, 3 ranges of A.C. volts (all of which are suitable for measuring the output watts of a radio receiver) and a resistance range.

The actual ranges provided are :—

D.C. Volts.
- 0-5 volts.
- 0-10 volts.
- 0-100 volts.
- 0-250 volts.
- 0-500 volts.
- 0-1000 volts.
- 0-5000 volts.

D.C. Current.
- 0-1 mA.
- 0-5 mA.
- 0-20 mA.
- 0-100 mA.
- 0-250 mA.
- 0-5 amps.

A.C. Volts.
- 0-10 volts.
- 0-100 volts.
- 0-500 volts.

Resistance Measurements.
- 0-100,000 ohms.

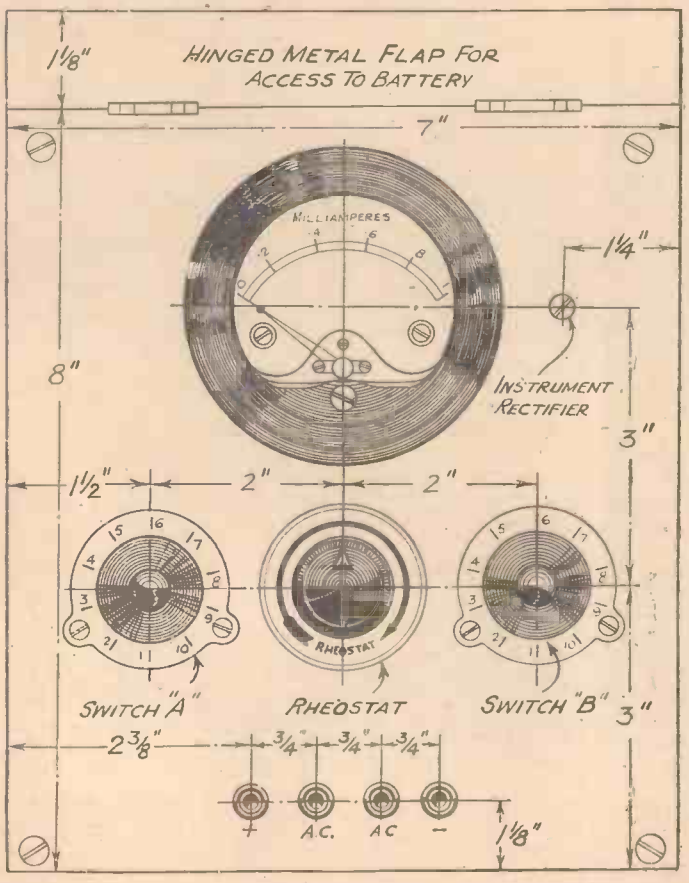


Fig. 1.—These measurements give the layout position for the panel of the instrument.

For servicing mains receivers, current measurements in A.C. circuits are very rarely needed, as continuity of circuits can be readily checked. All that is necessary is to be able to measure the voltage at various points. Further, it is necessary to use a current transformer, a shunt not being suitable for this purpose. For these reasons, therefore, A.C. currents are not provided for in the meter.

The basis of the instrument is a Ferranti 2½in. moving coil 0—1 milliammeter. Since the full scale consumption is only 1 mA it is possible, when using the meter as a voltmeter, to get a resistance of 1,000 ohms per volt, and this enables accurate readings to be obtained. Also, the good size dial, large markings and fine needle all make for easy and accurate readings, so that it is possible to construct a simple robust meter capable of being read easily, and having an accuracy of the order of 2 per cent.

Direct Readings

Most of the readings will be direct. For example, on the 100 volts range, a reading of 0.2 mA will indicate that the voltage available is 20 volts. The 250 volt range needs to be multiplied by 25 (ignoring the decimal point) and a reading of 0.2 mA will now indicate a voltage of 50; 0.6 mA will be equivalent to 150 volts, and so on.

An enlarged drawing of the meter scale, with the various ranges and values marked

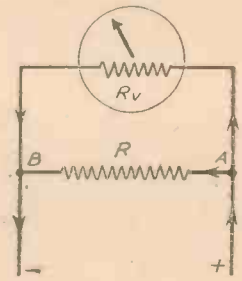


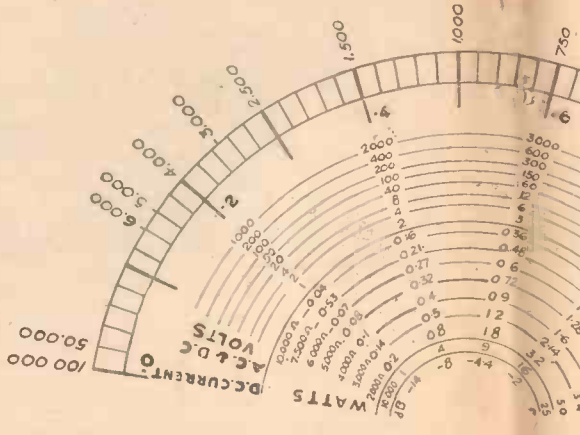
Fig. 2.—This diagram shows the principle upon which the shunts work when joined across the meter.

LIST OF COMPON
1 Ferranti 0-1 mA moving c
2 Ferranti 10 position si switches.
1 50-ohm potentiometer (Bu
1 1mA Westinghouse Instrum
1 5,000 ohm Dubilier resistan
1 10,000 ohm ,, ,,
1 100,000 ohm ,, ,,
1 250,000 ohm ,, ,,
1 500,000 ohm ,, ,,
1 1-megohm ,, ,,
1 5-megohm ,, ,,
1 8,000 ohm ,, ,,
1 250 ohm ,, ,,
1 90,000 ohm ,, ,,
1 450,000 ohm ,, ,,
1 1,000 ohm Bulgin power A.R.I.K.
4 terminal plugs.
1 oz. Bulgin oxydised nickel wire 30 gauge type 71.
1 length 18 S.W.G. tinned co
Connecting wire and sleeving

in, is given in Fig. 3. It should be cut out and pasted in the lid of the test set for easy reference. We do not recommend drawing it on the existing scale of the meter, as this will involve opening the instrument, and thus destroying the guarantee.

Fig. 5 shows the theoretical circuit of the meter, and Fig. 6 the general lay-out and wiring connections. The components required are shown in the table in the centre of this page.

Before we deal further with the theoretical considerations and the construction, just a



...TER "TEST SET

...Covering D.C. Volts and Current, A.C. Volts, ...ibels, are Dealt with in This Article

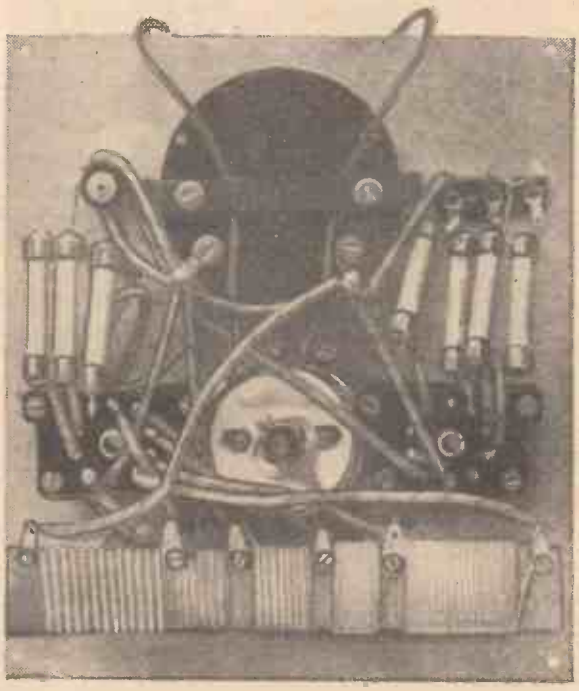


Fig. 6.—View of the wiring which may be considered in conjunction with the theoretical circuit below.

word about the resistances. Commercial resistances are rated to plus and minus 10 per cent. If the constructor is content to rely on such readings, he may purchase standard resistances from stock, although it will be much better if he has the resistances tested so that he can allow for the errors when taking readings. A far better plan, however, is to use specially-selected resistances. The dealer will have to get these, and they will be tested to an accuracy of 0 to minus 4 per cent. A small extra charge will be made, but the resistances are well worth it.

It must be borne in mind that the accuracy of the finished instrument depends on the care with which the shunts are made and the accuracy of the resistances. It is imperative, therefore, to go to work carefully and steadily, and make good soldered connections throughout.

...ENTS.
...oil milliammeter.
...ngle-pole meter
...lgin V.C. 84).
...ent-type rectifier.
...ce.
...r resistor type
...copper resistance
...per wire.

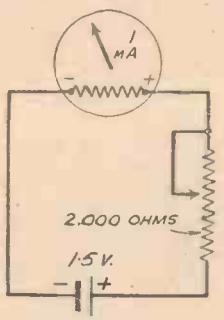


Fig. 4.—This diagram shows how the other ranges are obtained by means of a resistance connected in series.

Before making calculations as to shunt and series resistance values it is necessary to know the internal resistance of the meter. (The Ferranti instrument used has an internal resistance of 150 ohms.)

D.C. Voltage Ranges

The internal resistance of the meter is 150 ohms, so that in order to drop a voltage of 1 volt D.C. a series resistance of 850 ohms is required to bring the total resistance to 1,000 ohms. On the basis of 1,000 ohms per volt it is a simple matter to calculate the various series resistances. For the range of 5 volts a 4,850 ohms resistance will be required. Since our series resistances to be used have a tolerance of 0 to minus 4 per cent., it is safe to ignore the internal resistance of the meter and use a 5,000 ohms resistance for the 5 volts range. The resistance values of the other ranges are all calculated from Ohms Law—

$$R = \frac{1000\ V}{I}$$

where R is the resistance in ohms

V is the voltage (for full scale deflection of the meter)

I is the current in milliamps.

In each case I is 1 mA, so that our formula is simplified and becomes

$$R = 1{,}000\ V.$$

For 5 volts full scale deflection, R is 5,000 ohms.

For 10 volts full scale deflection, R is 10,000 ohms.

For 100 volts full scale deflection, R is 100,000 ohms.

For 250 volts full scale deflection, R is 250,000 ohms.

and so on for the various ranges.

If you can obtain the use of a precision voltmeter to check up the accuracy of your own instrument, you can either calibrate your scale, or else add a small amount of resistance by means of resistance wire, until the readings on your own meter agree with those given by the precision voltmeter. However, since the specially tested resistances will enable an accuracy sufficient for all tests in a radio receiver, it is hardly worth while to calibrate the meter specially or to compensate by adding extra resistances.

D.C. Current

We now come to the making of the shunts for the current ranges. Fig. 2 shows the working principle of the shunt. When current flows through a circuit and comes to a point such as "A," it has two paths open to it. It accordingly divides and part flows through the resistance R, and the other through resistance Rv (the meter in this case).

Our meter has an internal resistance of 150 ohms, so that, by Ohms Law, a voltage drop of 150 millivolts occurs across the meter windings when a current of 1mA. is passed. Supposing we wish to measure a maximum current of 5 mA. The meter itself will pass 1 mA only, so the other 4 mA must be accounted for by means of the shunt. Since the voltage drop is 0.15 volts, Ohms Law gives us the value of the shunt to pass 4 mA as 37.5 ohms.

(To be Continued)

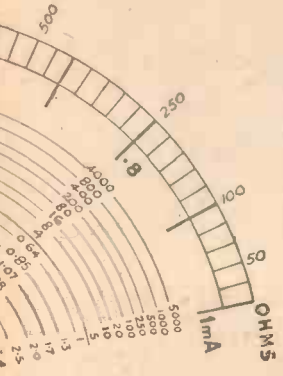
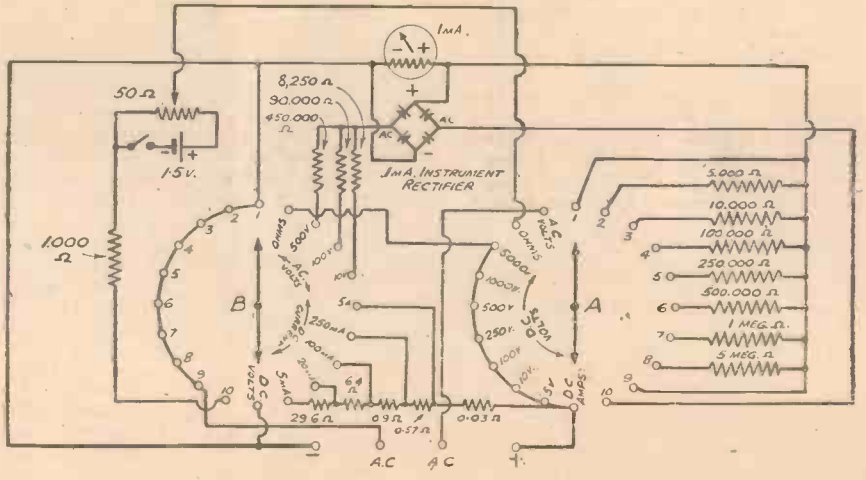
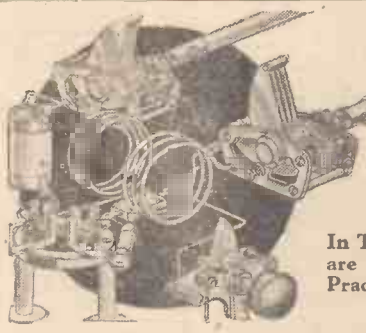


Fig. 3.—On the left, is a calibrated dial which may be pasted inside the lid, or copied out on a larger scale. On the right (Fig. 5) is the theoretical circuit of the complete instrument.





Short Wave Section

EXPERIMENTAL CHASSIS CONSTRUCTION

In This Article Interesting and Instructive Experiments are Outlined, Enabling the Experimenter to Obtain a Practical Knowledge of Steel Chassis as Applied to Short-wave Receivers. By A. W. MANN.

THE chassis method of construction is strongly favoured by short-wave experimenters and set builders. The foil lined or metallised wooden chassis are two of the most common types, due to the fact that they combine cheapness and efficiency, and therefore appeal to beginners whose funds are limited.

The more experienced experimenter, however, especially when designing a receiver for permanent use, favours the use of a stout gauge aluminium chassis as used by commercial set builders. The commercial set builder has, however, gone one better than the experimenter and uses a chassis of sheet-steel construction which, being of stout gauge material, is a firm and workmanlike job.

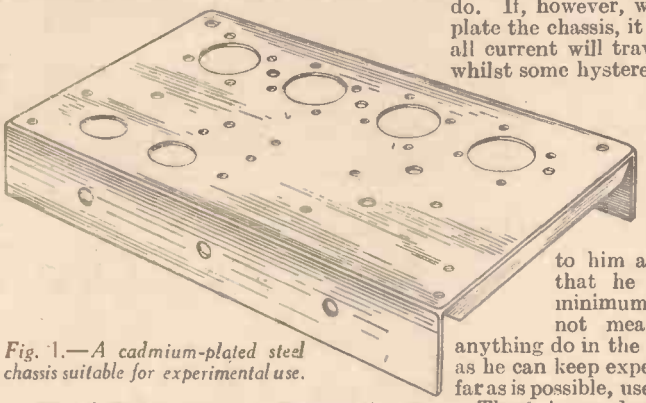


Fig. 1.—A cadmium-plated steel chassis suitable for experimental use.

The experimenter is apt to regard this type of chassis with suspicion, and associate it with all kinds of snags and pitfalls, but to do so is erroneous. We must view matters from the correct angle, and call to mind past experience.

For example, how many experimenters have at some time or other decided totally to enclose the short-wave set in an aluminium or sheet-iron box, with a view to improving performance and increasing over-all efficiency, only to find that the set is practically useless due to instability?

A little time spent in trouble tracking undoubtedly brought to light the fact that the actual screening was not in itself at fault, but the method of applying it was incorrect.

The same applies to the steel chassis i.e., if incorrectly used, trouble will result. We must, therefore, know something about the materials we are to use, and how to apply them correctly to suit our purpose. If the manufacturer can use a steel chassis successfully so can the amateur, always providing he is prepared to study the fundamentals associated with its use.

It is not, however, just a matter of buying a sheet of stout gauge steel plate, bending to shape and building the receiver, using it as a foundation. To follow such procedure will end in failure due to incurable instability.

Before going further, let us consider a few facts relative to steel. Compared with aluminium, losses are higher.

Screening Efficiency

Its screening efficiency is lower due to its greater resistivity. In considering a steel chassis we must also take into consideration skin effects at high frequencies. Current travels on the surface; the rest of the metal adds mechanical strength.

With the above in mind, it will be clear that a bare steel chassis simply would not do. If, however, we copper- or cadmium-plate the chassis, it follows that practically all current will travel on the plating, and whilst some hysteresis loss will take place, it will be of such a low order as to be negligible so far as the experimenter is concerned.

Now the average experimenter is usually willing to try out what to him are new ideas, providing that he can do so with the minimum of expense. This does not mean that he will make anything do in the component line so long as he can keep expenses down, but will, so far as is possible, use those on hand.

There is no doubt that in considering a few experiments with receivers built on steel chassis he will not be prepared to undertake the expense necessary in order to obtain a specially-made chassis. There are available in various radio-surplus stores throughout the country surplus steel chassis, ranging from three to five-valve types, and no doubt some readers of this section will have one on hand unused because they are undecided as to the best methods of adapting them to suit experimental requirements.

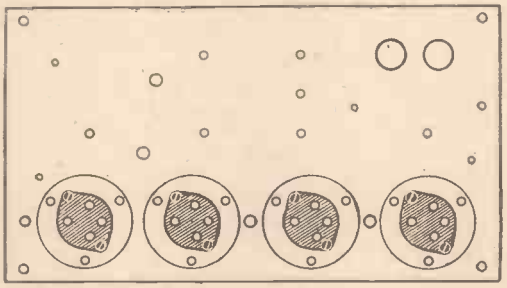


Fig. 4.—Four combined rings and sockets mounted on a chassis.

Cadmium-plated Steel Chassis

The writer recently had his attention drawn to a number of cadmium-plated steel chassis which were of first-class workmanship and ideal for experimental work, providing various apparent snags could be overcome.

Fig. 1 shows one of the chassis under discussion. In the top face are various-sized holes, which, when considered from the experimenter's point of view, will prove to be very useful.

The same applies to the holes for terminals and under-chassis mounted controls. There was, however, one snag—the holes intended for wafer-type valve sockets were of large diameter, and consequently, standard size sockets could not be fitted, being of much smaller dimensions. As the purchase and usefulness of the chassis depended upon overcoming the snag, the problem was given careful consideration.

Fig. 2, together with Fig. 3, shows the solution in detail. Fig. 2 is a ring cut from paxolin sheet, the outside diameter of the ring being greater than that of the holes cut in the steel chassis. The inside hole "C" is sufficiently large in diameter to clear the soldering tags of standard wafer sockets to hand.

Fig. 3 shows the wafer socket mounted on the paxolin ring, and held in position by two small bolts.

Fig. 4 shows four combined rings and sockets mounted on the chassis, and held in position by means of three small bolts.

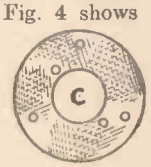


Fig. 2.—A paxolin-sheet ring.

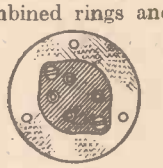


Fig. 3.—A wafer socket mounted on a paxolin ring.

Aluminium Cover Plate

It may happen that the constructor and experimenter wishes to use a similar steel chassis as the foundation of a permanent receiver, and this being so, desires in the interests of neatness, to cover the existing holes already drilled in the top face.

Fig. 5 shows how this may be accomplished. An aluminium plate of 20 gauge is cut to suit chassis dimensions. As shown in Fig. 5, clearance is allowed so as not to overlap the rounded edges. The valve-socket holes which are cut in this plate to suit standard holders are arranged to suit the centres of the existing holes in the steel chassis.

Having cut the aluminium plate to size, and fitted standard holders, all that remains to be done is to fasten the plate to the chassis by means of six small bolts. These, in conjunction with various component holding-down bolts, will ensure good mechanical and electrical contact between plate and chassis.

There are various precautions which should be kept in mind relative to the use of metal chassis. For example, the experimenter should not depend solely upon two or three small bolts holding the metal panel in place and making good electrical contact.

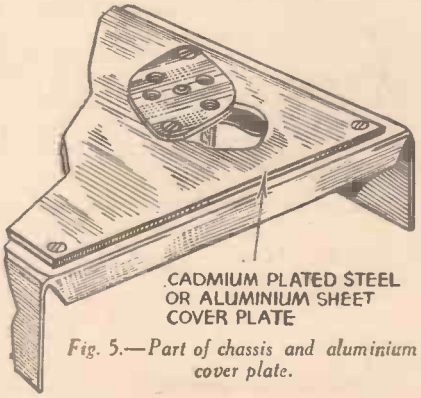


Fig. 5.—Part of chassis and aluminium cover plate.

Leaves from a Short-wave Log

A Change in W/L. and Call-sign

CR7AA, Lourenço Marques (Mozambique), formerly on 48.9 m. (6.135 mc/s), has now reduced its wavelength to 25.6 m. (11.72 mc/s), and has also altered its call-letters to CR7BH. The channel adopted is that already used by TPA4, Radio Colonial (Paris-Pontoise), France. The address of the station remains the same, namely, P.O. Box 594, Lourenço Marques.

Has Any Reader Logged XEWW?

A correspondent writes to say that he has heard a broadcast on 31.58 m. (9.5 mc/s) with the call XEWW, Mexico City, and an announcement to the effect that a 5-kilowatt transmitter is being used. No further details regarding this newcomer have been obtained so far, and the call does not appear in the latest published lists.

The Georgetown Broadcasters

As some little doubt seems to exist regarding the channels used by VP3MR and VP3BG, Georgetown (British Guiana), it is interesting to note that the frequencies announced recently by these studios are 6.06 mc/s (49.5 m.) and 6.13 mc/s (48.92 m.) respectively. VP3MR, until a recent date, was working on about 50.17 m. (5.98 mc/s).

Budapest on Short Waves

Broadcasts from Hungary may be picked up on two channels, namely, through HAS3, 19.52 m. (15.37 mc/s), and HAT4, 32.88 m. (9.125 mc/s), both stations being rated at 6 kilowatts. On the higher frequency a programme is given out on Sundays from G.M.T. 14.00-15.00, and on 32.88 m. (9.125 mc/s), a transmission is effected on Sundays and Wednesdays between 12.00-13.00 and from G.M.T. 23.00-24.00. The interval signal is that heard from the medium-wave Budapest (Hungary) studio.

Schenectady's Extended Broadcasts

The programmes of WGY, Schenectady (N.Y.), through the medium of the two short-wave outlets are now regularly heard from G.M.T. 15.00-06.00. W2XAD, on 19.57 m. (15.33 mc/s), comes on the ether at G.M.T. 15.00 and broadcasts continuously until 01.00. W2XAF takes the same programme on 31.48 m. (9.53 mc/s) and makes its appearance at G.M.T. 21.00; it carries on until G.M.T. 06.00.

Akash Vani Calling

Should you hear the above call on 49.59 m. (6.05 mc/s), log it as emanating from the Mysore (British India) short-wave transmitter. It has been heard testing between G.M.T. 16.00-17.00 and has now established a regular daily service of programmes.

Listen to JZJ and JZK, Tokio

The two Nazaki-Atagoyama high-power short-wave stations operated by the Japanese Broadcasting Corporation are now simultaneously relaying a daily programme from Tokio between G.M.T. 19.30-20.30, and JVM has been taken out of service. JZJ works on 25.42 m. (11.8 mc/s), but the strongest signal is from JZK, on 19.79 m. (15.16 mc/s).

VOLTAGE REGULATION

What the Term Means, and the Effects which are Obtained on Performance.

MUCH has been said of the necessity for good voltage regulation in the power pack, and few amateurs seem to know what trouble accrues if the voltage regulation is not good. First and foremost bad voltage regulation adversely affects quality of reproduction. The effects of bad voltage regulation will be more readily understood when it is realised that a power pack deficient in this quality changes its voltage output with current. The greater the current drawn, the lower will be the voltage. The power valve invariably takes the bulk of the H.T. current, so we can consider the behaviour of this valve as being primarily important. As the grid of the power valve is modulated, it becomes alternatively negative and positive. When the grid becomes negative, the anode current is small, and when the grid is positive, the anode current is considerable. If the voltage regulation of the anode supply is bad, it follows that when the grid becomes negative the voltage between anode and cathode rises more than is justified by the input, and when the grid swings positive the anode voltage falls to a value dependent upon both the load in the anode circuit and the drop in H.T. voltage from the power pack.

Distortion Introduced

This results in the wave-form in the output circuit being unequal on the negative and positive half-cycle; the distortion introduced in this way affects not only the power valve, but the detector valve, where the rise and fall in the anode supply voltage results in an effect that may be likened to low-frequency reaction. This if in phase, results in a tendency for reproduction to have a fringe or ragged edge, or if out of phase, a falling off in sensitivity, which is, however, too small to be seriously considered.

The H.F. Circuits

The effect of bad voltage regulation in the H.F. side can be equally serious, but manifests itself in another way. Assuming that a receiver is of the superheterodyne type, where several valves are controlled by the automatic volume control, the effect is to offset somewhat the functions of the latter. When the incoming signal starts to fade, the bias of those valves with variable-mu characteristics automatically recedes, and the anode current rises, and the magnification of the valve increases, the latter overcoming or partially overcoming the effects in the fall of the signal strength, but with bad voltage regulation as the anode current rises the anode voltage falls, and so does the amplification of the valve, particularly as the screen voltage falls at the same time. Where automatic volume control is not in use, no serious results are apparent. Those readers who use a neon tuning indicator can see the effects of bad voltage control by a movement of the neon light in sympathy with the music being received, *e.g.*, the six time pips from Greenwich result in the light popping up six times. Care should be taken, however, that the fluctuations in the light are not due to detector overloading, as the behaviour of the light is similar.

BRIEF RADIO BIOGRAPHIES—14

By RUTH MASCHWITZ

Elsie and Doris Waters

ELSIE and Doris really are sisters. They are members of a family of six, and when they were small they formed an orchestra with their four brothers. They both studied elocution and the piano at the Guildhall School of Music, and it was suggested by their professors that Doris should give up everything for two years to become a solo pianist. Likewise Elsie might have become a solo violinist. However, they had other ideas for their future, and started their theatrical career by joining Will Pepper's "White Coons" on Southwold Pier.

On fine days they would go down and ask the few people waiting for the matinée to come back again to the evening performance, and when the steamer was late on rough days, passengers and luggage used to pass through the audience! After the season they came back to London and entertained at dinners and concerts, Elsie playing the violin and Doris singing and telling stories. This procedure continued for six or seven years.

In 1927 they decided to run their own company for twelve weeks although they discovered just before their season started that the previous year's rent of the hall had not been paid, and the bailiffs were in!

Gert and Daisy came to life by pure chance. A gramophone company asked them to make a record, and when they had finished one side they found they had no song to use for the other. They decided to try a sketch for a change and there and then wrote a conversation between two Cockney women—Gert and Daisy.

Some time later when they appeared at a concert the audience shouted for the new characters, and without more ado they dashed behind the scenes, put on two borrowed hats back to front, and Elsie slung a handkerchief round her neck. Gert and Daisy made their first stage appearance.

Recently hurrying to an engagement they were held up for speeding. The policeman took out his note book and grimly demanded their names. When he was told Elsie and Doris Waters his face relaxed into a beaming smile. "Oh, Gert and Daisy!" he said. "You've given me and the missus many a good laugh. Don't you worry, miss, you just get along. We'll forget about the speed limit this time!"

When the B.B.C. first approached them they were adamant and refused to broadcast, but in 1927 they relented and have been heard on the air regularly ever since. They write most of their own material and never by any chance repeat their microphone performances.

Stainless Stephen

A. CLIFFORD BAYNE was born in Sheffield, which is one of the reasons for his adoption of the pseudonym Stainless Stephen, as being indicative of a famous Sheffield product. The dictionary also defines "stainless" as "immaculate" or "without blemish"—which he says proves that he has a sense of humour. He invented his "punctuation" type of patter after taking a course of Army signalling in 1915, and has made it his trade-mark. On one occasion his style found a real life counterpart when a distinguished naval historian, broadcasting for the first time, became nervous and began to say "Full stop" after every sentence

Stainless Stephen (left) here seen with two fellow cyclists, C. Marshall and A. W. Brumell.

In 1914 he joined the Yorks and Lancs regiment and served on the Western Front as a sergeant-major. He was twice wounded. He took up music-hall work in 1919, being billed as Arthur Clifford, comma Comedian, question mark. Four years later he made his first broadcast from 6FL, the Sheffield relay station, and his subsequent appearances before the microphone run into the hundreds. He writes all his own material and has created a number of characters in his broadcast, among them Oscillating Oscar, Radio Rastus, Sibilant Cyril, and Atmos P. Herics.

In 1928 he was specially engaged by the British Legion to appear as "Old Bill" at the Opera House, Lille, during the "War Time" performance given to entertain the Prince of Wales, prior to the dedication of the famous Menin Gate Memorial.

He has many fans, and once when driving through the night up to London from Devonshire, he stopped a passer-by to ask the way.

"I shall be delighted to help you, you're Stainless Stephen, aren't you?" came the totally unexpected reply. "I recognised you at once from your voice!"

When he has the leisure he reads biography and philosophy. He does a great deal of motoring, is a keen cyclist, and takes a great interest in all sports.

Next Week: Tommy Handley and Norman Long.

Practical Television

July 10th, 1937. Vol. 3. No. 58.

AUGMENTING THE ELECTRON STREAM

Of Late the Principles of Secondary Emission have Assumed a Degree of Importance, and this Article Shows the Methods Employed to Bring This About.

THERE is no doubt that the recent rapid developments in the science of television in research laboratories all over the world has brought about improvements in allied subjects. Outstanding among these is photo-electricity, for any system of television has a fundamental bearing on the electrical effects produced by light whether visible, ultra-violet, or infra-red. The earliest successful television system, namely the spot-light scanner, relied on the capability of photo-electric cells to impart to amplifier circuits voltage changes which corresponded in magnitude to the light charges acting on the cathode surfaces of the cells. In the modern forms of electron cameras the photo-emissive properties of metal surfaces or

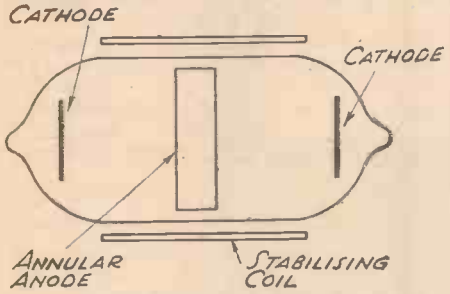


Fig. 1.—The form of multiplier due to Farnsworth which operates in a reciprocal fashion.

mosaics are harnessed, so that in conjunction with some form of scanning operation television signals are generated which simulate electrically the light and shade analysis of the scene to be televised.

The main obstacle met by early television pioneers was centred round the wholly inadequate sensitivity of these photo-electric devices, and in addition to improving this, schemes have been developed whereby the initial electronic cathode emission can be augmented so that the resultant output signal was of sufficient magnitude to be handled with normal thermionic valve amplifiers having a reduced number of stages. The advantage of this should be at once apparent to those who have handled high-gain valve equipment which had to deal with minute signals covering such an enormous frequency range as is demanded by high-definition television. No matter how careful the design, instability and microphony, coupled with the well-known Schott effect, rendered the operation of these amplifiers a difficult task, while the signal-to-interference ratio was not of the required order for efficient service.

Multipliers

This modern form of increasing the main electron stream has been brought about by what are termed multipliers, and up to the present the fundamental conceptions of the different types have been due to Zworykin, Farnsworth, and Weiss, but in every case they depend on secondary emission. This is a process associated with the fact that when an electron is made to strike a prepared metal surface with a high enough velocity, the impact is capable of causing secondary electrons to be removed from the surface.

Dependent on the initial electron velocity and the character and composition of the metal surface, so the number of secondary electrons released for each primary electron impact will vary, but measurement has shown that up to ten secondary electrons can be set free for each initial electron. Another particularly important factor associated with this phenomenon is that since it is similar in principle to the normal primary photo-electric emission, no time

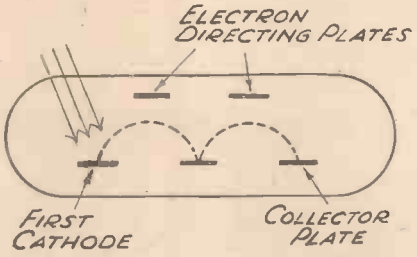


Fig. 2.—One form of Zworykin multiplier.

lag is present, and even when handling signal modulations of three or four megacycles, as in the case of high-definition television, the factor of multiplication associated with the device is maintained quite readily.

Electron Path

As a rough discrimination between the types of multipliers proposed, they are

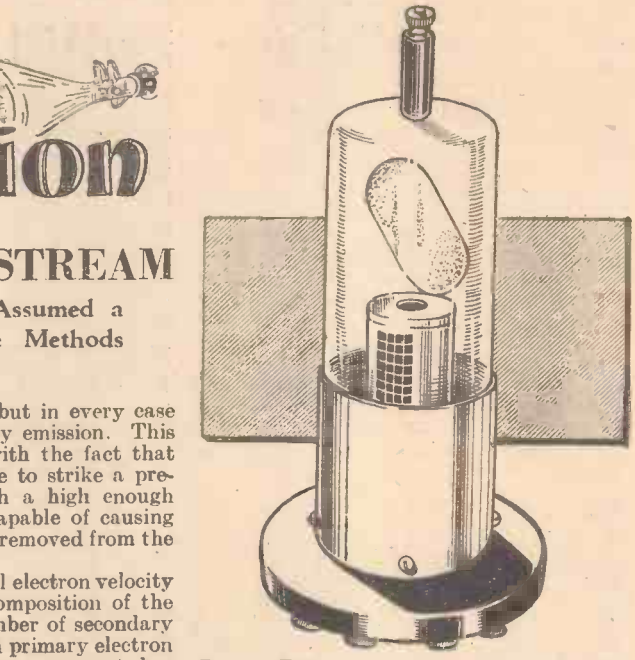


Fig. 4.—The commercial form of the smaller type Baird multiplier photo cell.

referred to frequently as reciprocal and successive. The first named is the result of Farnsworth, who first of all had two opposing metal surfaces along which an external source maintained a potential gradient. The zigzag path, followed by the

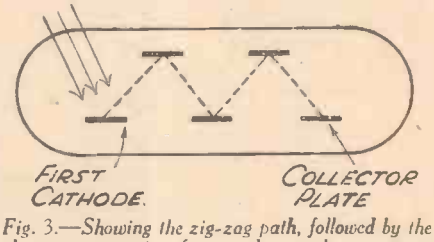


Fig. 3.—Showing the zig-zag path, followed by the electrons in moving from each secondary emitting surface.

initially introduced electrons, produced a progressive multiplication, but a subsequent development of this same inventor operated in a slightly different way. This can be seen in Fig. 1, where two circular cathodes are positioned at opposite ends of an evacu-

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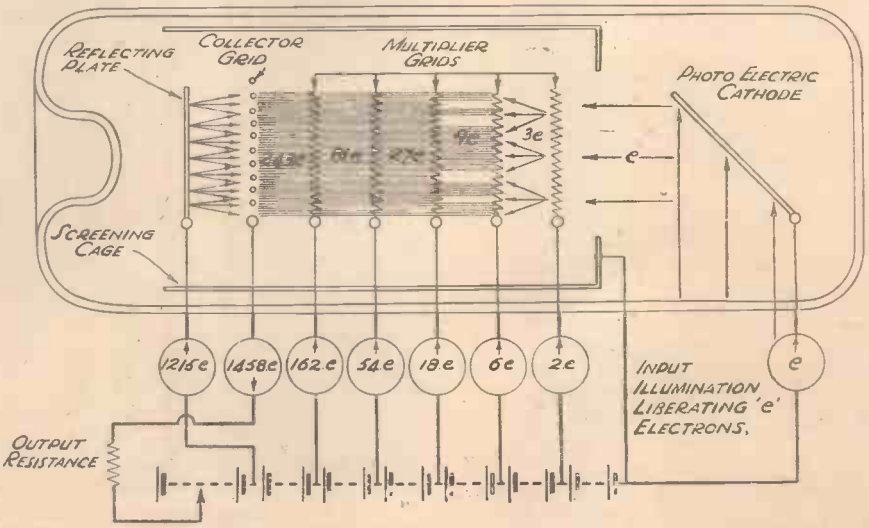


Fig. 5.—A simple schematic diagram to show the Weiss principle of secondary multiplication.

PRACTICAL TELEVISION

(Continued from previous page)

ated glass container. An alternating potential difference is established electrically between the cathodes and this, in conjunction with a ring anode placed midway between the cathodes, swings the electrons to and fro at a periodicity depending upon the potential of the anode with reference to the cathodes. An axial magnetic field produced from an external solenoid coil, through which is passed a direct current, stabilises the working of the multiplier, and prevents the electrons being collected too quickly by the anode. At a certain frequency of the alternating potential difference between the cathodes, a value is reached when the time of flight of the electron from end to end is exactly equal to a half period, and under this condition the electrons collected by the anode are a maximum giving a resultant multiplication of considerable magnitude.

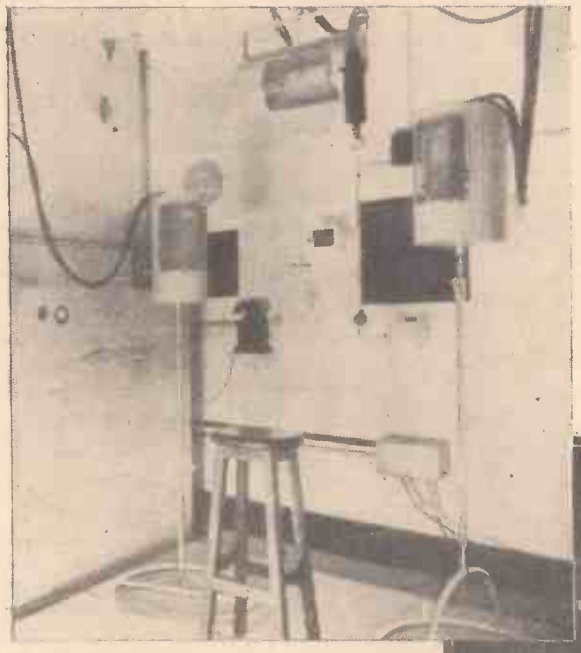


Fig. 7.—The larger type cells shown in use with spotlight television.

The first multipliers of the successive type were suggested by Jarvis and Blair over ten years ago, but later this was improved very materially by Zworykin. In this case the multiplier has a chain of separate and distinct secondary emitting surfaces. The primary electrons are directed to fall on the first surface, and from this the secondaries are led to the next surface, and so on down the chain. Figs. 2 and 3 show simply two ways in which this sequence of events takes place. In one case the metal surfaces lie on one side of an exhausted tube, and by a combination of electro-magnetic and electrostatic fields the electrons follow the path shown by the dotted lines. The modification of Fig. 3 makes the path a zigzag one in the electron route to successive surfaces. Amplification of primary photo currents up to a hundred thousand are claimed for multipliers of this type, although under strict service conditions there is a critical adjustment of the applied voltages, with a possibility of variations in the measure of overall gain.

Secondary Amplifying Stages

The Weiss principle of secondary emission amplification has been further developed by Baird Television, Ltd., and definite figures are now available concerning the performance of the two sizes available. Of the successive type, there is a chain of secondary amplifying stages, and the current is made to pass in sequence down the chain to be amplified at each stage. Instead of metal plates, however, the stages are really electron permeable grids, the surfaces of which have been specially prepared to give a high secondary factor. The primary electrons incident upon the first grid liberate secondaries at low velocity which are attracted through the meshes of the grid by the positive potential on the next grid. Sufficient striking velocity is acquired to liberate further secondaries which are in turn attracted onward down the chain. The amplification factor per stage is variable up to four, depending on the voltage applied to succeeding grids.

A reference to Fig. 5 will make the action quite plain, the arrows denoting the direction of the electrons, while the secondary emission multiplication per grid is assumed to be three. At the end of the multiplier there is arranged a secondary emitting plate upon which the electrons from the last multiplying grid impinge. A secondary factor of 8 can be obtained by a solid surface, and hence a large multiplication takes place in the last stage, but in the diagram a factor of 6 has been taken. The electrons liberated from the plate are collected by an unsensitised open mesh grid,

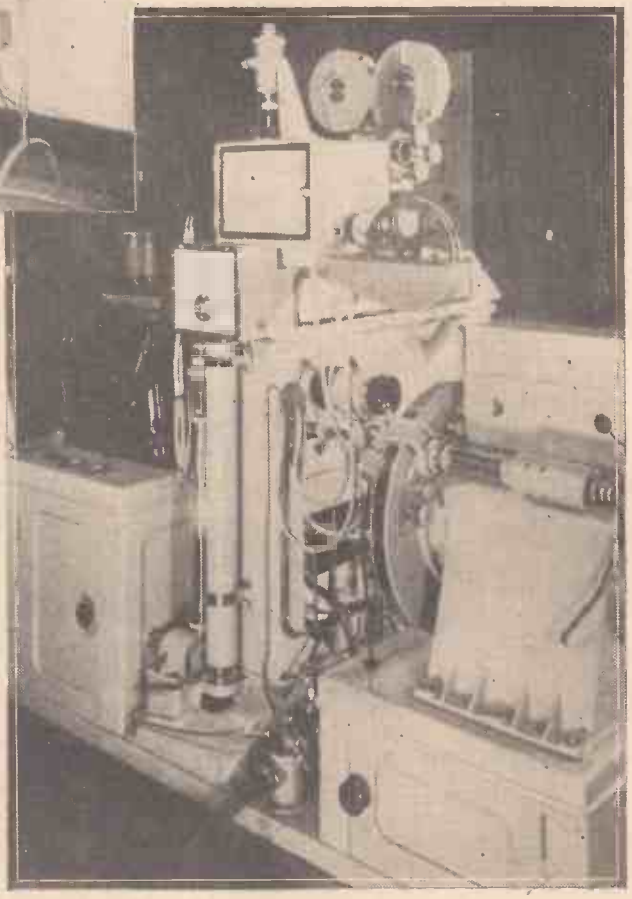


Fig. 8.—The smaller type multiplier photo cell is used in the intermediate film equipment shown in this illustration.

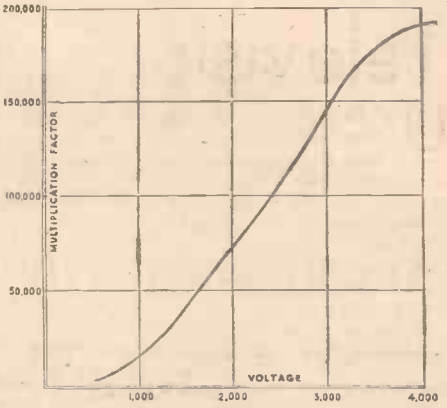


Fig. 6.—Multiplication plotted against total voltage for the smaller type Baird cell.

and from here pass into the output circuit of the multiplier.

Output Stage

These grids are arranged as parallel circular discs inside a cylindrical screening tube, which has an aperture in the end nearest the first grid so that the primary photo-electrons leaving the cathode enter the multiplier under saturation conditions and impinge on the first multiplying grid.

In the commercial form of an earlier Baird experimental model the cathode connection is taken out at the top, while the grid connections are at the base as shown in Fig. 5. The primary photo-electric cathode is normally a special cæsium silver oxide having a sensitivity of about 30 microamperes per lumen and a maximum spectral sensitivity at 6,500 A.U., but the response is quite good down to 8,000 A.U., and the cells may therefore be used for infra-red detection and amplification of infra-red signals.

Naturally the overall amplification obtained with multiplier photo-electric cells of this type is dependent upon two factors—the voltages supplied to each stage and the number of stages employed. As an indication of the results obtained in practice, however, reference can be made to Fig. 6, which shows the total applied voltage plotted against amplification factor for the small type Baird cell having a cathode area of 15 sq. cms. and a nine-stage multiplier. This particular form of cell finds its greatest application with concentrated light beams, and is employed in the intermediate film scanner shown in Fig. 8. The light variations passing through the scanner apertures are focused on to the cathode of the cell which is incorporated in the metal case seen on the right of the photograph. For diffused light operation the multiplier cell is altered in construction to give an active cathode area of 250 sq. cms., and three of these are shown in Fig. 7.

Television and the Deaf

UNTIL quite recently, there have been thousands of people to whom wireless has meant nothing—those who are totally deaf. The introduction of programme television appeared to offer great possibilities for those unfortunate people who have not benefited from radio. For the first time serious experiments have been made to ascertain to what extent television, which depends upon sound as well as vision for its full effect, would appeal to the totally deaf.

The expressions on the faces of these deaf men give a good indication of the pleasure they are obtaining from the television demonstration referred to in this article.

An Interesting Experiment

As a result of suggestions made to the General Electric Company by those interested in the welfare of the deaf, a series of practical tests with television are being carried out. A set was installed by the G.E.C. at the Tower House Home for Deaf and Dumb Men at Erith (run under the auspices of the Royal Association in aid of the Deaf and Dumb), and the results have been most promising.

The programme was first shown to about thirty men, most of whom have been totally deaf from birth. In order that those conducting the experiment should share to some extent the reactions of the deaf people, the sound was cut out and only the vision shown. The programme consisted of a fashion parade, Zoo animals, a news bulletin and a short play. As the vision appeared on the screen, the men turned to each other excitedly gesticulating and one after another they began to put their thumbs up, the sign in their language meaning "good." Only the play appeared to suffer from the lack of sound, but it made little difference to the deaf men who followed it intently and then burst into spontaneous applause at the end.

Afterwards, through an interpreter, the men explained their reactions to television. All of them were delighted with it, and they wanted to know whether they would be able to see important events, particularly football matches. All appreciated the possibility of having this source of news and entertainment continually available.

"Great Possibilities"

"There is little doubt that television offers great possibilities for the deaf," said Mr. D. A. C. Ellwood, superintendent of the home. "There are a few men who, although normally deaf, can hear something of the radio through earphones and amplifiers, although they cannot differentiate between sounds, but for the great bulk of deaf people wireless has been quite useless. These experiments with television suggest that it can fill a great gap in their lives."

The tests are being continued in order to find, among other things, whether television still exercises an appeal after the novelty has worn off, and what type of programmes are most valuable to the deaf.

It is probable that a complete report will be sent to the B.B.C. in the hope that they will be able so to arrange their programmes that each session contains at least one item which does not depend on sound.

The Leipzig Autumn Fair

THE Leipzig Autumn Fair, 1937, will be held from August 29th to September 2nd. In accordance with its traditions the Fair will include an exceedingly comprehensive range of finished products.

The number of exhibitors at the Sample Fair at Leipzig Inner Town is expected to be about 400 firms showing domestic utensils (metal ware and cutlery, wood and basket ware, furniture, domestic machinery, brushes, illumination fittings, glassware, porcelain, earthenware, etc.), approximately 1,550 firms showing leatherware, jewellery and fancy goods (leather goods, travel requisites, trunks, precious metals and jewellery, watches and clocks, cutlery, carvings, haberdashery, arts and crafts), approximately 800 showing toys, musical instruments, sport articles and automatic machines, approximately 600 showing paper goods, pictures, books, stationery, office requisites, advertising materials, packing materials, approximately 400 showing textile goods and 200 showing foodstuffs and hygienic preparations (comestibles, drugs, pharmaceutical preparations, cosmetics and the like). The collections are being prepared at present.

A Letter to Thermion

SIR,—In a recent issue of your paper I read the following description of Swing Music:—

"A rhythmic undulation, irrespective of tempo and mood, basically derived from Negro-folk-dance music and more recently treated with increasing sophistication, generally by dance ensembles with a percussive background, to a succession of improvisations by, or transcriptions for, vocal or instrumental soloists or sections on a given theme or harmonic routine."

I notice you place at the end of this effusion, three full stops and let it go at that.

Fie on you, sir, for so lightly treating such a serious matter. I am sorely tempted to enclose 1s. and demand a blueprint.

When you think of all that has been written in your valuable paper about quality of reception, high fidelity, etc., and the painstaking way in which difficult technical matters have been lucidly explained, all the carefully detailed diagrams that have been specially devised to clearly set forth really complex electrical problems, to such of the uninitiated as myself—surely, sir, it is preposterous on your part to put this concentrated lump of music-cum-office-cum-Oxford dictionary before me, without some sort of explanation. You must have known that it would give me and others mental indigestion similar to swallowing a stone.

Now, sir, will you please tell us something about this so-called Swing Music. I—and I am sure there are others—would be very interested. What is Swing Music, anyway?

Is the above a really satisfactory definition of this prolific art? Does not the matter lie much deeper than that?

We hear so much to-day about self-expression, emotional expression, surrealism, etc., etc., and it is noticeable that it is in connection with the arts that these terms are used.

We rarely hear that A., the well-known designer, has expressed himself by producing an air-plane which nobody understands, or that B., the wealthy oil man, has expressed himself by providing the money to build it. A. has got to make the d—— thing fly and B. hopes for social advancement.

Scientific people cannot profit by the "isms," etc., they are bound to keep to hard facts and they are quite content to leave all bolony to their advertising consultants.

Now what is this self-expression?

We know that the zenith of self-expression is reached by—

A very angry person.

A young fellow who is chasing a nice possibility.

His wife who has just caught them.

A very ambitious person.

An egotist.

An actor or vaudeville artist who receives great applause.

A man who has just hit his thumb with a hammer.

A person about to sneeze.

A person subject to economic pressure.

The desire to get there by fair means or foul, is that self-expression?

Take the case of a person who thinks he is a clever musician, artist, sculptor, etc., yet failing to get recognition as such.

Take the case of the artist who paints in a polyglot of colour distorted forms which require a written description to explain the self-expression he tries to convey, or the musician who, with, or mostly without, great talent finds the ordinary path of a musician a tame affair and who turns to this Swing Music, and so relieves his economic pressure.

Who and why buy Swing Music and what use is it?

The earliest form of music is presumed to be the tap! tap! tap! tap! of the aboriginal hollow tree trunk. Education punctuated the above rhythm. Further development evolved other instruments such as animals' horns and so on.

Human beings liked these rhythmic noises because they provide a form of shock excitation to their nervous system or senses, allaying their latent fears, prejudices or boredom.

Ignorant people who fear something behind them run like the devil—not to escape it, but the shock excitation to their nerves—of running—allays the fear.

Which of us does not drum impatiently with our fingers or whistle, or draw jazz pictures on balance sheets or scribbling pads?

Colour is said to be a stimulation of the senses *via* the eye produced by decomposed light. Similarly cannot a musical note or tone be said to be a stimulus of the senses *via* the ear produced by decomposed noise?

Can you, dear sir, fully appreciate what this question involves?

Have you forgotten that milk is now being sterilised by being subjected to a loud note of 9,000 cycles, and that a Vienna doctor is experimenting with gramophone records of weird sounds by means of which he can induce a state of catalepsy within three minutes, the patient so remaining for as long as five hours. Such research being for the purpose of diagnosing and curing some of mankind's ills. Psychophony—as I believe this new therapy is called—is being investigated in many parts of the world. People's voices are being examined by this means to enable a diagnosis of their nervous failings. Restless animals are said to have been soothed by suitable sounds.

Is it not a fact that purveyors of Swing Music live on the fat of the land, and are well received in all kinds of society. While mere melody makers hold out their hats outside cinema queues or starve in garrets.

Here is my attempt to define Swing Music.

Swing Music is the *second* lowest form of musical expression as we know it to-day. Executants break in with their interjections as a more telling and remunerative means of expression than their mediocre attempts at melody.

Do not, dear sir, after reading this hie thee away to a desert isle lest you suffer from the boredom or other modern afflictions mentioned above, which, owing to your subconscious longing for self-expression send you speeding back to London to dine and Foxtrot and Hot Jazz and generally have a good time which is bound to mark you as a supporter of Swing Music.

Therefore remain among us but do please explain peculiar things like Swing Music more fully.

Finally, I have said that the *second* lowest form of musical expression is Swing Music.

The lowest form of musical expression is—syncopated, rhythmic or merely hot—a "Raspberry." Cheerio!—LESLIE KING (Kingston-on-Thames).

P.S.—I suggest you get one of your jazz experts to set this to music and sing it to you.

Letters from Readers

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

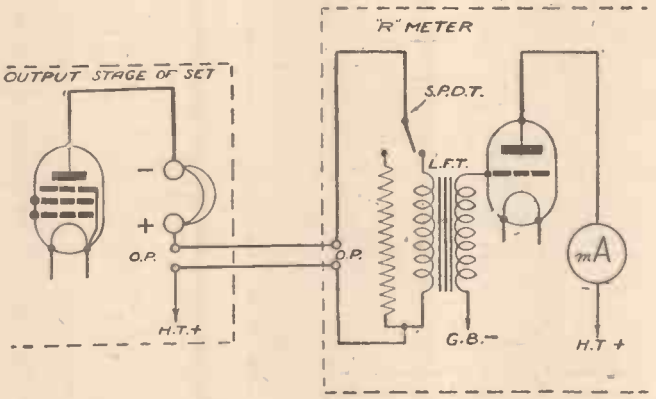
An "R" Meter

SIR,—In a letter which I wrote to you some time ago, I stated that I would give details of an "R" meter to anyone who asked for them. The requests for these details have been so numerous that I have found it impossible to deal with them individually, so I give herewith a circuit diagram, together with all the necessary working details.

This meter does not pretend to give standard values for "R" strengths, for I do not know of any such standard, but once the owner of this meter has calibrated it to his own ideas of the various "R" strengths, it will enable him to keep his strengths constant.

The meter is simply a form of valve voltmeter, and it was while experimenting with such an apparatus that I hit upon the idea of constructing the meter. It consists of a valve so biased that it takes zero anode current when no signal is being fed to it. When it receives a signal, the anode current varies according to the input strength, and is measured on a suitable milliammeter. A good type of valve to use is a super-power one, as it can give a wide variation of anode current. This valve is coupled by an L.F. transformer to the output of the set. With most output valves an ordinary intervalve transformer (about 3-1) is suitable, as it is connected in series with the existing speaker, 'phones, or output transformer, as the case may be. An S.P.D.T. switch is provided to switch in a resistance equivalent to that of the transformer winding when the meter is not in use, for the transformer has a choking effect, and spoils the quality. The resistance is merely to keep the current constant, and in cases where the interposition of the transformer primary in the anode circuit of the output valve of the set does not greatly reduce the anode current, the resistance and S.P.D.T. switch may be omitted and the transformer primary cut out by a shorting switch.

In reading the "R" meter, it is necessary merely to substitute the deflection on the meter in milliamps for a predetermined value of the "R" code. To calibrate the meter, an R1 signal is found, and the milliammeter deflection noted, then an R2 signal, and so on. When the meter is in operation, it is necessary that the station being received should send out a steady tuning note, for speech or music will, of course, send the milliammeter needle kicking all over the scale. To avoid waiting for a tuning note, a scale may be fitted to the reaction or volume control, and "R" values may be obtained from the amount the reaction of volume control has to be reduced *from maximum just to cause the milliammeter needle to kick up from zero.* A more accurate result is obtained with a tuning note, but the method just described is far more accurate than the tolerant human ear. Another method of reading the "R" meter without a tuning note is to arrange a separate unit to heterodyne the incoming carrier when it is unmodulated. This is rather difficult, because the difference between the heterodyne frequency and the carrier frequency must always be the same, no matter to what frequency the set is tuned.



Circuit diagram of the "R" meter described in Mr. Tilley's letter.

If the meter valve is fed from the same H.T. supply as the set, it should be decoupled to prevent feed-back.—R. P. M. TILLEY (Thorpe-next-Norwich).

A Short-wave Experiment

SIR,—As I wish to attempt to discover the effect, if any, of the soil on short-wave reception, I am taking the opportunity of asking for the co-operation of your readers in this direction. I should be pleased to receive reports for the following stations for the week beginning Thursday, July 8th: W2XE (13 m.), W3XAL (16m.), W8XK (19m.), W1XAL (25m.), W1XK (31m.) and W8XAL (49m.).

The reports should cover R-strength (R1 to 9), intelligibility (QSA1 to 5), fading (QSB to R1 to 8) and QRN (atmospherics). A description of the type of soil prevailing in the surrounding district, and the direction in which signals are screened by hills, should be given, together with details of receiver and antenna. Finally, I should like all reports in by Saturday, July 17th. G. R. LEWIS, Redland House, Leckhampton Road, Cheltenham.

A 20-metre Log from Bedford

SIR,—I first started listening on the short waves six months ago, with your Simplest Short-wave Set. Since then I have progressed to a three-valver with loudspeaker, and use this alternately with two valves and earphones. The circuit is a simple one, while the indoor aerial which I use is 30ft. long and 20ft. high. I give below some of my best catches on 20 metres during the last four months, mostly on earphones:—

LU4BN, LU7AG, LU9BD, LU7AZ, LU4BL, LU6KE, YV1AA, YV5ABE, YV5ADE, YV5AK, YV5AE, OA4R, HK1JN, CO7VP, CO7CX, CO2OY, CQ2ON, XE2B, VPGG, NY2AE, HI5X, VK2HF, VK4BD, VK4DV, VK3AK, VK5AW, VK2XV, VK2XU, OQ5AA, YI2BA, YI2BB, PK1ZZ, PK1MX, W6DAY, W6QRL, W6QF, W6GCT, W6AL, W6OI, W6NNR, W7DNB, W5FFA and W5GAR.

Wishing your excellent paper a long life and uninterrupted success.—P. S. YEATES (Bedford).

A Log from Greenford

SIR,—Here is part of my log of calls heard on 20-metre 'phone band for the last nine weeks.

PY8AD, 1DW, 2ET, 2BA, 2JL, 1FR, 3BB, CE3DW, 1AO, 1AR, CN8AA, CO6OM, 7VP, 2WW, 2WZ, 7CX, 2AG, HK3JA, YR5AA, LY1AA, SV1KE, 1CA, LU2CA, 1EX, 1QA, 4BL, 4AW, 6KE, 6DP, 7AG, 7AZ, H17G, VE1DR, 1JH, 1FK, 1LR, VE3MB, 3LL, 3HC, 3EO, VE2BD, 2CA, VE5OT, 5BF, FA3LY, 8CF, FT4AI, 4AA, 4AE, 4AN, LZ2PX, ZB1A, U3BC, SM5YS, SM2VP, VE2CQ, YI2BA, VP3BG, VP5PZ, W1 to 9, VK3KX, 5AW, 3HK, OA4N, OA4AL, K4SA, YV5AE, SU5NK, SU1RH, EA9AH, and more than 70 Americans. My receiver is an 0-v-1, battery operated. —DENNIS MARTIN (Greenford).

CUT THIS OUT EACH WEEK

Do you know

—THAT a large number of American receivers now employ either push-button or 'phone dial methods of station selection.

—THAT a superhet circuit is not essential for television picture reception.

—THAT interference may be introduced into a modern receiver through metal pipes or similar bodies near the building.

—THAT the above form of trouble is capable of introducing cross-modulation effects.

—THAT noises in a receiver can sometimes be traced to the movement of metallic bodies entirely unconnected with the receiver or other electrical circuits.

—THAT colour-coding is now being adopted for the wiring to various components in modern apparatus, as well as to the components themselves.

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

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

QUERIES and ENQUIRIES

Dial Light Problem

"I recently fitted a dial light to my battery receiver but I now find that the accumulator only lasts half the time. Does this indicate a fault, or does the light take so much current that it runs the battery out? I got the lamp from a wireless shop."—F. E. W. (Rugby).

THE ordinary flash-lamp bulb is often used as a dial light, and this type of bulb may take as much as three or four ordinary battery valves. Consequently, when using a bulb of this kind a switch should be included in the leads to the dial light so that it may be switched off when a station has been located. A better procedure, of course, is to use one of the properly designed low-consumption bulbs and then it may be left on all the time, and will serve at the same time as an indication that the receiver is switched on. The bulb should have a filament rated at .06 amp.

Defective Switch

"My set is home-made and has an H.F. volume control consisting of a combined potentiometer and switch. Recently volume fell off and after some unsuccessful tests to trace the cause signals eventually became so weak, that they were hardly audible. I tried various things and finally put a screwdriver across the two contacts on the back of the volume control and signals immediately burst out as before. Can you tell me what this fault indicates, as I can only get signals now when these two points are shorted?"—G. F. P. (E.11).

THE two contacts are undoubtedly those joined to the L.T. leads, and are for the on/off switch. As signals can be obtained when these are short-circuited the indication is that the internal mechanism of the switch is faulty, as the two points should be short-circuited in the "on" position. If you are unable to take the component to pieces and repair the defect, we suggest that you return it to the makers unless it has been in use for a considerable time. Alternatively, you can fit a simple on/off switch on the panel or in some other convenient position, and remove the two leads at present joined to the two contacts, and put them on the new switch.

Electrolytic Condenser Connection

"I have a three-valve T.R.F. battery receiver, with automatic bias on the output pentode. I have a 50 mfd. electrolytic condenser across the dropping resistance in the H.T.— lead. Should the negative on the condenser go to earth or to the H.T.— side of the resistance?"—F. G. (Rugby).

THE resistance is connected to provide a voltage drop for biasing purposes, and, therefore, the negative side of the resistance must be returned to the grid of the valve. The L.F. transformer is therefore joined to the junction of the H.T. negative and resistance, and accordingly the negative side of the electrolytic condenser must also be joined to this point. The positive side of the condenser is connected to the earth line.

Mains Unit and Class B

"I have a mains power unit capable of giving 120 volts at 25 mA, and I have been using it with very good results to supply H.T. to a 1-v-1 receiver. I now wish to add a Class B stage to the receiver and would like to know if this unit would supply sufficient current for this purpose. If not, could you please suggest another unit or arrangement which would serve my purpose?"—A. F. F. (Belfast).

RULES

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

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

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

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

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

IN most cases a peak current of 30 mA is required for Class B working and thus your unit is hardly large enough. Furthermore, to obtain an even voltage supply when using a Class B stage, in which the current fluctuates with the volume of the received signal, a Neon stabiliser is desirable across the output. You could obtain one of these and try it with your unit, keeping volume down slightly so as to avoid distortion due to the lack of sufficient current, but we think that you will probably find that with the combination you intend to use a larger mains unit will be desirable.

Radiogram Hum

"I have converted my mains set into a radiogram and experience considerable hum. I have tried several remedies but cannot cut it out. When the switch is turned to gram, the hum is introduced, but is not apparent on radio. The volume control does not affect the degree of hum, and the pick-up leads are enclosed in screened sleeving. Can you suggest the cause of the trouble?"—F. L. (Bury).

THE trouble may be introduced from the connections to the radiogram change-over switch. Although you have screened the leads to the pick-up itself, you may not have screened the switch leads, and it is possible for these to pick up the hum. Alternatively, the pick-up may be placed close to the gramophone motor which may be switched on when the change-over switch is operated (you do not give details of this), and the hum may be introduced by induction. We presume that the valve to which the pick-up is joined is correctly biassed and that no open-circuit occurs when the switch is operated.

Screening Cans

"I wish to build a set and make my own components. As I intend to use a set of coils I should like to obtain efficient screening cans as I think this would be preferable to building them from copper. Can you suggest a simple scheme, or tell me where I can buy suitable cans? The coils are being wound on 1in. diameter formers of paxolin."—G. F. Y. (Watford).

YOU could arrange suitable screening by using a sheet of copper or aluminium, bent at right angles and mounted on a base so that each coil was in a separate compartment. The height of the screen would have to be carefully chosen so that no interaction could occur over the top. If you wish to obtain cylindrical screens ready made from aluminium these may be purchased from Messrs. Bulgin in two sizes. They are 2¼in. in diameter and with a height of 3⅞in., they cost 1s. 7d., and with a height of 2½in. the cost is 1s. 2½d.

American Valve Data

"Can you give me data regarding the type 6D6 American valve, as I have some circuit details incorporating this valve and wish to use an English one in its place? Accordingly I desire to know the relationship between certain of the components and the valve impedance, etc."—M. R. C. (Barnet).

THE heater of this valve is rated at 6.3 volts 0.3 amps, and the valve is a variable-mu, screened H.F. pentode. Maximum anode volts are 250 and the screen volts 100. The impedance is 250,000 to 800,000 ohms, and the amplification factor 375 to 1,280 (these two figures varying according to the bias applied). There are, of course, equivalent English valves now obtainable, in the Osram and Tungsram range.

Transformer Connections

"I have a small mains transformer taken out of a set which has been dismantled. Unfortunately, no note was kept of the connections, and I am not certain what the different windings will give. Could you tell me what they are from the diagram which I enclose?"—L. F. B. (Caerphilly).

UNFORTUNATELY, the code has only recently been followed by the majority of manufacturers, and therefore your transformer may not be built to the latest recommendations of the Radio Component Manufacturers' Federation. It would appear, however, from the colours that these are in agreement, and we suggest that you make a careful test, following these indications. The brown leads are the 4-volt A.C. supply for the heaters, with the brown and yellow striped lead joined to the centre tap of this winding. The red leads are the H.T. secondary winding and the red and yellow lead is the centre-tap. The green and green and yellow leads are the rectifier heater winding, but this may be a 4 volt 1 amp. or 4 volt 2.5 amp. winding. The primary has apparently only been wound for a single input voltage of 250. We hope to publish full details of this code in a subsequent issue.

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

RADIO CLUBS AND SOCIETIES

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

International Short-wave Club (London)

A LARGE audience of members and radio enthusiasts attended the meeting of the London Chapter held at 80, Theobalds Road, W.C.1, on Friday evening, June 25th, to listen to a lecture on television receivers by Mr. E. F. Burnett, A.M.I.R.E. This was followed by a demonstration of television reception, the receiver being the latest Pye "Teleceiver." Reception was perfect, definition and quality of reproduction being of a very high standard. Television is demonstrated regularly each month, also every other branch of radio is dealt with at the Friday meetings. Interested readers are invited to attend with their friends.—Sec., Arthur E. Bear, 100, Adams Gardens Estate, London, S.E.16.

Perth Radio Club

THIS club now has a membership of 16, and new members will be welcomed. The club meets every Monday at 8 p.m., at 14, Kirkgate, Perth, where we hold a Morse Class, Lectures, Discussions, etc. The entrance-fee is fixed at 2s. 6d. yearly. Juniors (under 18 years), 1s. 6d. per year. There is also a charge of 3d. per attendance. The club hopes soon to have sufficient funds to acquire its own club-room.—Sec., R. Adams, 2, Croft Park, Craigie, Perth, Scotland.

REPLIES IN BRIEF

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

A. P. (Exmouth). G.B.1 should be 4.5 to 7.5 volts and G.B.2 9 volts. Fuse is joined to H.T.— and L.T.— at any part of the wiring. H.F. volume control is to keep the input down to avoid overloading the detector and the L.F. volume control is used to prevent overloading of the first L.F. stage. The ear will be the best guide in satisfactory operation of these two controls.

A. J. N. (Stirling). Any H.F. valve with more or less similar characteristics may be used. This particular valve is not critical.

G. E. (Holywell). We cannot supply blueprints of commercial receivers and are unable to assist you in the particular case mentioned, as the makers have been out of business for some time, and we have not examined any of their apparatus.

F. H. (N.W.4). No alterations to the circuit are needed. Simply obtain the coil you require and insert in place of the coils specified. This particular receiver may be used for the broadcast wavelengths if desired, simply by using the appropriate coil.

M. P. (Luton). Special sparking-plug suppressors and a resistance for connection to the coil may be obtained from Dubilier or Belling & Lee for your car, and will prevent the trouble.

F. H. P. (Birmingham). If you work out the formula you will find that results are identical and the expression given by the writer is in our opinion simpler for the beginner or non-technical reader to understand.

L. D. (Carlow). As the receiver is a short-waver you will find probably that a short wire reaching from the aerial terminal on the set up to a stand-off insulator screwed close to the ceiling will give you all that you require. If you require an outside aerial, try a vertical wire or thin copper rod stretching vertically outside the window near the set. This would be preferable to the horizontal arrangement you refer to and would give much better results.

L. H. (Kidderminster). You could merely replace the valve mentioned. The resistance would probably be better disconnected.

R. G. (Chiswick). If your mains are A.C., it would be preferable to use a transformer as this will not dissipate so much heat and will be more efficient. Upon receipt of fuller details we will endeavour to give you the necessary information.

L. J. (Sidcup). The PA.1 valve should be quite suitable, but an input volume control would be desirable to prevent overloading the output valve on the louder records or wireless signals.

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are drawn full size.

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

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

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

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

PRACTICAL WIRELESS

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Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen)) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans)) ..	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW4
Fury Four (2 SG, D, Pen) ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B.)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull	9.2.35	PW47
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D.C. £5 Superhet (Three valve) ..	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4 ..	—	PW59
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The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES		
Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	16.5.36	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

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Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen) ..	—	AW426
A Modern Two-valver	—	WM409
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Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
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All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen) ..	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	*June* '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen) ..	—	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each) ..	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D Pen) ..	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (S.G. D. Trans) A.C. ..	—	AW383
S.G. Three (SG, D, Pen) A.C. ..	—	AW390
A.C. Triodyne (SG, D, Pen) A.C. ..	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW430
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen) ..	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	—	AW425
Heptode Super Three A.C. ..	*May* '34	WM350
"W.M." Radiogram Super A.C. ..	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
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Tyers Portable (SG. D, 2 Trans) ..	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America ..	23.1.37	AW420
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D. Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	*Jan.* 19 '35	AW463
The Carrier Short-waver (SG, D, P.)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-Wave World-Beater (H.F. Pen, D, RC, Trans) ..	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super ..	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter ..	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C. ..	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v). for WM392 ..	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New-Style Short-Waver Adaptor (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.I.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

Miscellaneous Advertisements

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

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

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SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

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

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ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. Temple Bar 9338.

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Have you had our GIANT ILLUSTRATED CATALOGUE AND VALVE LIST? Send 4d. IN STAMPS FOR THIS BARGAIN LIST.

NEW 1937 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT, 13 to 86 Metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE! DE LUXE MODEL**, 14 to 150 Metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

SUPERHET CONVERTER KIT, 12/6. De Luxe Model, 18/6. S.W. SUPERHET CONVERTER KIT, for A.C. Mains Receivers, 20/-. A.C. Valve given FREE!

NEW 1937 2-VALVE S.W. KIT, 13 to 86 Metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE. DE LUXE MODEL**, 14 to 150 Metres, complete Kit and Chassis, 4 Coils and all parts, 25/- VALVES GIVEN FREE. 3-VALVE S.W. KIT, S.G. Det. and Pen., 42/-. VALVES GIVEN FREE.

SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

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

The New **"Premier" Short Wave CONDENSERS**, with Trolitul Insulation. Certified superior to Ceramic. All-brass Construction. 15 mmfd. 1/4; 40 mmfd. 1/7; 100 mmfd. 1/10; 160 mmfd., 250 mmfd. 2/6. S.W. H.F. Chokes, 9d.; screened, 1/6.

MAINS VALVES famous Europa 4 v. A.C. types, 4/6 each. H.L., L., S.G., Var-Mu-S.G., H.F. Pens., Var-Mu-H.F. Pens. 1, 3 and 4-watt A.C. directly heated output Pentodes. Full-wave rectifiers 250 v. 60 m.a. A.C./D.C. types. 20-volt. .18 amp. S.G. Var-Mu-S.G., H., H.L., Power and Pen. Following types all 5/6 each. Full-wave rectifiers, 350 v. 120 m.a. and 500 v. 120 ma. 2½ watt indirectly-heated Pentodes, Octode Frequency Changers.

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

AMERICAN VALVES. Genuine American HYTRON and TRIAD first-grade Valves. 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves all types, 6/6 each. Genuine American **DUOTRON** Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. OCTOL bases, 9d. each.

3-WATT A.C. AMPLIFIER, 2-stage for mike or pick-up. Complete kit of parts with 3 valves, 40/-. Wired and Tested, £2/15/0.

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

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each. **PICK-UP HEADS** only, 4/6 each.

PREMIER MAINS TRANSFORMERS, wire-end type with screened primaries, tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. H.T. 8 & 9 or H.T.10 with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., 8/6. 250-250 v. 60 m.a., 4 v 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 8/6. 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 10/6. Any of these transformers with engraved panel and N.P. terminals 1/6 extra. 500-500 v. 150 m.a., 4 v., 2-3 a., 4 v., 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 17/6 **SPECIAL OFFER PHILIPS MAINS TRANSFORMERS.** 250-250 v. or 300-300 v. at 800 m.a., 4 v. 5 a., C.T.; 4 v. 1 a. Tapped Primary 100-250 volts 6/11. 450-450 v. at 150 m.a. or 500-500 v. 100 m.a., 4 v., 4 a. C.T. 4 v. 4 a. and 4 v. 3 a. Screened Primary. Tapped input 100-250 v., 12/6. **AUTO TRANSFORMERS**, step up or down, 60 watts, 7/6; 100 watts, 10/-. **SMOOTHING CHOKES** 25 m.a., 2/9; 40 m.a., 4/-; 60 m.a., 5/6; 150 m.a., 10/6. 2,500 ohms, 60 m.a. Speaker Replacement Chokes, 5/6.

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SPECIAL OFFER LISSEN TWO-GANG SCREENED ALL-WAVE COILS, 12 to 2,000 metres, complete with switching and wiring diagrams, 6/11 per set.

Special Offer BTH Energised Moving Coils 10½in. diam. 1,650 ohms field Power or Pentode transformer (state which) 14/6.

ROLA latest type P.M.s. 15/-. R. & A. mains energised 2,500 ohms field, 10/6 each; Jensen P.M.s, 10/6.

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ALCO ELIMINATORS AND CHARGERS. Standard outputs, 18/-. With charger, 25/-. Charger 7/6. Year's guarantee. Details free.—P. and D. Radio, 1, Goodinge Road, N.7.

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PHOTOGRAPHIC MATERIALS.—Films, Plates, Papers, Postcards, Mounts, Chemicals, etc. Superb quality. Economically priced. Factory fresh always. Money-making lists free.—"Kimber's," 105, Queen's Road, Brighton.

A DICTIONARY OF WIRELESS TERMS, by Ralph Stranger. A Wireless Work of Reference that should be on the bookshelf of every keen amateur. Compiled by a master of lucidity, it gives the meanings of all Technical terms in general use. Price 2s. 6d. from all Booksellers and Newsagents.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

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The ideal microphone for all P.A. and Stage work. Robust construction, enabling the use of long microphone leads, without loss of output, with remarked absence of "feed back." No energising current required. Special Alnico magnet. Response 70-6,000 cycles. Output 85 d.b. down. Chromium Floor Model, Price £4 10s. 6d., or Special Double Button Model £2 2s. 6d.

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RECORD

The quality valve in the COMPLETE range

RECORD RADIO LTD., 2/3, Eldon Street, E.C.

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COUPON

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PRACTICAL AND AMATEUR WIRELESS, 10/7/37.

ADVERTISEMENT INDEX

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12 Sanwell

THE ADVANTAGES OF HEADPHONES—See page 423

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

AND PRACTICAL TELEVISION

a GEORGE NEWNES Publication

Vol. 10. No. 252. July 17, 1937.

a MAINS-LESS H.T. UNIT

6 VOLTS

250 VOLTS

TRANSMITTING TOPICS—See page 422

Practical and Amateur Wireless

Edited by F. J. CAMM.

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

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

ROUND *the* WORLD *of* WIRELESS

H.T. from L.T.

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

International Broadcasting Union

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

Set Testing

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

ON OTHER PAGES.

The Zoo at Olympia

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

Variety from Coventry Hippodrome

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

Television Range

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

Story of the Chorus

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

Irish Guards' Band

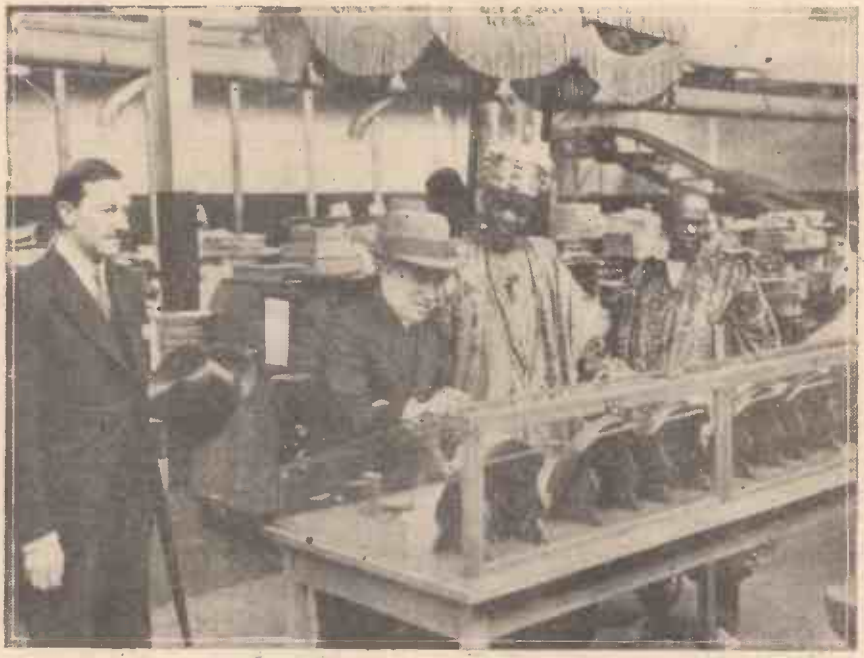
THE Band of His Majesty's Irish Guards is among the bands which are visiting Leamington Spa this season. Their performance, conducted by Captain J. L. T. Hyrd, Director of Music to the Regiment, will be broadcast in the Midland Regional programme on July 31st from the Pump Room Gardens. This band was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

ROUND the WORLD of WIRELESS (Continued)

Revue in Miniature

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

INTERESTING and TOPICAL NEWS and NOTES



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

Light Orchestral Concert

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

Somerset Music

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

Two Crime Plays

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

B.B.C. Scottish Orchestra

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

SOLVE THIS!

PROBLEM No. 252

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

Solution to Problem No. 251

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

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

Cheltenham Municipal Band

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

New Appointment

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

Dance Music

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

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

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

Cinema Organ Music from Aberdeen

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

THE "MULTUMETER" TEST SET

(Concluded from page 397, July 10th issue)

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

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

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

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

"Divided Shunt"

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

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

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

Winding the Shunts

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

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

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

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

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

* See text.

A.C. Volts

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

(*Continued on next page.*)

THE MULTUMETER TEST SET

(Continued from previous page.)

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

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

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

Resistance Measurement

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

Output Meter

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

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

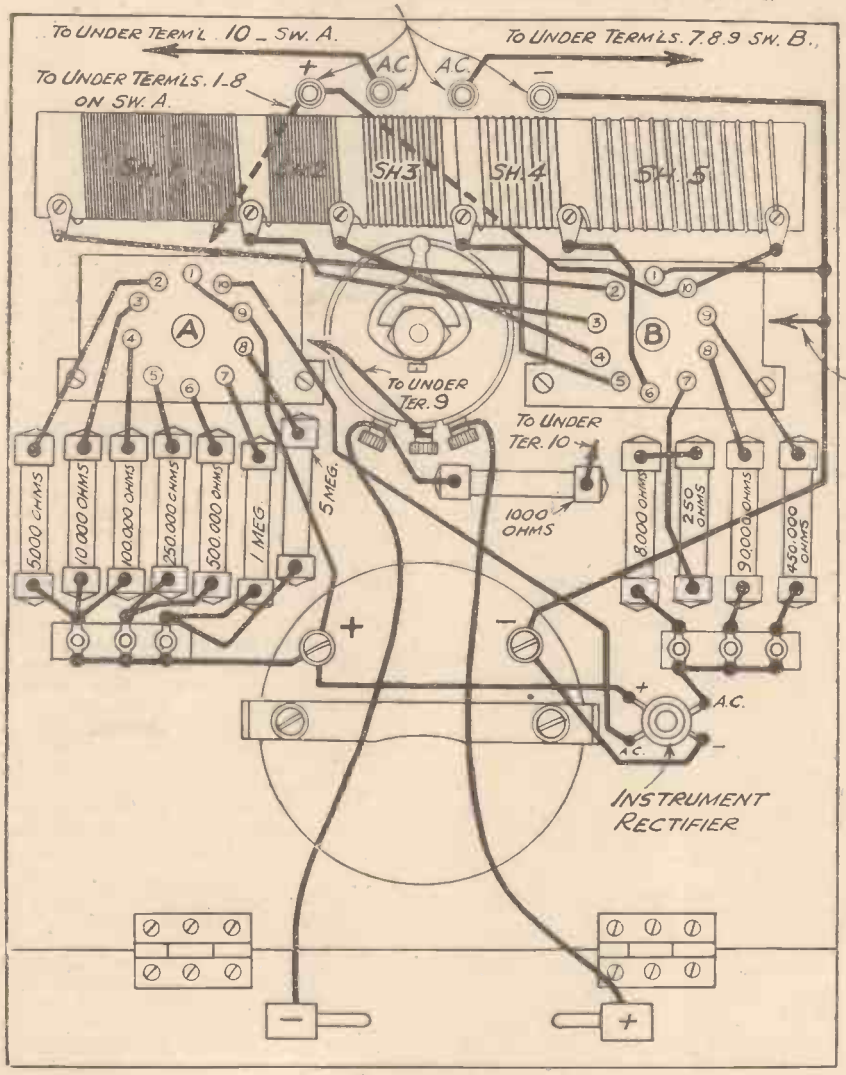
The scale is calibrated to show the watts output for the most common impedance values of output valves in use, when using the instrument for 100 volts full scale deflection.

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

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

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

WIRING DIAGRAM OF THE "MULTUMETER" TEST SET



Dynamic Characteristics of a Valve

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

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

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

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

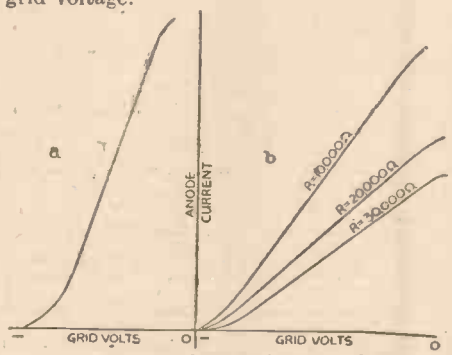


Fig. 1.—The standard grid-volts/anode-current curve, and the effect of varying loads shown graphically.

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

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

Load Effect

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

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

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

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

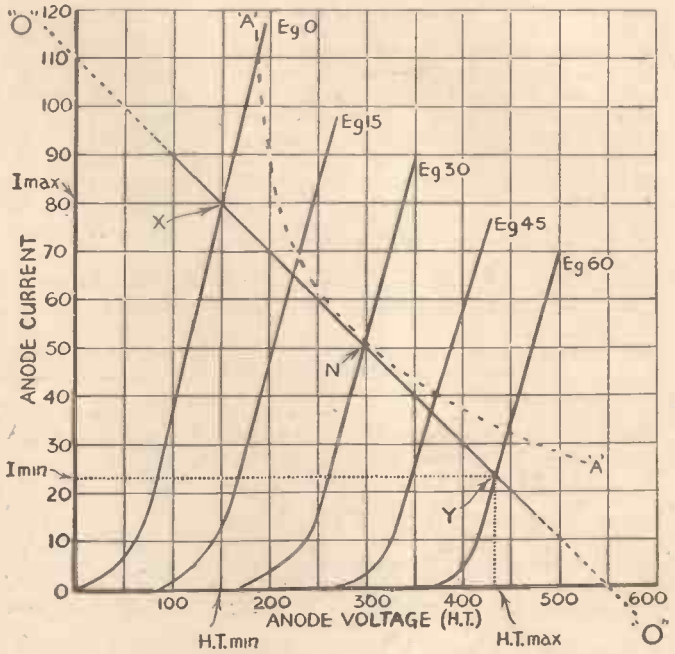


Fig. 2.—Dynamic curve, showing load line, dissipation, and other important working data.

Grid Voltage Values

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

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

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

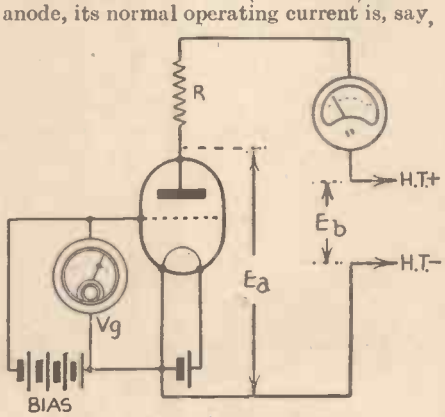


Fig. 3.—Circuit arrangement for taking dynamic curves or other valve data.

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

Maximum Anode Dissipation

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

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

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

(Continued overleaf)

DYNAMIC CHARACTERISTICS OF A VALVE

(*Continued from previous page*)

Load Line

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

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

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

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

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

Anode Current Swing

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

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

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

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

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

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

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

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

Second Harmonic Distortion

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

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

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

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

NEW PILOT BATTERY RECEIVER

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

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

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

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

PROGRAMME NOTES

B.B.C. Scottish Orchestra

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

Organ Recital from Glasgow

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

A Circus on the Move

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

Practical Television

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

Television at Radiolympia

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

A Camera Note

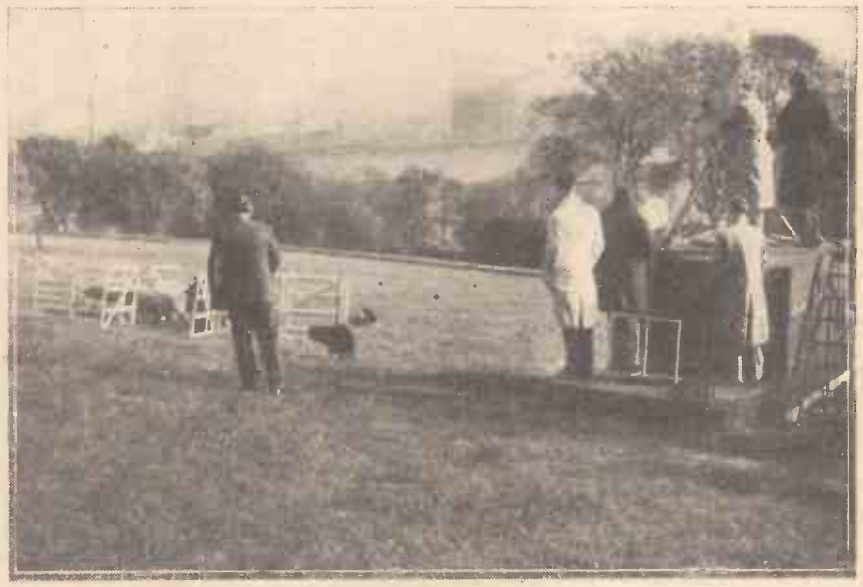
IN the simple explanation of the operation of the Inconoscope camera it is shown that the elements of the mosaic are charged to varying potentials as a result of the photo-electric emission caused by the focusing of the optical picture to be televised on to the signal plate. The electrons so lost by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

Avoiding Stray Fields

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

Big Screen Brightness

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



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

"THE RAFT"

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

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

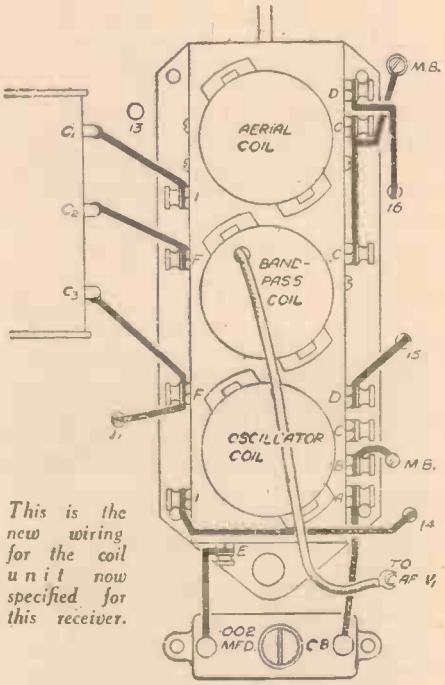
Constructional Details of "Practical Wireless" Receivers—9

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

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

Modern Components

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



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

Operation

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

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

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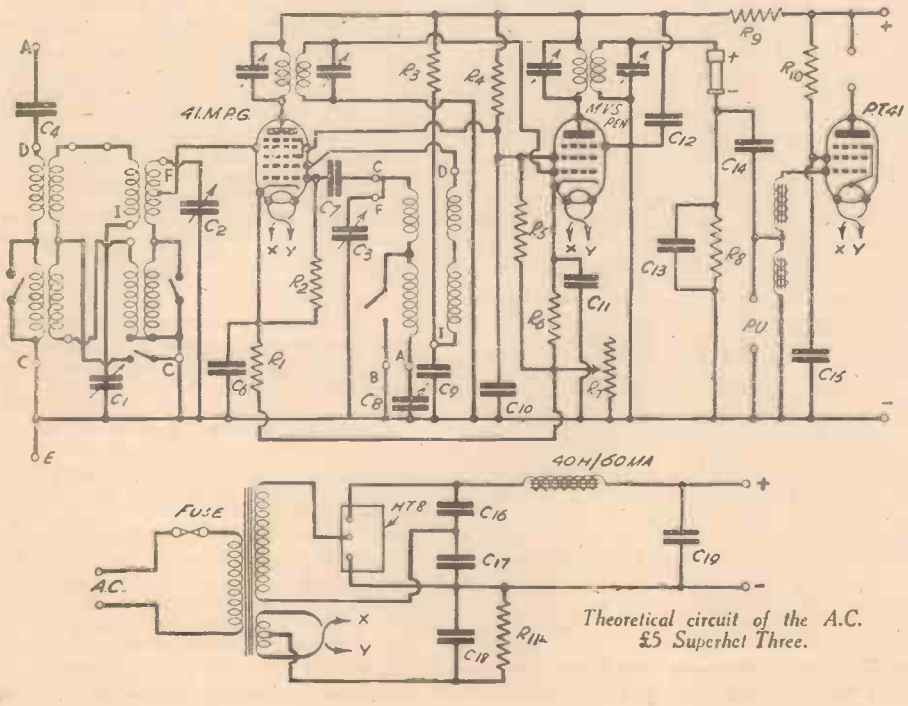
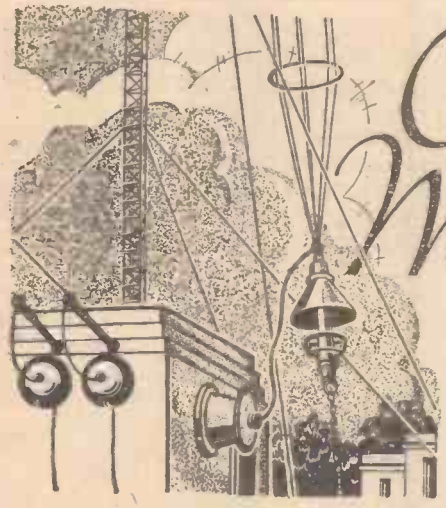


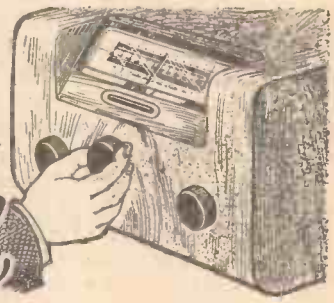
Theoretical circuit of the A.C. £5 Superhet Three.

LIST OF COMPONENTS.

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



On Your Wavelength



By Thermion

Are You On the Black List?

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

Sets with Frills

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

Black Lists

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

Cheap Batteries

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

The New Models

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

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

The International Broadcasting Union

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

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

The programme committee's agenda included suggestions for

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

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

Interference Problems

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

Notes from the Test Bench

Ganging Trouble

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

Parallel-feed Transformers

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

Coil for Experimenters' One-valver

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

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

African Chief and the Gramophone

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

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

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

Waxes Rushed to Hayes

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

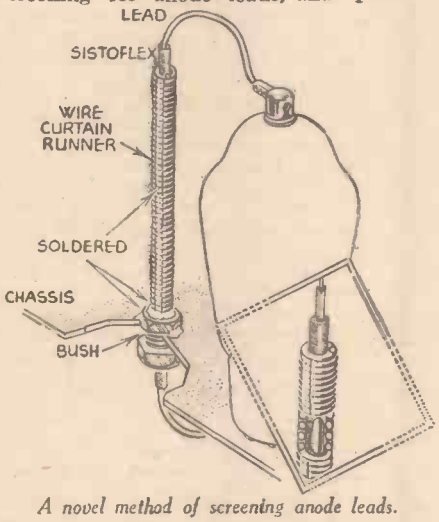
For the recording of H.M. The King's speech during the evening a similar procedure was adopted, using the same number of machines and staff.

A PAGE OF PRACTICAL HINTS

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

Screening Anode Leads

I HAVE found that a length of wire curtain runner makes an admirable screening for anode leads, and quite



A novel method of screening anode leads.

commercial finish will result if the fixing and soldering is done carefully.

The employment of a brass bush, as illustrated, overcomes the possible dry-point effects which will result if the assembly becomes unsoldered, and again, the extra element of strength makes for greater efficiency.—A. BRODEWICK (Pinner).

Radio Fault Tracing

WHEN locating a fault in a tuning circuit it may be a useful test to break, temporarily, the connection between coil and tuning condenser and to make an ohmmeter test across the latter with the object of checking the D.C. resistance in shunt with the circuit. This is not, by any means, an infallible test, but there is always the chance that the trouble may be caused by some simple "leak" across the tuning condenser. If the coil D.C. resistance is known and accurate means of measurement are available a test should be made to see if there is any shorting between turns. Tests should be made for any high-resistance joints ("dry joints"). Cases have been known where a corrosive action has taken place and the coil insulation affected. This effect may sometimes have bad influence upon the H.F. resistance of the circuit, although the effect upon the D.C. resistance may not be noticeable.

Coupled H.F. circuits can give selectivity troubles if, for any reason, the coupling becomes excessive and this is a point that may be worth investigating, particularly in the case of capacity coupled circuits.—H. SMITH (Harrow).

Radiogram Switch

THE amateur constructor who uses the average manufacturer's ganged-coil assembly finds that this often has incorporated a switch for long- and medium-wave selection, but finds himself compelled to install an additional switch should he desire to use a gramophone pick-up.

The writer found that a short length of ebonite or fibre, fitted snugly over the switching shaft, secured with a pin or screw, and with a notch filed along its length, made a very satisfactory cam to control a simple switching arrangement, as shown. The switch was made from an old telephone jack, the contacts and insulation only being retained, and secured to a metal plate which in turn was fastened to the metal base of the coil unit.

The cam is arranged on the shaft so that the centre blade falls into the slot in a mid-way position between long and medium switching positions. There is the added advantage that the action of the slot gives a positive indication when the "gram" position is found.—C. W. PICKEN (Canterbury).

THAT DODGE OF YOURS!

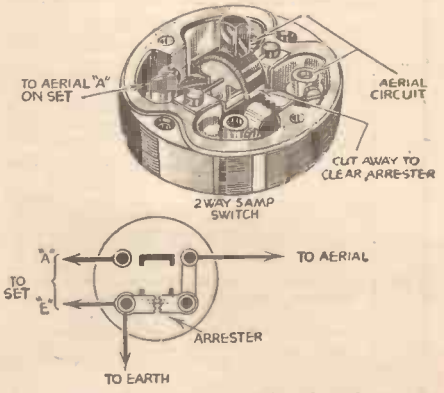
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

Simplified Fault Finding

MY receiver recently developed a fault which stopped all signals. I could not even get the local. To add to my misfortune my only meter had been damaged the previous week and I particularly wanted to try to get the set right for an item later in the evening. I proceeded to locate the fault in the following way. First I located an old pick-up adapter in the junk box and fitted a pick-up to this. When inserted in the detector stage (the set was not employed as a radiogram) I could get some kind of noise by plucking the needle point. This indicated that detector and L.F. stages were in order. I next transferred it to the I.F. stage and again could hear a noise when the needle was plucked. In the frequency-changer stage I could not obtain results and suspected this stage. As the coils may have made some difference I tested the anode circuit by placing an ordinary compass near the I.F. transformer, after removing the screening cover, and found that when switched on the needle was deflected. This indicated that anode current was flowing, and thus, for my purpose I was driven to suspect the tuning circuits. An external examination showed that all connections were in order, and before modifying the setting of the trimmers I removed the ganged condenser screening cover to inspect the trimmers in case the mica had become broken. I then found that the condenser vanes were "all in," or at maximum, whilst I noted that the tuning pointer was at minimum. A further test showed that the trouble was that the grub screw holding the dial to the condenser spindle had become loose and the condenser was not turning with the dial—G. T. WALDE (Hendon).

A Two-way Aerial Switch

BY removing the circular terminal fixing nuts of a two-way electric light switch to enable two strips of sheet brass to be clamped under the terminals (providing an arrester gap) it can be utilised as an aerial switch. The accompanying sketch of the modification shows part of the rocker arm cut away to clear the additional springs, the latter being fitted well clear of the



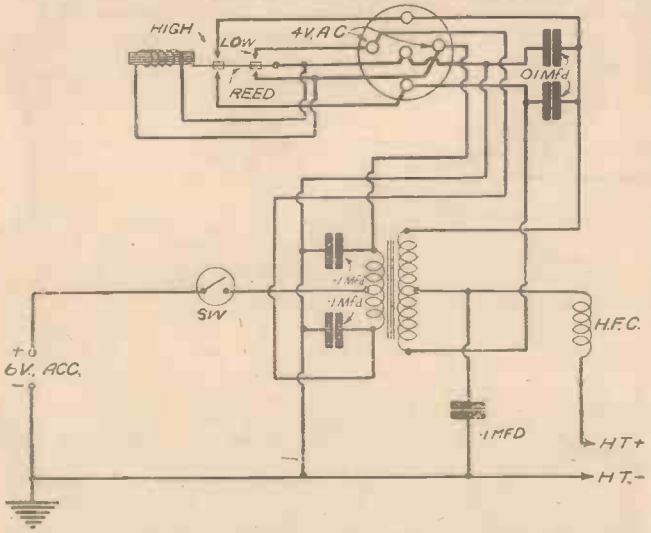
A two-way electric-light switch adapted for use as an aerial-earth switch.

switch movements. A bakelite switch can be fitted in surroundings where the usual porcelain type of aerial switch is unsightly, and moreover the former possesses a very low self-capacity.—W. H. ARCHER (Liverpool).

A MAINS-LES

In this Article our Popular Contributors tell you How Operated from a 6-volt Accumulo

AFTER last week's discussion I expect you are all waiting anxiously for the detailed instructions for building the H.T. unit which we introduced in our article. This particular unit was built for a special purpose, namely, to operate a small mains set in a car, and therefore, it was designed to deliver a full 250 volts. It should be pointed out, however, that it is not necessary to have such a high output. The actual voltage which you can get is dependent upon the transformer which is employed, and there are two models made for use with the special vibratory rectifier which we are using. One delivers a maximum of 150 volts and the other 250 volts, and you can therefore build one of these units to operate either a battery or a mains set.



shown in Fig. 1, and it will be noted that three H.T. positive feeds are provided for. This was because the particular set which was to be used had three H.T. input terminals and it was not desirable to modify the receiver wiring. A better plan would be to use a single maximum H.T. output from the unit and obtain the various lower H.T. voltages in the receiver by means of decoupling circuits. However, this is a matter for individual attention, and does not seriously affect the design. It will be seen from the circuit that in addition to the arrangement shown last week a smoothing

usual way with stout gauge wire, with insulated sleeving in certain places where there was a risk of leads coming into contact due to excessive vibration, which might be expected in the car. Again, this precaution need not be taken if the unit is to be used with an ordinary battery receiver.

The voltage-dropping resistances must be selected according to the voltages required at the point to which they are connected, and the current flowing at that point must therefore be known before the correct resistance value can be ascertained. Remember that this is done by subtracting the voltage required from the total voltage and dividing this by the current in milliamps. The answer will give you the number of thousands of ohms. Thus, if you need 200 volts and the current is 5 mA, the excess 50 volts is divided by 5, giving 10, and thus a 10,000 ohms resistance is required.

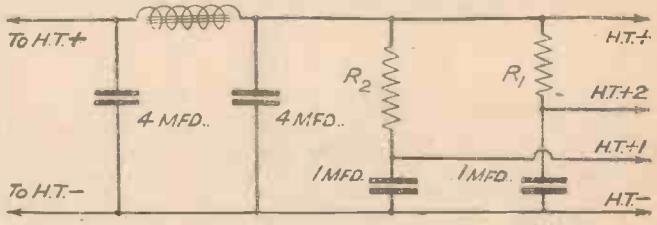


Fig. 1.—Complete circuit diagram of the H.T. unit showing the vibrator and rectifier on the left, and smoothing and voltage dropping circuit on the right.

Constructional Details

The constructional details are the same in both cases, even to the colour of the leads which are fitted to the transformer, and therefore, all of these notes will apply in both cases. As you will see from the illustration on our cover, we built the unit in a small metal box, one which had actually previously housed a well-known mains unit. This particular box was 7in. long by 7½in. wide and had an overall depth of 3½in., so that it is actually smaller than many super H.T. batteries and, incidentally, weighs less than one of these components. No overcrowding will take place if you adopt these dimensions, although if you need to make the unit for some special purpose you can adopt different dimensions and may manage to get all of the parts in a smaller area.

LIST OF PARTS.

One H.T. Transformer, type M.T.2 or M.T.5 (See Text) (Bulgin).
One Vibrator - Generator - Rectifier, type H.T.V.2 (Bulgin).
Three .1 mfd. Tubular Condensers (T.C.C.).
Two .01 mfd. Tubular Condensers (T.C.C.).
One Toggle On/off Switch, type S.80.T (Bulgin).
Four Insulated Terminals, L.T.—, L.T.+, H.T.—, H.T.1, H.T.2, and H.T.+ (Clix).
One L.F. Choke, type L.F.14. (Bulgin).
Two 4 mfd. Fixed Condensers, or two Electrolytic Condensers (See Text) (T.C.C.).
One H.F. Choke, Type H.F.8.S (Bulgin).
One Containing Case (See Text).
Additional condensers and resistors for voltage dropping may be employed as mentioned in the text.

The complete circuit we adopted is (L.F.) choke and two large capacity condensers are provided, with the separate voltage-dropping or decoupling components for the lower H.T. tappings (Fig. 1). The two smoothing condensers which we used were 4 mfd. Mansbridge type, and again the individual may modify these if he so desires and use electrolytic components, provided that suitable provision for mounting them can

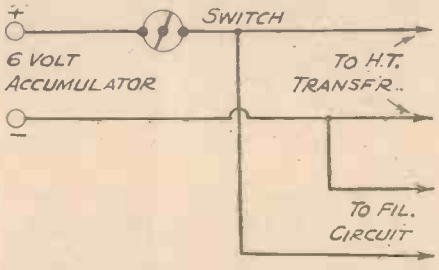


Fig. 2.—Theoretical connections for feeding the heater circuit of 6 volt mains-type valves.

be made. To accommodate the vibrator the holder was mounted on a small angle bracket specially made for the job and bolted to the centre of the box, whilst the cover was cut from thin sheet iron and drilled as shown in the illustration on the cover. Incidentally, this box was connected to the H.T. negative terminal and then to earth, in order to avoid any possibility of interference being picked up by the receiver.

Wiring

A complete wiring diagram is given in Fig. 4 and this was carried out in the

So much for the unit, which is employed simply by connecting the positive and negative terminals to the corresponding terminals on a 6-volt accumulator, and which is brought into use by means of the

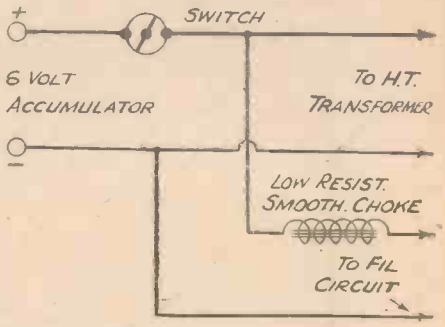


Fig. 3.—This arrangement must be used for supplying the filaments of battery (2 volt) valves.

switch. If used on a car, there is one precaution. The negative terminal of the accumulator in this arrangement is joined to earth, and if the car battery is wired with the positive joined to earth, the battery will be short-circuited.

Filament Supply

If the unit is being used with a battery receiver, the same accumulator (6 volts) may be used to operate the filaments by taking suitable precautions to drop the voltage and prevent interference being fed back from the vibrator. This may most

SS H.T. UNIT

to Build an H.T. Battery Eliminator which may be itor. By THE EXPERIMENTERS

conveniently be carried out by using a small low-resistance smoothing choke (type L.F.44), supplied by Messrs. Bulgin, and this should be included in the positive lead from the accumulator. If standard type mains valves designed for 6.3 volt working are employed, this smoothing choke may be omitted, and the heaters may then be fed direct. Fig. 2 shows the filament supply circuit added to the input to the mains unit, and Fig. 3 shows the arrangement when 2-volt valves are used.

A Word of Warning

Before concluding this article a word of warning is necessary regarding the type of receiver which is fed from the unit. As in the case of all types of rectifier, the voltage and current outputs are interdependent. Thus, the maximum output from the larger transformer is 250 volts at 60 mA., and if a lower current than this is taken, the voltage will rise. Similarly, if a larger current is taken, the voltage will fall. The popular Q.P.P or Class B amplifying arrangements operate with a fluctuating current, this rising and falling with the type of music being received and the volume which is being obtained. Consequently, the voltage also will vary and this will give rise to distortion. To obviate this trouble a special Neon stabiliser should be connected across the output.

This may be obtained from Messrs. Cossor, and a circuit diagram showing how it should be wired will be supplied with it. The simplest arrangement is to join it across the H.T. positive and negative terminals of the unit, but a series resistance may have to be included in some cases in order to prevent too high an initial voltage from being applied to the neon tube. This device will not, of course, be used with a mains receiver where an output voltage of 250 is being employed, and the Class B or Q.P.P. feature will not be needed in these circumstances.

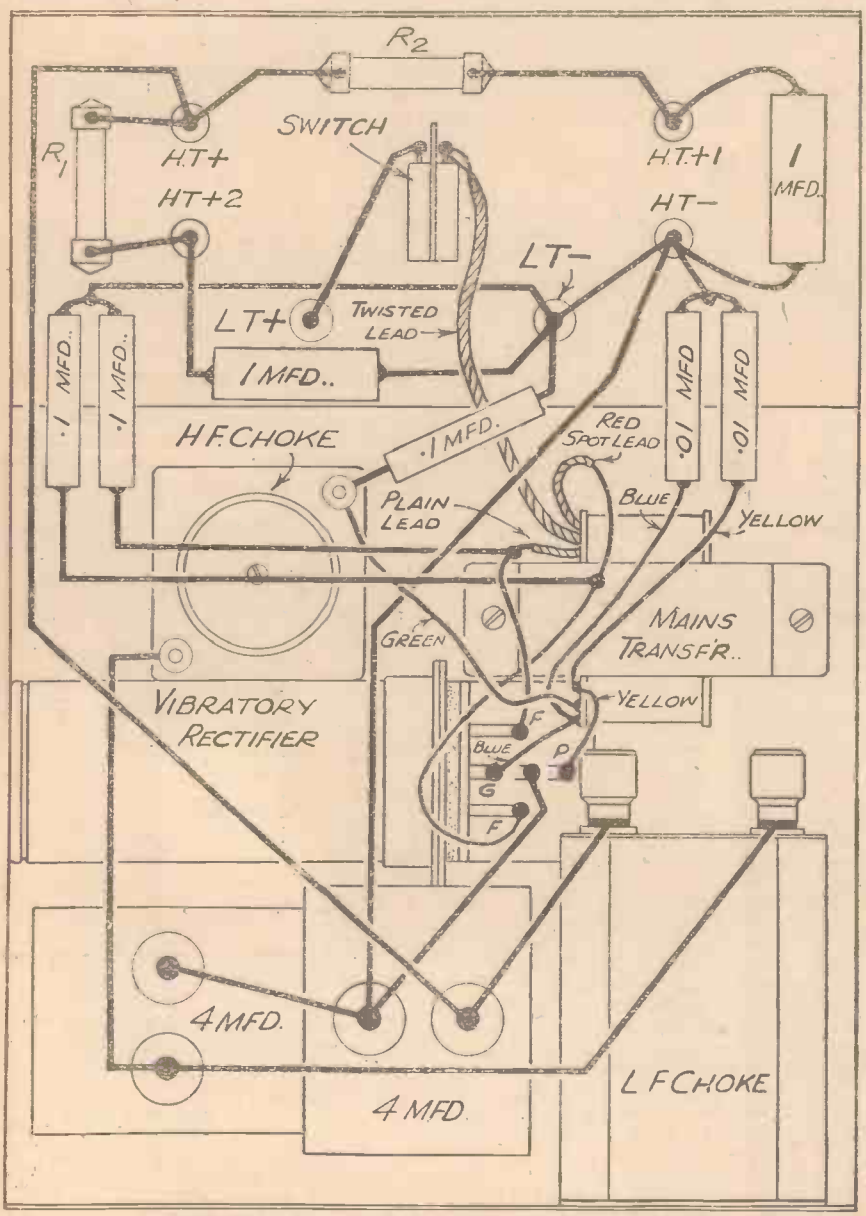


Fig. 4.—Wiring Diagram of the complete H.T. Unit.

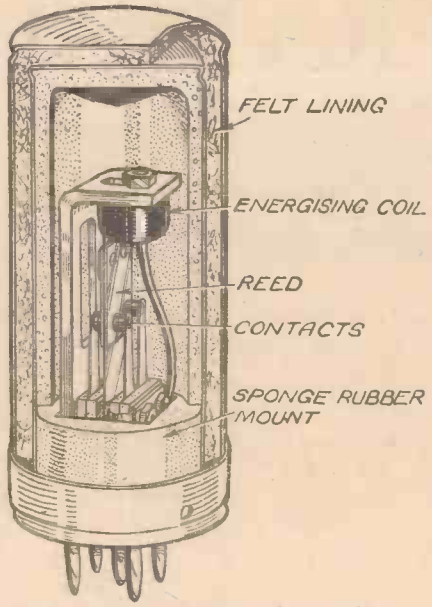


Fig. 5.—Our artist has here shown the internal arrangement of the vibratory-rectifier, but the constructor should not remove the screening cover in view of the risk of damage.

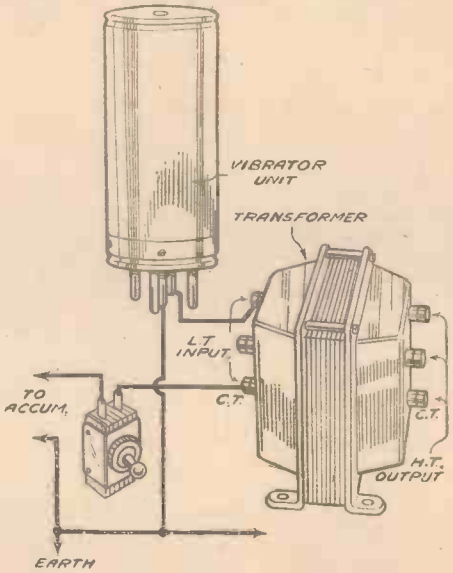


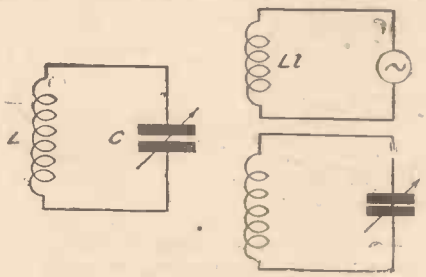
Fig. 6.—Pictorial diagram showing the input arrangements for rectifier and transformer.

TRANSMITTING TOPICS

Monitor-Frequency Meter, Over-modulation Indicator, and The Tritet Oscillator, are Discussed in this Article - - By L. ORMOND SPARKS

ALTHOUGH the G.P.O. Regulations do not state that a frequency meter is essential when a crystal-controlled transmitter is employed, it is one item which should form part of the equipment of every station.

They are not expensive things to make up, neither does the construction involve a lot of work; the only part requiring a



Figs. 1 and 2.—Circuit diagrams of an absorption type frequency meter.

reasonable amount of patience and care is the actual calibration. However, that is not so difficult as it would first appear.

There are several types of frequency meters each, apparently, having outstanding claims, so it is up to the constructor to select the one most suitable for his work, and according to the parts available.

Absorption Method

The most simple arrangement is, undoubtedly, that making use of absorption, and which consists of nothing more complicated than a straightforward tuned circuit.

The fundamental circuit is shown in Fig. 1. The grid coil L is coupled to the circuit under test, which, in the case of a transmitter, is the generator of oscillations or, in other words, the oscillator, and tuned by the condenser C until the maximum power is absorbed. When such a state exists, the circuit C.L. will be tuned to the same frequency as the oscillator.

It is usual to provide some visual means whereby it is possible to tell, easily, when the two circuits are in resonance. A suitable neon lamp across the condenser C, or a small pocket lamp bulb in series with L is quite satisfactory, only the latter method has the disadvantage of making the tuning rather flat.

A better arrangement is shown in Fig. 2, where it will be seen that a separate winding is used for the lamp, the winding L1 being inductively coupled to L. This does not increase the resistance of L.C. and, therefore, allows very much sharper tuning to be obtained. On test, the difference is quite marked.

Choice of Coils

It is not necessary to wind special coils, although if the constructor desires to do so he can obtain all the data he requires from standard S.W. coils, and I would suggest that ordinary four-pin plug-in S.W. coils—with reaction winding—are used, providing they are of good make, and accurate so far as their waveband coverage is concerned.

There is one point which might need attention. The distance between reaction and grid windings may need reducing, but that all depends on individual conditions, and must, therefore, be left as a matter for experiment.

When the meter circuit is in resonance with the circuit under test, the lamp will give the maximum brightness; the power absorbed may stop the oscillator oscillating, and cause an increase in the anode consumption of the valve.

It is, of course, vitally necessary that the meter is calibrated accurately, and the condenser C fitted with a really good *slow-motion* drive. Select that type which gives the greatest turns ratio with the smoothest drive.

The calibration can be carried out in conjunction with any S.W. receiver—preferably of the straight type—which is capable of receiving a good number of commercial S.W. stations whose frequency of transmission is known. Each coil, i.e., each waverange, must be calibrated, so it may be necessary to spend some little time

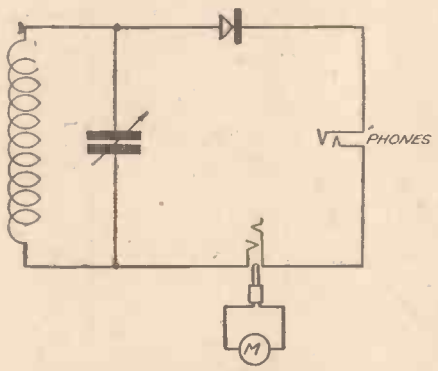


Fig. 3.—Circuit diagram of a simple over-modulation indicator.

on this part of the business. Simple tuning charts, providing they are plotted with care, are all that is necessary to determine the frequency for any coil at any given setting of C.

Over-modulation Indicator

During certain tests recently, I wanted to rig up a monitor without the trouble of additional L.T. and H.T. supplies, and, as I came across a W.6 Westector, I decided to try out the simple and well-known arrangement shown in Fig. 3.

The coil and condenser combination is chosen to suit the waveband concerned, though there is no reason why standard plug-in S.W. coils should not be used, thus making its use more general. It is necessary lightly to couple the coil to the transmitter, but care must be taken to see that rectified current does not exceed, say, 0.2 mA, or that specified by the makers of the rectifier, by making the coupling too tight.

Headphones can be connected by terminals, or plug and jack. Personally, I think the latter arrangement is the better, especially, if it is made standard throughout the station equipment.

The milliammeter "M" should have a maximum reading of, say, 1 mA, or 1.5 mA, the former being the better. Don't expect a cheap instrument to be satisfactory. The current to be measured or indicated is very small, so it is essential for the meter to be really efficient.

With this simple piece of apparatus, a constant check can be maintained on the quality of one's transmission, and it will be found invaluable in general station work.

With regard to modulation indication, it is not always an easy matter to obtain a reasonably accurate idea of how one is modulating the carrier. There are, of course, arrangements for checking the effect of that part of the transmitter, but, they are rather complicated and hardly suitable for the beginner.

The monitor shown—without any alteration—can be used for such work, and, while it will not give actual indication in terms of percentage, it will indicate if the modulation is above or below 100 per cent.

If all is in order, and modulation does not exceed 100 per cent., the meter needle will remain steady, but if the percentage of modulation is increased above 100 per cent., then the needle starts to kick upwards, and adjustments are called for.

It will be remembered that over-modulation can be responsible for radiation over a very wide waveband, thus causing interference to nearby receivers; therefore, it is a point which must be watched.

The Tritet Oscillator

When considering oscillators, it was appreciated that such arrangements—when crystal controlled—were single-frequency generators, and if it was required to operate on other frequencies than the fundamental, a "doubler" stage had to be employed.

It is possible, by making use of the Tritet or Tri-Tet, as the Americans write it, to obtain the effects of an oscillator and doubler in one valve, thus making it possible for a station to operate on, say, three wavebands with one crystal.

The circuit, Fig. 4, consists—as its name implies—of a triode oscillator and a tetrode

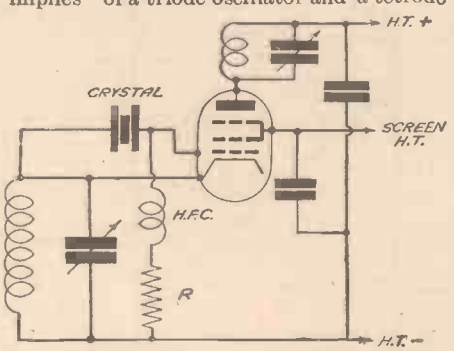


Fig. 4.—Circuit diagram of the Tritet oscillator.

doubler, the screening grid and suppressor grid being connected together and acting as the anode of the triode oscillator.

As many output pentodes have the suppressor grid strapped, internally, to the cathode, it is advisable to secure the type where an external connection is provided for the suppressor. Although the other arrangement will work, its output is not so great, neither is it so stable.

The circuit is not tricky to operate if

(Continued on page 427)

The Advantages of Headphones

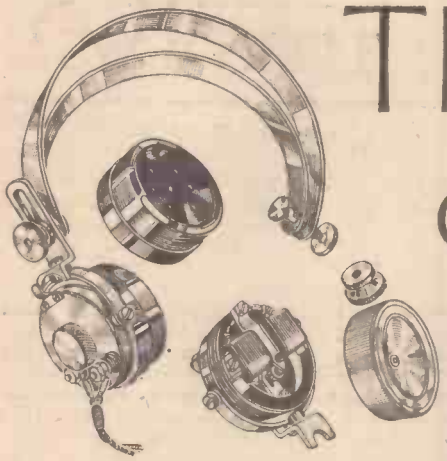


Fig. 1.—A complete earpiece and details of the reed type headphones made by S. G. Brown and Co.

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

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

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

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

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

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

Types of Movement

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

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

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

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

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

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

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

Moving-coil Model

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

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

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

Every consideration for invalids and those

(Continued on the next page)

THE ADVANTAGES OF HEADPHONES

(Continued from previous page)

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

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

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

Fig. 3.—The Voluphone speaker unit.

Important Broadcasts of the Week

NATIONAL

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

Thursday, July 15th.—Concert Party programme.

Friday, July 16th.—Chamber Music.

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

REGIONAL

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

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

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

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

MIDLAND

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

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

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

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

NORTHERN

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

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

Friday, July 16th.—Chamber Music.

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

WESTERN

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

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

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

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

WELSH

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

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

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

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

SCOTTISH

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

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

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

Saturday, July 17th.—Variety programme.

NORTHERN IRELAND

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

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

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

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

TELEVIEWS

An Installation Problem

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

In Germany

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

BRIEF RADIO BIOGRAPHIES—15

By RUTH MASCHWITZ

Tommy Handley

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

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

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

Tommy Handley is here seen with his wife.

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

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

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

Norman Long

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

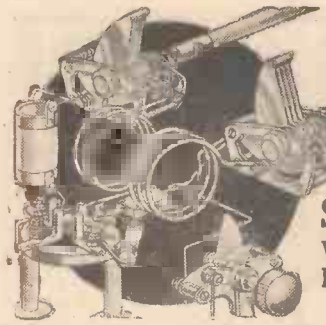
"A dog, a fire, and a radio" is Norman Long's idea of a happy evening at home. The set is the new Ekco Model 37.

"What's the matter?" asked Norman.

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

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

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



Short Wave Section

SHORT-WAVE RECEIVER TROUBLES

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

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

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

Extending the Tuning Range

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

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

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

H.F. Choking Problems

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

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

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

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

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

Resonance

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

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

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

Aerial Pointers

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

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

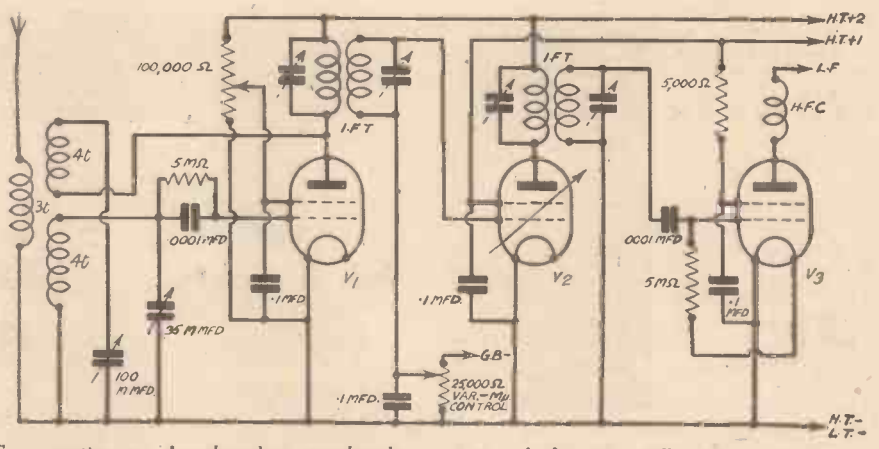
A long aerial for top-band reception is sound practice; that is, an aerial specially designed for the purpose. On the other hand, few have the necessary space available, or for that matter wish to specialise. We must, therefore, view the subject from the point of view of aerials of average length, such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

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

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

Aerial Coupling

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



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

A lot depends upon the receiver as to the most satisfactory method to adopt, nevertheless, aerial coupling is an important factor on all bands, and it is advisable to strike a happy medium for 16 metres to 94 metres reception in the interests of calibration, and fit additional aerial input terminals for reception on the top bands. The same applies in the case of reception below 16 metres down to 5 metres.

Parallel-fed Transformers

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

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

Take, for example, the parallel-feed

(Continued on facing page)

SHORT-WAVE SECTION

(Continued from previous page)

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

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

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

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

RADIO CLUBS AND SOCIETIES

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

Wirral Amateur Transmitting and Short-wave Club

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

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

Thames Estuary Radio Society

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

Leicester Amateur Radio Society

THE summer programme of this society is as follows:

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

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

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

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

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

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

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

REPLIES IN BRIEF

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

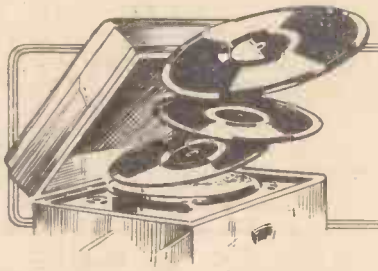
TRANSMITTING TOPICS

(Continued from page 422)

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

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

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



Impressions on the Wax

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

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

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

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

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

Decca

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

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

Brunswick

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

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

The Aldershot Tattoo

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

Swing Music

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

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

From the Films

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

Letters from Readers

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

Signal Surges

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

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

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

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

Heard on Our Simplest Short-waver

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

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

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

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

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

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

Station VK3LR

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

Transmissions from Kuala Lumpur

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

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

CUT THIS OUT EACH WEEK

Do you know

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

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

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

Leaves from a Short-wave Log

A Call from Panama

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

Flying Doctors on the Air

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

A New Peruvian

Lima, OAX4Z (or J ?) is now on 49.24 m. (6.092 mc/s) with a power of 2 kilowatts, and relays the programme of the medium-wave studio, OAX41. The call heard is: *This is the National Broadcasting station of Peru, at Lima (South America).* Address given: Radio Internacional, S.A., Avenida Abançay, 915, Lima (Peru).

Latest Advertised Schedule of CRCX

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

GST Daventry

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

The Voice of Dominica

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

Radio Philco, Saigon

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

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are drawn full size.

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

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

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

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

PRACTICAL WIRELESS

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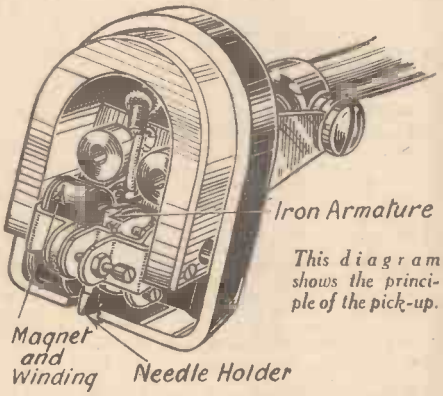
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

How a Pick-up Works

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

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



This diagram shows the principle of the pick-up.

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

H.F. Chokes

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

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

Parvo Frame Aerial

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

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

RULES

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

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

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

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

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

Blue Glow

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

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

Open Grid Circuit

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

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

Television Invention

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

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

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

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Surplus, Clearance or Secondhand, etc.

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Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

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

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TUBULAR CONDENSERS, non-inductive all values up to 5 mfd., 6d. each. 1 Watt Resistors, 6d. 4 Watts, 1/-.

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MISCELLANEOUS

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"THE OUTLINE OF WIRELESS," by Ralph Stranger. Fifth edition, 8s. 6d. net.—This book, which covers the subject from A to Z, is to be recommended to all who desire to master the theory of Modern Wireless. At all Booksellers and Newsagents.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

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EVERYMAN'S WIRELESS BOOK, by F. J. Camm, 3s. 6d. net. An invaluable book of reference explaining the operation, upkeep and overhaul of all types of wireless receiver. 200 illustrations. From all Booksellers and Newsagents.—George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

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

PRACTICAL AND AMATEUR WIRELESS, 17/7/37.

ADVERTISEMENT INDEX

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12 Sranwell

AERIALS FOR FLAT DWELLERS—See page 435.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 10. No. 253. July 24th, 1937.

Making Complete Data!

SHORT-WAVE Coils

MAKING THE MOST OF A MILLIAMMETER

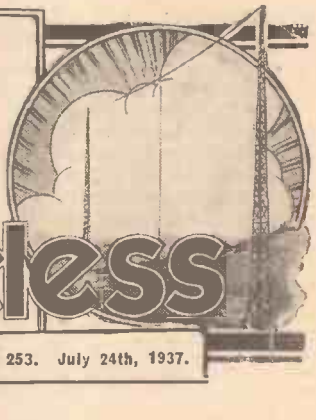
See Page 446.

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. X. No. 253. July 24th, 1937.



ROUND *the* WORLD *of* WIRELESS

Short-wave Coils

TUNING on the short-wave bands is not quite the simple problem that it is on the normal medium or long-wave broadcast bands, and a much higher degree of efficiency is necessitated due to the high frequencies which are dealt with. Furthermore, the tuning condenser must be of such a size that tuning is not rendered too critical and thus each tuning coil will only cover a very small portion of the available short wavelengths. We are therefore forced to adopt separate coils in order to cover a wide range of frequencies and in most cases it is not desirable to employ a multi-wave coil with wavechange switching for this purpose. The keen experimenter will provide himself with a wide range of plug-in coils of various types so that different circuits may be tried out and so that the maximum performance may be obtained on each waveband. On page 450 we give some of the most complete short-wave coil data which has yet been published, and it should be possible from this to build a very comprehensive range of coils for any desired wavelength. The table should be cut out and pasted on a card to be hung in a prominent position over the work-bench or in the wireless den. Circuit connections may, of course, be arranged according to the particular receiver which is to be employed.

Northern National Show

THE dates of the Northern Radio Exhibition have now been fixed and this particular event will be held from Tuesday, September 14th to Saturday, September 25th inclusive. The venue will be the City Hall, Deansgate, Manchester, and it has been agreed that only British-made goods shall be exhibited. The exhibition has been approved under Clause C of the new exhibition regulations of the Radio Manufacturers' Association.

Television Irregularities

IT is stated that the present television broadcasts are not sufficiently consistent to enable them to be received by a mechanical-optical system which has been developed in this country, and until the transmitter is made to run consistently receivers made under this system cannot be placed upon the market. It is proposed to draw the Television Advisory Committee's attention to this matter in order that the necessary steps may be taken to enable these receivers to be produced for public use.

Music for the Week

COMMENCING on Monday next the B.B.C. Symphony Orchestra (Section C) will be conducted by five different British conductors—Julian Clifford, Leslie Heward, Constant Lambert, Joseph Lewis and Frank Bridge. Under Julian Clifford the orchestra will play Schumann's Second Symphony on July 25th (Regional); on July 28th (National) Leslie Heward will conduct Arthur Bliss's "Serenade" for Baritone and Orchestra with Roy Henderson as soloist; on July 29th, also in the National, Constant Lambert's programme will include a "Concertino" for Trumpet and Strings by Riisager and "Five Saudades," by Darius Milhaud; on July 30th (National) Eric Coates's Suite "Springtime" will be played under Joseph Lewis, and in the National programme on July 31st Frank Bridge will conduct Delius's "On Hearing the first Cuckoo in Spring."

ON OTHER PAGES.

New Rome Station

THE Italian broadcast station at Santa Palomba, off Prato Smeraldo, near Rome, should be heard on the air very shortly. It was recently inspected by the Minister for Popular Culture and it is claimed that this will be one of the most powerful stations in the world. No details are yet available concerning the wavelengths to be adopted.

"When You and I Were Dancing"

MEETING in a restaurant for the first time for many years, two people talk of the dance tunes that were "the rage" when they last saw each other—tunes that rekindle memories of the times. Music and dialogue will be based on their conservation in the programme "When You and I Were Dancing," to be broadcast on the Regional wavelength on July 23rd. It will be the third of its kind and production will be by Douglas Moodie. Leslie Baily is writing the dialogue and Dave Frost and his band, during the half-hour of the broadcast, will play, non-stop, thirteen or fourteen dance tunes of the past.

Baseball Commentary

THE first baseball commentary which has ever been attempted in the Welsh Region will be broadcast on July 27th, when a descriptive commentary will be given of the match between Cardiff and Grange Albions from Cardiff Arms Park.

Children's Concert Party

IN the Northern programme on July 27th a Children's Radio Concert Party will be broadcast. The artists include a blind boy, Denis Rawlinson, who will be the pianist. Another member of the party is a 14-year old accordian player, Tom Cheetham, who although only of "page boy size" is a steelworks' employee. This programme is another "Gingham Embrella" feature.

Scottish Motor-cycle Speed Championships

ON July 31st Alexander Bruce will be at West Sands, St. Andrews, to give a running commentary on the Motor-cycle Open Championships. This item will be broadcast in the Scottish programme, but later in the day a recorded extract from the commentary will be broadcast from London.

ROUND the WORLD of WIRELESS (Continued)

"Show of Shows"

ON July 26th "Show of Shows, 1937 Edition," presented by Gerald Palmer and Caspar Middleton, will be broadcast from the Knightstone Pavilion, Weston-super-Mare. The cast will include: Peggy Ford-Carrington (the New Zealand soprano); Michael Ivan (Russian tenor); Marion Dawson (the indescribable comedienne); Billy Bernhart and Partner (comedians); Isna Roselli and her Six Girls; and Hal Moss's Mayfair Broadcasters, augmented by Al Lever's Winter Gardens Band.

"Men and Matters"

SIR ALEXANDER GIBB, G.B.E., a distinguished engineer, will contribute to the series entitled "Men and Matters" on July 22nd. Sir Alexander has a long record of public service and is the author of "The Story of Telford," and "The Rise of Civil Engineering."

Orchestral Concert

ERIC WARR will conduct the B.B.C. Midland Orchestra in an evening programme for National on July 27th. Included in it will be Mendelssohn's D minor pianoforte concerto, which was first performed in Birmingham Town Hall, in 1837, with the composer at the piano. Weber's "Euryanthe" overture will also be given. Sir George Smart, who conducted at the Birmingham Festival 100 years ago, and also at the Exeter Hall, when "St. Paul" was given before Mendelssohn, was a close friend of Weber; it was at his house that Weber died, and he organised the Dresden memorial to this composer. The pianist for the D Minor concerto will be Arthur Roberts.

New Staff Training Director

WE are informed that Mr. S. D. Spicer has been appointed Staff Training Director as from October 4th next in succession to Mr. G. C. Beadle, who becomes West of England Regional Director. Mr. Spicer was educated at Clifton College, the Royal Naval Staff College, and the Staff College, Camberley. He entered the Royal Navy in 1904 and after twenty-nine years' service, retired with the rank of Captain. He joined the Talks Department of the B.B.C. in May, 1935.

INTERESTING and TOPICAL NEWS and NOTES

Tuning in a programme on the new 8 guinea Ferranti Superhet, model 837.

Royal Marines Band

ALFRED SALTER (baritone) will be the vocalist in a concert by the Band of His Majesty's Royal Marines, Plymouth Division (by permission of Brigadier H. G. Grant), conducted by Captain F. J. Ricketts, Director of Music, Royal Marines, to be broadcast from the Abbey Hall, Plymouth, on July 29th. In a concert by the band on July 31st, the vocalist will be Victor Hunt (tenor).

W. T. Forse, Controller of "His Master's Voice" factories, showing the Prime Minister of New Zealand, the Rt. Hon. Mr. M. J. Savage, one of the "His Master's Voice" all-world radiograms, when the Premier inspected the "H.M.V." factories recently.

Women in Waltzes

CONTINUING their selections of waltzes played in strict tempo, Jimmy Ross and Bill Thomson will present a second edition of "Women in Waltzes," on July 29th, from Aberdeen. They play on two pianos, and they will draw upon such pieces as "The Quaker Girl" and "The Maid of the Mountains" for their programme.

Concert from Torquay

SYLVIA BRENDT (contralto) will be the vocalist at a concert by the Torquay Municipal Orchestra, conducted by Ernest W. Goss, from the Pavilion, Torquay, on July 27th.

Western Cabaret

WESTERN Cabaret from the Royal Bath Hotel Ballroom, Bournemouth, on July 29th, will include: the Carlyle Cousins in Close Harmony; Beryl Orde (impressionist); and dancing to Harry Roy's "Lyricals," with Jack Harris, directed by Maurice Kasket.

English Dance Bands in Scotland

TWO well-known dance bands from the south will be in Scotland this week, and will broadcast from Scottish stations. The first is Roy Fox's, which may be heard from Edinburgh on July 27th, and the second Joe Loss's, which will play at Glasgow on July 28th.

Alhambra Revels

HALF an hour's Alhambra Revels will be broadcast from the Alhambra Theatre, Glasgow, on July 22nd. This up-to-the-minute summer-time show has a strong cast. It includes Hugh Rene, the new style comedian; Marion Dawson; Gladys Holmes; Webster Gibson; Rene Esler; Victor King; Lewis Barber and Marjorie Stevens; The 12 Alhambra Young Ladies; and Benny Loban and his Band. It is produced by Vivian Palmer.

The Second Test Match

FROM Lancashire's famous cricket headquarters, Old Trafford, Manchester, Mr. P. G. H. Fender will at various times during the second Test against New Zealand on July 24th, 26th, and 27th broadcast commentaries on the play for listeners to the National programme.

SOLVE THIS!

PROBLEM No. 253

Martyn moved from a district having a D.C. mains supply to one supplied with A.C. Unfortuuately, his set (a four-valve table model superhet using .2 amp. valves) was designed for operation from D.C. only. What would be the cheapest way for him to convert his receiver for A.C. operation? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 253 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, July 26th, 1937.

Solution to Problem No. 252

The smoothing condenser in Howard's receiver had developed an internal short-circuit.

The following three readers successfully solved Problem No. 251, and books are accordingly being forwarded to them: L. Knight, 16, Common View, Letchworth, Herts; E. J. Hiscock, 3a, St. Aubyns, Hove, 3, Sussex; F. Edgson, 11, Steyne Road, Acton, W.3.

Aerials for Flat Dwellers

There is a Wide Range of Indoor and Outdoor Aerials which are Available for Those Listeners who Have No Access to a Garden. Some Suggestions are Given in This Article.

By W. J. DELANEY

MANY listeners are under the impression that because they reside in a flat or in a building which has no garden at the rear, they are debarred from obtaining the same enjoyment from the radio as may be obtained by those with such facilities. This is by no means the case and the aerials mentioned in the following notes may be employed by such listeners and will in many cases provide as good reception as may be obtained with an orthodox outdoor aerial. In fact it may safely be said that in many cases those who

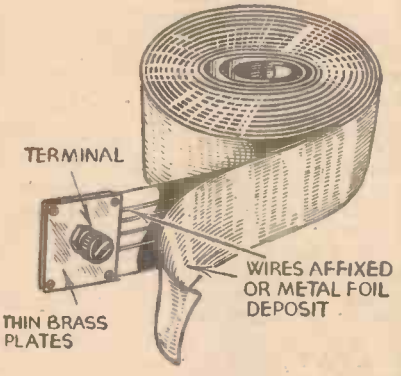


Fig. 1.—The invisible type of adhesive aerial, of which the "Pix" is a good example.

are already using an outdoor aerial may find that a well-designed aerial of one of the types to be described may provide better results than are obtainable under the present conditions. As an instance of this I may mention my own case, where I originally erected a 60ft. outdoor aerial supported horizontally at roof level from the house to the end of the garden. The ground at that part rises to a roadway which is practically level with the roof, and the entire bank is thickly planted with tall trees. The screening effect of this bank and trees is bad, but a "No-Mast" aerial erected on a chimney stack gives far superior results, not only from the direction in which the bank lies, but from all parts.

Indoor Aerials

When it is desired to erect the aerial inside the house there are many arrangements which may be adopted. If a loft is available, of course, a wire may be suspended from the roof rafters, and the ordinary insulated hooks used by electricians may be used as suspension points. In the majority of cases, however, it may safely be said that the aerial should not be turned back upon itself. Although this may mean that a very short aerial has to be employed, this will generally prove more efficient than a wire run backwards and forwards across the roof. If adjacent turns of the wire can be separated by more than 3ft., however, a cross formation may be employed. When bringing the end of the aerial down to the receiver an important point to watch is that it does not run in proximity to electric cables, gas or water pipes. These will act as shields and result in signal loss, and again a minimum of 3ft. separation should be aimed at. If it is impossible to obtain this distance and the wire has to run closer, endeavour to make a right-angle crossing, even although this means that a wire must run be in zig-zag formation to the receiver.

When the aerial has to be erected in the room in which the receiver is situated, a wall aerial must be employed. The most effective arrangement is a length of stranded wire (heavy single flex) suspended at least 1ft. from the walls by means of insulated distance pieces, although it may be laid along a picture rail. When it is spaced from the wall, however, it will not only result in higher efficiency, but it will also ensure that no losses are introduced from absorption by gas or water pipes, or lead-covered electric supply wires inside the wall.

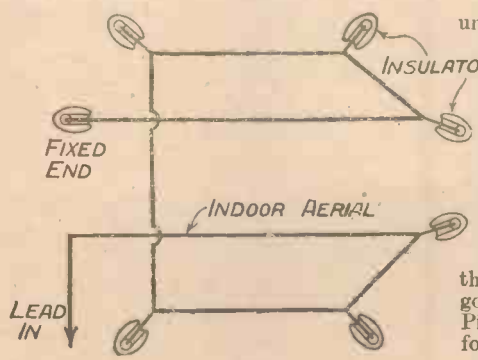


Fig. 2.—When erecting an aerial in a loft, adopt this arrangement in order to accommodate a lot of wire in a small area.

Invisible Aerials

A drawback to this type of aerial is its unsightliness, and one of the invisible types of aerial may therefore be desirable, especially if a powerful set is in use to make up for the slight loss of efficiency. The invisible type of aerial consists of a wide paper strip, gummed on one side and either incorporating a layer of thin copper wires or being coated with a metallic deposit. In the former case a further layer of coloured paper is fixed over the wires and thus it is possible to obtain a colour to match the wallpaper or internal decoration. A very good example of this type of aerial is the Pix, which may be obtained in two lengths for 2s. or 3s. 6d.

Another type of aerial which often gives good results consists of a sheet of metal or metal foil arranged in some convenient manner above the actual receiver. One way of accommodating this is to attach it to the back of a large picture, or if suitable contact can be made the silvered surface of a mirror may be employed in a similar manner. In a large radiogram or similar type of cabinet, the inside of the lid may be covered with a sheet of foil for this purpose, copper or aluminium being employed for these types of aerial.

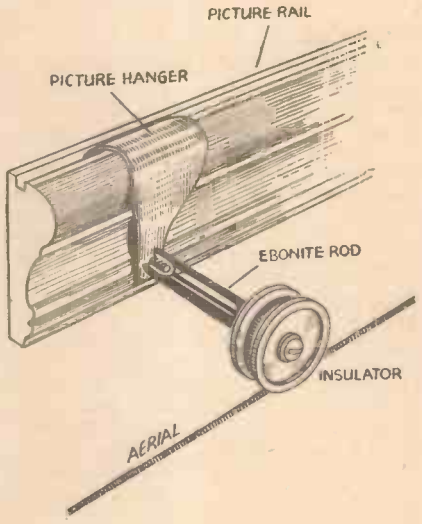


Fig. 3.—An aerial may be suspended from a picture rail by means of this device.

Outdoor Aerials

It must not be assumed, however, that the flat-dweller is restricted to an indoor type of aerial. There are many types of outdoor aerial which can often be employed with more satisfactory results than may be obtained with an indoor arrangement. For instance, the brush or "No-Mast" aerial previously mentioned may be fitted to the side wall of the house, although it is rather important that the highest part of the house be used for the purpose. If, therefore, you reside in the lower part of

(*Continued at foot of next page*)

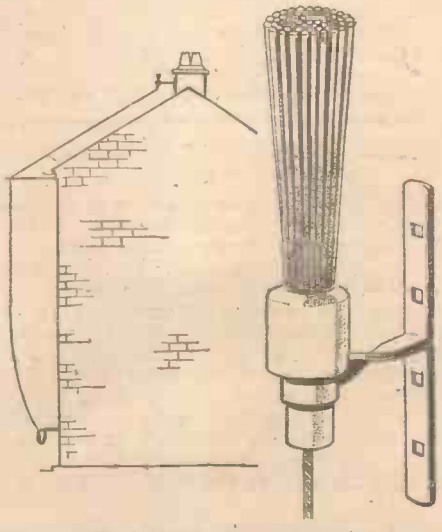


Fig. 4.—The "No-Mast" aerial which is highly successful when garden facilities are not available.

A New Range of Valves

Kinkless Tetrodes for the Output Stage

IN January, 1935, Marconiphone announced the N.40, an entirely new patented form of tetrode output valve offering certain advantages over pentode construction.

During the past two years development has continued, and to-day Marconiphone announce the release of the first four items in a range of tetrode output valves. In order to refresh readers' memories, it may be useful to review briefly the theory involved :—

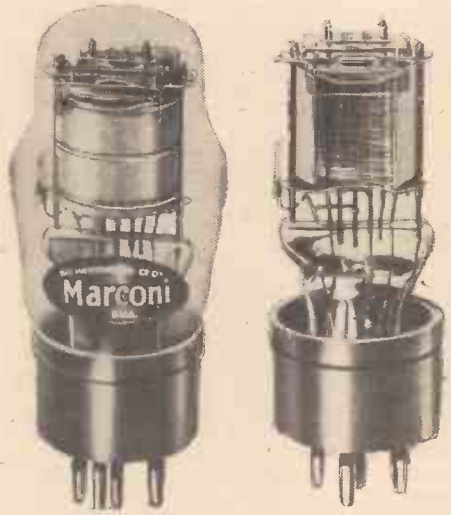
Principle of the Pentode

If we take a triode of suitable construction and insert an additional grid between the original grid and the anode, we obtain a form of tetrode or "screen grid" valve, which possesses a high magnification factor and can be made to function as an output valve by correct adjustment of electrode potentials. There is, however, one serious limitation, due to the fact that as the anode potential approaches that of the screen grid, a sharp drop in anode current occurs, giving the familiar "kink" in the curves.

This phenomenon is due to the following cause : Electrons, arriving at the anode at high velocity, break up atoms of the metal and cause a cloud of secondary electrons to be shot off into the surrounding space. As long as the anode potential is sufficiently above that of any adjacent electrode it will draw back this secondary emission, but if the screen potential is comparable, it will exert such force as to attract a proportion of the secondary electrons and so cause a drop in the net electron stream in the anode circuit. The resultant curve has a "knee" at a point which seriously restricts the anode voltage swing obtainable without distortion, and so limits the output which the valve can give.

The "pentode" is a tetrode with an additional grid between the screen grid and the anode. This grid is connected to the cathode, and is thus sufficiently negative with respect to the anode to ensure that the latter's secondary emission is substantially returned intact to its source. The "kink" is thus removed and the "knee" of the curves moved back towards the zero anode volts line, so extending the available undistorted anode voltage swing.

In Marconi tetrodes the restriction of the secondary electrons is brought about by making use of the "space charge" of electrons which always exists, consisting of electrons in transit from the cathode to the anode. These, if allowed to do so, will form a negative charge between the screen and the anode, and, possessing a negative charge, will tend to repel the secondaries which are produced at the anode and prevent their return to other electrodes. Owing to the presence of the wires which support the grid and screen, additional electrodes are added to restrain the charge and keep it of the right size and shape to bring about the required suppression.



General view and the electrode assembly of the KT type valves.

The types released are as follows :—
Type KT2 replaces PT2, 11s.
Type KT42 replaces N42, 13s. 6d.
Type KT63, 13s. 6d.
Type KT66, 25s.

It is intended that all future Marconi output valves apart from triodes should employ the new patented form of construction and give all the advantages of this design. Announcements regarding the change over of present types of pentodes N41, MPT4, etc., will be made from time to time.

Replacements

Exhaustive tests have conclusively established that the new series of KT valves will satisfactorily replace the existing pentode valves in sets already on the market. Additionally, new receivers will be able to take full advantage of the improvement offered by the KT series, as the slight changes in load, etc., will easily be incorporated in their design.

Other Makes

Several new valves have also recently been released by other manufacturers, and details of the Cossor and Osram valves are as follows :—

COSSOR

Type 220 OT

This is a tetrode for use in the output stage of a battery-operated receiver. Its characteristics and function are similar to those of the 220 HPT, but it has the advantage of a lower grid-anode capacity, thus reducing attenuation of the higher audio frequencies. The filament is rated at 2 volts .2 amps and it is designed for a maximum H.T. (anode and auxiliary grid) of 150 volts. A five-pin base is fitted.

Type 42 OT

This is a similar type of valve, designed for a similar purpose in a mains-operated receiver and accordingly it has a 4 volt 2 amp. heater. The maximum H.T. for anode and auxiliary grid is 250 volts. This valve has a 7-pin base.

Type 202 STH

This is a universal I.-H. triode-hexode valve for use as frequency changer in D.C. or Universal Mains superhet receivers. It incorporates a triode and hexode as separate sections and is thus highly suitable for use in short-wave or all-wave receivers. The heater is rated at 20 volts .2 amps. and maximum anode voltage is 250. The oscillator anode voltage is 100 and a similar voltage is required for the modulator screen. A 7-pin base is fitted.

OSRAM

Type KT2

This is a 2-volt tetrode and embodies similar characteristics to those found in the type N40 output valve. A special form of construction is employed restricting the secondary electrons by making use of the "space charge." Owing to the presence of the wires which support the grid and screen, additional electrodes are added to restrain the charge and keep it of the right size and shape to bring about the required suppression. The essential details are similar to those given in the Marconiphone range.

Type KT42

This is a similar type of valve for A.C. mains receivers and will replace the existing N42 output pentode.

It is stated that from time to time similar output tetrodes will be introduced to replace the existing output pentode valves in other types. Tests already made show that the KT type of valve may satisfactorily replace the existing pentode in existing receivers, as already mentioned.

AERIALS FOR FLAT DWELLERS

(Continued from previous page)

the building it may be necessary to obtain permission from the residents above you to enable you to fix the aerial at a convenient point outside their window. If this is not possible, however, it should be placed as high as possible above the ground. Practically any of the multi-wire types of single aerial may be employed in a similar manner, and there are several patterns on the market from which to make a selection.

Another scheme is to erect a short metal pole outside the window, again making use of the rule mentioned for an indoor aerial, namely to keep as far from the wall as possible. Lengths of copper rod may be obtained in various diameters and may be fitted one inside the other (after the manner of a fishing rod) to obtain height without undue weight, and the leading-in wire should be soldered to the lower section. In this connection it should be remembered that a useful device is the Philco aerial which is made to suspend out of the window, and the accompanying illustration shows how this is fixed to the window frame.

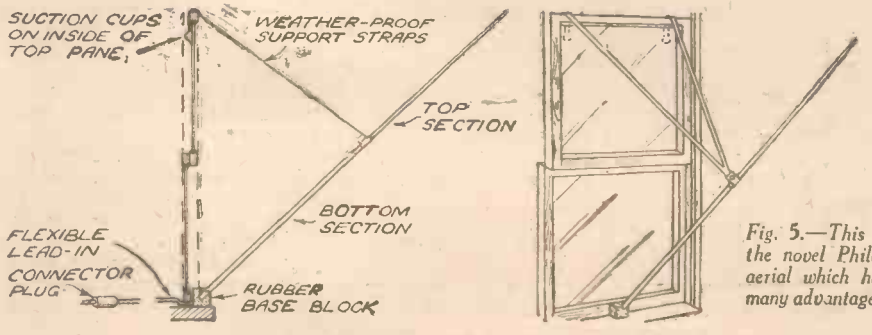


Fig. 5.—This is the novel Philco aerial which has many advantages.

Constructional Details of "Practical Wireless" Receivers—10

A Popular Four-valve A.C. Receiver with Push-pull Output Stage, and Known as the A.C. Hall-Mark, is the Subject of this Article

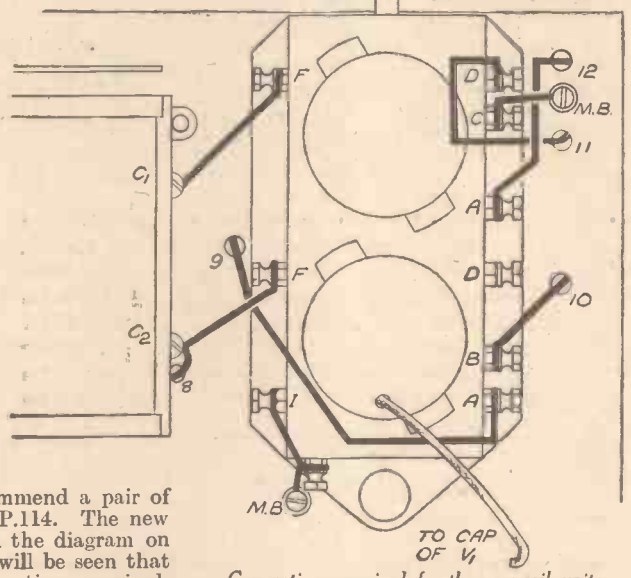
FOR good quality signals on the local station, with a fair sprinkling of distant stations at good quality on the loudspeaker, a receiver employing a single H.F. stage with a push-pull output stage is hard to beat. Such a receiver is the A.C. Hall-Mark, and as will be seen from the circuit diagram below, this receiver follows standard practice, and as such will give little difficulty either from the construction or operation point of view. The H.F. valve is a variable-mu pentode giving high gain and good stability, whilst a triode valve is employed for the detector. The H.T. supply is obtained from a metal rectifier, and in this particular receiver the maximum current is somewhat below the maximum rating of the rectifier. Consequently, there is a slight voltage rise and this enables us to employ a speaker field for smoothing purposes so as to ensure that the receiver will be hum-free in operation.

L.F. Instability

A trouble which is often experienced when using a push-pull stage is L.F. instability. There are several methods of overcoming this trouble, one of the easiest being the use of a split secondary push-pull, input transformer. This enables an adjustable bias to be provided for each valve in conjunction with a split or separate filament winding on the mains transformer. However, in this receiver, we use indirectly-heated output triodes, and an ordinary centre-tapped input transformer, and, therefore, other methods are suggested in the event of this form of instability being experienced. It will be noted in the theoretical circuit that two fixed condensers are shown in broken lines across the secondary winding, one condenser being included across each half of the winding. The capacity of these condensers should be about .0001 mfd., although the exact values may have to be found by trial. They affect the quality of reproduction and give a deep tone to signals, so that if it is found that they are not desirable in certain individual cases an alternative scheme may be adopted to prevent the trouble. This is the inclusion of a fixed resistance between the centre-tap of the transformer and earth. The position is indicated by a cross in the theoretical circuit, and the value of the resistance may be between 20,000 and 50,000 ohms.

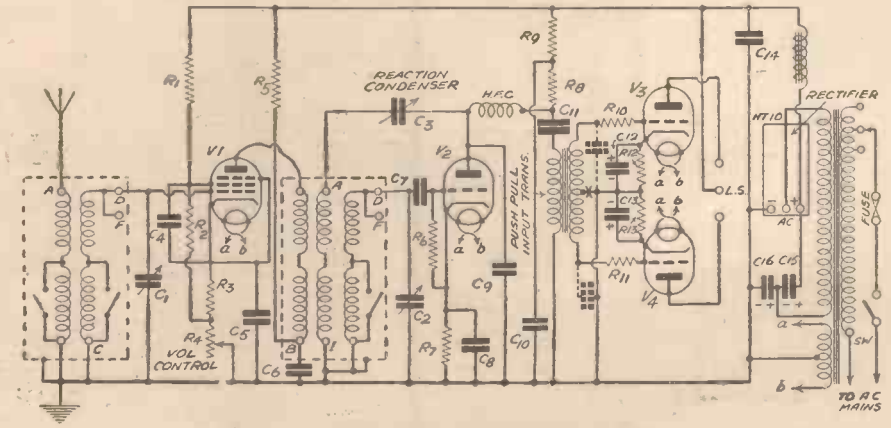
New Coils

The coils originally specified for this receiver are not now obtainable, and in substitution we now recommend a pair of Varley coils, type No. BP.114. The new connections are shown on the diagram on the right, from which it will be seen that there is very little alteration required. Terminals D and F on the coil unit are common, and thus connections are simplified in the case of the aerial coil. Remember that for best results the earth-return connections, shown as points M.B., must be efficiently made, and although a bare wire may be clamped beneath a screw or bolt, it is worth bearing in mind that the return path to the actual earth terminal is made *via* the metallised surface of the chassis. Therefore, this must be kept scrupulously clean during the work of assembly and the surface should not be fractured. In case of any doubt all points marked M.B. on the blueprint may be linked together by means of heavy gauge bare wire, either soldered to the bolts or clamped in the usual way. The resistors used in the original receiver are not now obtainable, but any good standard 1 watt resistor may be used and we therefore now specify standard Dubilier resistances. The full-size blueprint gives all the essential details and should be used in conjunction with the above diagram.



Connections required for the new coil unit Varley B.P. 114.

BLUEPRINT No. P.W. 45



Theoretical circuit of the A.C. Hall-Mark Four.

LIST OF COMPONENTS.

One A.C. Hall-Mark Four console cabinet. (Peto-Scott).
One Metaplex chassis, 12½in. by 12in., with 3½in. runners. (Peto-Scott).
One 2-gang variable condenser, complete with drive (Formo).
One reaction condenser, .00015 mfd. (Polar).
One two-gang coil unit, Type BP.114 (Varley).
One input push-pull transformer, Type DP.36 (Varley).
Twelve 1 watt fixed resistors: 50,000 ohms, 30,000 ohms, 25,000 ohms, 10,000 ohms, 10,000 ohms, 750 ohms, 250 ohms, 350 ohms, 350 ohms, .5 megohms, 20,000 ohms and 2,000 ohms (Dubilier).
Three tubular fixed condensers, .1 mfd., .1 mfd. (type 4403), .5 mfd. (type 4406) (Dubilier).
Two fixed condensers, 1 mfd., 2 mfd., type BB. (Dubilier).
Three electrolytic condensers, 25 mfd., 25-volt working (type 3046) (Dubilier).
Two electrolytic condensers, 8 mfd., 500 volt working (type 0218) (Dubilier).
One fixed condenser, 4 mfd., 500 volt working (type LC) (Dubilier).
One screened H.F. choke, HFPJ (Wearite).
One QMB on-off switch, type S.80 (Bulgin).
One 10-way group board (Bulgin).
One 2,000-ohm potentiometer, type VC.26 (Bulgin).
One mains transformer (B.T.S.).
One H.T. 10 metal rectifier (Westinghouse).
One .5 amp fuse and holder (Microfuse).
One twin-socket strip, with plugs marked A and E (Belling-Lee).
Four valves, MVS Pen, 41MHL, 41MP and 41MP (Cossor).
One mains-energised loudspeaker, type (P. W.) (W.B.).
Two component brackets (Peto-Scott).
Four chassis-mounting valveholders, one 7-pin, three 5-pin (Clix).

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THE EXPERIMENTERS DISCUSS CIRCUITS

This Week Our Popular Contributors Forsake Their Usual Constructional Articles and Deal Generally With an Ever-Popular Subject

by The Experimenters

WE wish to make our first task that of thanking those many readers who have been good enough to write to us during the past few weeks. Some of our friends have had queries, and these have been replied to by post in the usual manner. Others have simply written to wish us well, to make suggestions or to ask for articles on various subjects. Every one of these letters is appreciated, and if there are any to which we have not replied through the post—because no inquiry was involved—we take this opportunity of saying "thank you!"

"S.G., G.B.B., Crystal and The Lad"

It was rather peculiar that, on the day before our article in the issue dated July 10th went to press, we received an interesting letter from a gentleman who addressed us as "S.G., G.B.B., Crystal and The Lad;" and went on to say that he hoped he had got the names right. What if he hadn't; what's in a name, anyway? At least, we felt that we had become known to this reader sufficiently well for him to be able to obtain some idea of the different characters of our select band. However, the point we wished to raise was that this particular reader's suggestion was that we should prepare an article dealing with the question of obtaining high-tension current from the low-tension battery. We make no claim to being thought-readers, but we had apparently anticipated his requirements, and hope that what we wrote in the two preceding issues provided all the information which our reader required.

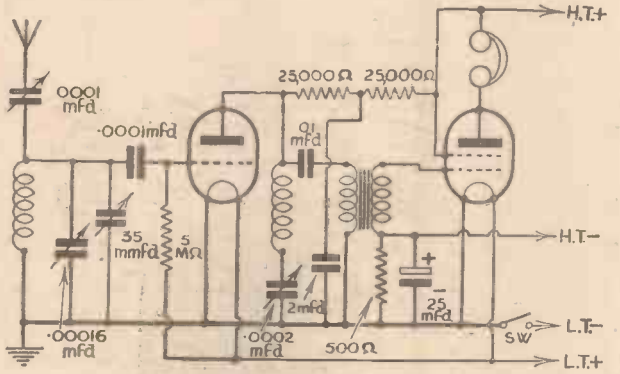


Fig. 1.—The two valve S.W. circuit sent by a reader, G6KR.

A Two-valve Short-waver

Another letter of more than usual interest from amateur transmitter G6KR was handed to us on the morning of writing this. G6KR, of Shrewsbury, tells us that he has for some time been using a two-valve short-wave receiver having a circuit almost identical with that which we recently described, with very satisfactory results. He tells us that on the 20- and 40-metre bands all continents "and, in fact, nearly all countries, have been heard during the past 12 months." Our correspondent also mentions that 10-metre signals have been logged, and that oscillation continues down to 6 or 7 metres. He uses a Hivac D210 as detector, followed by a Hivac-Harries pentode. Continuing his description of the set, G6KR writes: "The receiver is built into a chassis of aluminium, and is very compact. The front panel is 7in. by 5in., the chassis being 5in. from the back to front, and 2in. deep."

This reader was kind enough to send a circuit of his receiver, which we reproduce in slightly-amended form in Fig. 1. The only alterations we have made concern the addition of suitable component values, and the inclusion of a switch in the L.T.-lead. We have done this because the diagram as sent was not marked to show the most suitable values, and our reader found it unnecessary to use a switch; probably he employed a mains H.T. unit with trickle charger. He offered to send one or two photographs of the set as he made it, and we hope to reproduce these when they arrive, if they are suitable. We must emphasise that the component values which we have shown are our own, and they might differ slightly from those employed by G6KR. In any case, the values are those which we have found most suitable in the course of our numerous short-wave experiments.

It will be seen from Fig. 1 that band-spread tuning is employed, the two condensers having values of .00016 mfd. and 35 m.mfd.; these values are not critical, but reliable S.W. condensers should be used. Any good, standard short-wave coil unit, with reaction winding, can be used, and most readers will have their pet ideas on this subject.

Radio Philandering

We seem to have been trespassing to a certain extent on the province of the Short-Wave Section, but we simply had to pass on the remarks of our correspondent. The circuit question, however, leads us to a subject in which we are all deeply interested. Every keen amateur at one time or another takes delight in drawing circuits on odd pieces of paper. In fact, the "disease" is just as bad as the habit of the love-sick swain who is reputed to spend too large a proportion of his time in writing odes and scraps of verse to his loved one. And just as his efforts often fail to be posted, so do the circuits of the wireless-sick enthusiast fail to be interpreted in terms of coils and condensers.

The habit of sketching out odd bits of circuits is a good one, if only because it teaches the "artist" to think in terms of circuit symbols, so that he is better able to "weigh-up" any circuit which he comes across. We recommend those who have not yet succumbed to the craze to give it a trial. But, whenever possible, it is wise to go a little further by building sets around the circuits and carefully observing the results which they provide.

Understanding Circuits

To those who are not yet accustomed to thinking of circuits as realities we make a few suggestions. The first is that the circuit should not be studied as a whole until a little experience has been gained. Look at the various sections, and analyse each in turn. There is the tuning circuit, detector circuit, high-tension circuit, low-tension circuit, reaction circuit and so on. Start then by drawing the theoretical diagram for a simple crystal circuit, such as that shown in Fig. 2. Here you can see the tuning circuit, consisting of a coil and a variable condenser. Then there is the aerial circuit, which in this instance consists of a separate coil of wire placed near to the tuning coil and connected to the aerial and earth leads. Next is the detector circuit, comprising the crystal detector; it is connected between the two ends of the tuning circuit. Finally, there is a pair of 'phones connected across two terminals of a fixed H.F. by-pass condenser,

Building-up a Circuit

After you have got the hang of that ultra-simple arrangement you can try a single-valve circuit, such as that in Fig. 3. The tuning system remains unchanged, but instead of a crystal detector being wired across it there is a three-electrode valve with its own high- and low-tension systems. In this case the 'phones are joined in series

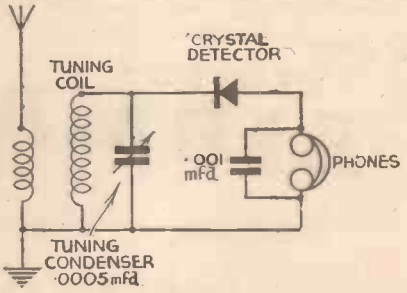


Fig. 2.—A simple crystal-receiver circuit which shows how a tuning circuit and a detector circuit can be combined.

(Continued overleaf)

THE EXPERIMENTERS DISCUSS CIRCUITS

(*Continued from previous page*)

between the anode of the valve and H.T.+. Actually, they are connected back to the "earth" end of the tuning coil, just as they are in the crystal circuit, although this is not immediately apparent. The connection is made through the high-tension supply.

To add reaction to the circuit it is necessary only to make the connections shown in broken lines in Fig. 3. First there is a reaction winding on the coil, this being placed near to the tuned winding. Then there is the reaction condenser in series with the reaction winding, and completing the connection to the "earth" line. Every valve circuit you can think of is built up in the manner we have outlined, so it is unnecessary to say any more on this particular subject. It is left to you to work out a few circuits for yourself. If you turn up a few back issues of PRACTICAL AND AMATEUR WIRELESS all manner of circuit arrangements will be found, and several of these should be copied—not traced—when it will soon be found that their full meanings become evident. Try out our suggestion!

The "Best" Circuit

Talking of circuits, we are often asked which is the best. At the risk of disappointing many readers we are compelled to reply that there isn't a best. Much depends upon the purpose for which the set is required, and still more upon the manner in which the circuit is used. That is, a perfectly good circuit can be completely spoiled by indiscriminate choice of components for use in it, or by careless arrangement of them. Besides, if the average beginner were to attempt to make a complicated superhet, for example, following a circuit which had been proved to be particularly efficient he would probably find that results were very unsatisfactory. On the other hand, if he were to choose the simplest type of three-valver he would be far more likely to build a set which would give complete satisfaction.

There is another interesting side to the question, which is that there is far more scope for the experimenter of little experience in improving on a set using a circuit that he fully understands than there is in "wrestling" with an advanced circuit involving a large number of "unknown quantities." Besides, it is often surprising to observe the extremely fine reception which can be obtained with a two- or three-valve receiver in the hands of a keen experimenter. This is probably more true when dealing with short waves than with broadcast reception, but it can be applied generally.

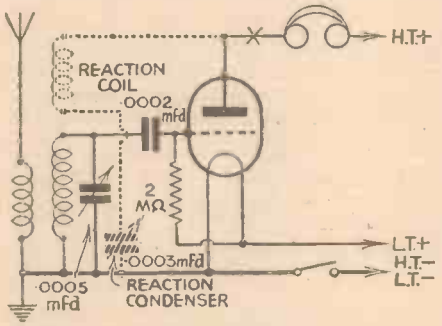


Fig. 3.—Circuit for a single valve set having a tuning system similar to that shown in Fig. 2. The reaction circuit is shown in broken lines. When using reaction it is generally desirable to insert an H.F. choke at the point marked X.

Experimental Progression

Our advice to all experimenters who are comparatively new to the hobby is to start with a simple receiver of their own design. Many will be able to build, in addition, a more advanced set from the constructional details regularly given in these pages, but that set should not be modified, for details are published only after exhaustive test to determine the most suitable constants. After the simple receiver has been completely mastered, the experimenter can gradually progress to more advanced designs, but he will find that much of the fun comes from producing those designs, building up on the foundation of earlier experiences. In this way the modest amateur can in time attain the status of an expert. And that status will prove invaluable whether the future aim is to be an experimenter purely and simply, or to enter the profession of radio engineering. Really good and sound designers and service engineers are always at a premium, and they can command a good salary!

Our article this week has tended to wander from point to point, but we hope that you have found it entertaining, if not particularly instructive. Don't forget to write to us if we can help you, or if there is any particular subject with which you would like us to deal. Our aim is to give our readers the material they require, and we can best do that if you tell us what you want.

July 24th, 1937 Vol. 3 No. 60

EXCLUDING TELEVISION STATIC

Various Means of Eliminating Interference Caused by Motor Vehicles, Electro-medical Apparatus, and Natural Atmospherics are Discussed in this Article. By G. V. COLLE

THE main cause of electrical static on a television programme, embracing both sound and vision, may be attributed to the ignition systems of motor vehicles. Through the loudspeaker it is heard as a burring or staccato noise of regular beat, but increasing and then dying down in intensity as the offending vehicle passes along the highway, close to and then away from the aerial system. On the screen it manifests itself as a mild snowstorm, sometimes causing drift in the synchronisation or even complete temporary wipe-out of the picture.

Another and, fortunately, less common form of interference is that due to electro-medical apparatus. Whereas the ignition static is rarely radiated more than 200yds., that due to medical apparatus, such as diathermy machines, X-ray, violet ray and similar appliances, creates complete wipe-out many miles from its source. It has been heard as much as 2,000 miles away!

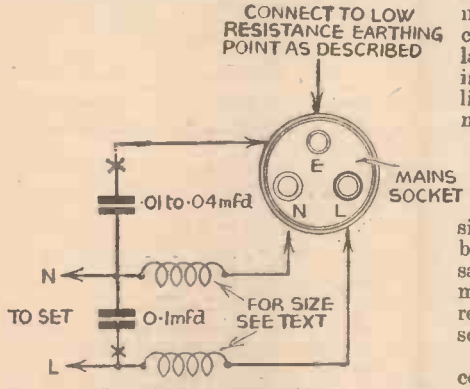


Fig. 1.—Connecting an H.F. filter to a 3-pin mains point.

Ignition Static

Electrical and natural atmospheric statics heard on medium and long wavelengths rarely affect the 6 to 7-metre band which is now used for television purposes in this country. On the other hand, it so happens that ignition static is at its greatest intensity between about 7 and 12 metres, due to the inherent inductance and capacity of magnetos and spark coils providing their natural resonances over those frequencies.

From the very outset it should be made clear that for both the cases cited, complete freedom from interference is a matter for legislation, by compelling all car owners, hospitals, and makers of home violet-ray outfits to silence, in a radio sense, the offending apparatus. Whereas such legislation will prove inevitable in course of time, it is desirable to be familiar with such devices as are available at present to reduce the static to bearable proportions. In other words, steps taken at the receiving end can only be considered palliatives, and not complete cures.

Most forms of dipole, doublets and double-doublet aerials are suitable for television reception and when erected directionally, that is, in optical relationship to the transmitter, will provide a large signal pick up with a relatively low static accompaniment. Under these conditions the aerial is not made noise-proof, but provides a high signal-to-noise ratio. Matters can be further improved by erecting the aerial as high as possible above surrounding objects and, additionally, keeping it as far from highways as space and circumstances will permit. A long lead-in, often necessitated, is no detriment, as by proper impedance matching its losses can be reduced to a negligible amount.

Aerial Screening

With a vertical television aerial, it is possible to screen it by means of a similar vertical wire half a wavelength away, or by a parabolic reflector consisting of a number of such wires spaced over half a circle of half a wavelength radius. The latter aerial, while somewhat cumbersome, is immune from static radiations except in a line corresponding to that of the transmitter (at the open end of the array).

To render all forms of television aerials most effective, particularly under the conditions outlined, the receiving equipment must be *completely* screened. Minute signal pick-up without the aerial must not be tolerated, a condition which can be satisfied by increasing the sensitivity to maximum without the aerial to see if reception can be achieved, and adding screens where found necessary.

Although in the usual way a good earthing connection is not essential with a dipole aerial system, yet it sometimes happens that another point of earthing will alleviate an obstinate case which does not otherwise yield to treatment. A direct earth connection by means of a very heavy insulated wire or copper strip, ½in. by 20 s.w.g., to a buried zinc plate or a copper tube about 3 to 4 inches in diameter will provide a low D.C. resistance path. Use preferably heavy bolted and soldered joints, finally taped or painted over (as if the installation is for an electrical sub-station).

Mains Filters

A mains filter must be looked upon as a necessity and should be introduced at the local power point used for the receiver. Those designed for normal broadcast reception are useless unless augmented by small H.F. chokes possessing high impedance at 6 to 7 metres, and capable of carrying the current passed by the equipment. Coils of about 10 turns or less, close wound, of No. 20 s.w.g. D.C.C. or D.S.C. wire wound on 1½in. diam. formers will provide a reliable starting-off point, provided they are used in conjunction with non-inductive 1,500 volt D.C. test condensers, in accordance with B.S.S. No. 613.

The object of this mains filter is to act as an efficient by-pass to mains-conducted interferences at low wavelengths. Due to the possibility that interferences may be existent at wavelengths above or below the television range, the chokes are made of larger inductance than 6-7 metres, to prevent shock excitation effects. By adding suitable capacity condensers, high-frequency interferences flowing along the mains wiring will be localised and returned to earth. A value of .1 mfd. across the A.C. mains leads and a value of between .01 and .04 mfd. between neutral and earth should prove the most effective (see Figs. 1 and 2).

Fuses

Fuses in series with the condensers are not essential, but if desired, can be introduced at the points marked X on Figs. 1 and 2. The type which is ¾in. long, capacity 2 amps each, is the most suitable. A small wood box can be used for mounting.

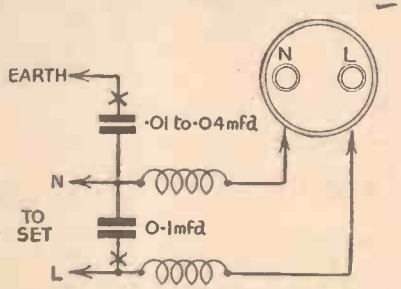


Fig. 2.—How to connect the filter to a 2-wire mains system. It is necessary to ascertain correct polarity by testing with a lamp between each pole and earth. The one which lights the lamp is "L" (live).

AN OLD CONTROVERSY

WHEN cathode-ray tubes were beginning to become fashionable as television picture reproducers, many stories gained ground concerning the deleterious effects produced on the eyes by rays said to be emitted from the screen surface. This idea was soon proved to be quite fallacious, however, but a somewhat similar situation is now arising because the medical world is making increased use of ultra-short waves for treatment of certain diseases. Diathermy apparatus is an outstanding example, and television's detractors are endeavouring to use this as an excuse for holding up television's development. The mere fact that medical equipment uses wavelengths in the same band-width as television is no criterion that the apparatus is similar. In point of fact they are quite different. The television receiver is an instrument of low power which detects the radiated ultra-short waves from the transmitting station, but apart from any oscillator leakage, which is confined to a very small area, there is no re-radiation of energy at all. In the case of the medical equipment, however, this is really a transmitter (as television receiver operators know only too well from the degree of interference they experience when working in the same locality) whose object is to direct the ultra-high frequency waves on to the affected part of the body and so bring about curative results.

Televiews

Wimbledon's Success

A RECORD transmission period consisting of two and three-quarter hours on the last day of the Wimbledon tennis tournament was a fitting finale to one of the most ambitious television experiments attempted by the B.B.C. The one or two technical hitches which did occur during the fortnight in no way marred the transmissions, and the public reaction to the possibilities opened up by this O.B. work has been amazing. Two cameras were used, one of these being fixed to give a more or less bird's-eye view of the court and players, and left unattended to be faded in as required. By the judicious use of suitable lenses and panning, the operator of the second camera gave the required intimate touches of the play and showed how the spectators packed the court, and were enthusiastic in their praise of good shots. The three mobile vans—namely, control-room, ultra-short-wave transmitter and power supply unit—worked together for the first time. The wooden frame containing the aerial elements was so oriented that the signals were beamed on to the Alexandra Palace tower at the summit of which was the receiving aerial with its special filters to reject direct pick-up from the main broadcast aerials.

FERRANTI TELEVISION

Following a recent visit of the Ferranti chief television engineers, Mr. M. K. Taylor and Dr. Searby, to the United States of America for an exchange of views on radio matters, Mr. Lewis and Mr. Loughran, of the Hazeltine Corporation, are paying a visit to the Ferranti organisation in this country.

The illustration shows a group taken at Messrs. Ferranti's Moston Works, including one of the latest Ferranti Television Receivers. Reading left to right, Mr. Loughran (seated), Mr. M. K. Taylor, Dr. Searby, Mr. Lewis and Mr. A. Hall, chief radio engineer of Ferranti, Ltd.

DAVIS CUP MATCHES TO BE TELEVISED

The Davis Cup Challenge Round will be televised, beginning on July 24th, and in order to include the whole of this important event, special relays from Wimbledon will take place on July 26th and 27th, although normal television programmes are closing down for three weeks on July 24th.

Transmission from Wimbledon on July 24th will begin at 2.30 p.m. and play will also be televised in the intervals between studio productions. On July 26th and 27th the tennis relays will be continuous between 3.0 and 4.0 p.m. and, if the matches are of sufficient interest, may run on until 4.30 p.m. each day.

As before, two cameras will be used at Wimbledon, one near the south-west corner of the court, to give near and panoramic views, and the other in a fixed position at the other end of the court, to give a general view of the play and the spectators.

The mobile television unit at Wimbledon employs a radio link to Alexandra Palace. No film is employed, transmission being instantaneous.

Important Broadcasts of the Week

NATIONAL

Wednesday, July 21st. — Nikki Makes News, a radio play with music.

Thursday, July 22nd.—Blackpool Entertains: Organ recital from the Empress Ballroom; variety act from the Palace Theatre; Concert Party programme from the North Pier; Dance Band from the Empress Ballroom and Concert Party programme from the South Pier.

Friday, July 23rd.—Concert Party programme, from the Spa Theatre, Scarborough.

Saturday, July 24th.—Music Hall programme.

REGIONAL

Wednesday, July 21st.—Speedway Racing: England v. Australia, from New Cross.

Thursday, July 22nd. — Nikki Makes News, a radio play with music.

Friday, July 23rd.—Tewkesbury Drama Festival: Excerpts from the final scenes of Murder in the Cathedral, by T. S. Eliot, with a commentary, from Tewkesbury Abbey.

Saturday, July 24th.—Lohengrin, act 3, from Bayreuth.

MIDLAND

Wednesday, July 21st.—Choral programme.

Thursday, July 22nd.—Forgotten Rivalries 2, Hummel-Beethoven, a sidelight on contemporary musical opinion.

Friday, July 23rd.—Tewkesbury Drama Festival: Excerpts from the final scenes of Murder in the Cathedral, by T. S. Eliot, with a commentary, from Tewkesbury Abbey.

Saturday, July 24th.—Croquet: A commentary on the second test match at Cheltenham.

WESTERN

Wednesday, July 21.—Concert Party programme, from the Summer Theatre, Newquay.

Thursday, July 22nd.—Kayles to St. Merryn: a description of the local variation of the game of skittles, from the Cornish Arms.

Friday, July 23rd.—People on the Move, The West of England—a talk.

Saturday, July 24th.—A Programme of Somerset music.

WELSH

Wednesday, July 21st.—In Lonely Places: an account of a Shepherd's life in the heart of the Plynlimmon country on the moorland around the Teify Pools.

Thursday, July 22nd.—Eisteddfod Eve: Machynlleth prepares for the Royal National Eisteddfod of Wales, from the Eisteddfod Pavilion, Machynlleth.

Friday, July 23rd.—Cyngerdd o Faledi (A Ballad Concert).

Saturday, July 24th.—A Night at Porthcawl; Cabaret from the Esplanade Hotel, Porthcawl; a concert party and a description from Coney Beach.

NORTHERN

Wednesday, July 21st.—Orchestral programme.

Thursday, July 22nd.—Field Day at Burton Constable, being a dramatic reconstruction of the first Brass Band Contest ever held in this country.

Friday, July 23rd.—Concert Party programme, from the Spa Theatre, Scarborough.

Saturday, July 24th.—The Miners' Gala Day at Durham, an eye-witness account.

SCOTTISH

Wednesday, July 21st.—Going Anywhere? A Holiday revue.

Thursday, July 22nd.—A Variety Bill in Brief consisting of ten two-minute turns.

Friday, July 23rd.—Organ recital from the Capitol Cinema, Aberdeen.

Saturday, July 24th.—Alhambra Revels, a summer time show, from the Alhambra Theatre, Glasgow.

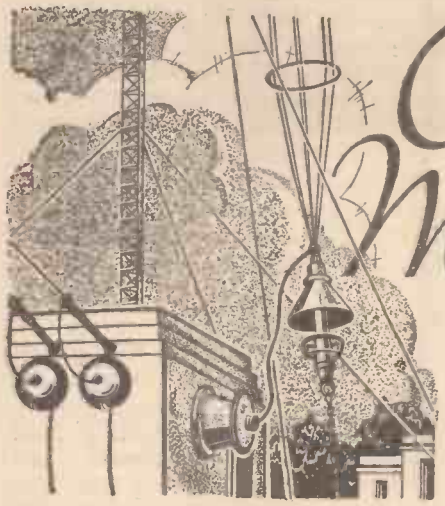
NORTHERN IRELAND

Wednesday, July 21st.—Haunted Nendrum, feature programme.

Thursday, July 22nd.—Speeches at the Annual Dinner of the British Medical Association, from the King's Hall, Balmoral, Belfast.

Friday, July 23rd.—Instrumental programme.

Saturday, July 24th.—Orchestral concert



On Your Wavelength

By Thermion

Radiolympia

NOT so many weeks now before Radiolympia opens its portals and discloses the glittering array of new models and television receivers. I want to warn you that we shall be at the same spot as last year—Stand No. 10, Ground Floor, the site of the leading, most up-to-date and progressive technical journal, newspaper and magazine combined, which leads the field, has the largest net sales, and shows the way. It is fitting that the leading wireless periodical should have the largest Press stand as formerly. Those that were last shall be first! PRACTICAL AND AMATEUR WIRELESS, which is just five years old, was the last in the field, but has become first. I shall be there in person, and there will be the usual crowd trying to identify me. It is a remarkable thing that no one has yet succeeded in doing so. Why anyone should be interested in finding out my real name I cannot say. If I signed myself "James Thermion" everyone would think it was my real name and be satisfied.

Traffic Light Control by Radio Valve

THE use of wireless valves in other industries grows. A valve of a type used in many wireless sets is the latest device for road traffic control.

The average traffic light signals change more than 4,000 times in 24 hours. Apart from the road-safety factor, therefore, accurate and consistent timing is essential, but variations of electrical supply voltage have often been a serious handicap to efficiency.

To remedy this the latest traffic robot system, known as Autoflex Stabiliser-Rectifier, incorporates an Osram thermionic valve in an ingenious voltage stabilising circuit. Acting as rectifier, the valve converts A.C. input to D.C. output, at the same time controlling any variations. It is designed to operate with perfect accuracy for long periods without attention.

A Novel Idea for Snack Bars

THE management of the White House, Albany Street, N.W.1, have led the way with a novel scheme to enable patrons of their snack and cocktail bar to hear the radio and see "Greenwich time" from the same source. I learn that this snack bar is in the luxurious swimming pool, designed like a pleasure cruiser. Installed on the wall above the bar is the latest wonder of wireless, the "Radiochron," a combination of 5-valve superhet with an electric clock.

To all outward appearances just another well-designed electric clock, the "Radiochron" has no ugly trailing wires, aerial or earth to mar its neat and compact appearance. Yet with the aid of its unique patented tuning system this British marvel of radio efficiency can, in good conditions, get as many as 50-60 stations at good entertainment strength.

A member of the White House staff said that nearly all their customers at the bar have remarked on the novelty of this efficient service. Some indeed would not believe it was a radio as well as a clock until they had heard it for themselves.

False Economy With Batteries

DESPITE the great electric grid which spans the country and the widespread use of electricity, there are still thousands of homes in which batteries are used as the source of power for radio sets. It is, perhaps, because of the great demand for batteries that there are still many unreliable types on the market.

No better advice can be given with regard to buying batteries than to insist on branded and advertised types. Many electrical firms of world-wide repute specialise in battery design and construction and produce batteries which may cost at the most only a few pence more than the inferior article, but are far more economical because they give a trouble-free return out of all proportion to the difference in price. The General Electric Company, for example, has a special department to investigate scientifically all battery problems. Its job is to probe into every battery development with the object of increasing battery life and efficiency.

There is more in a dry battery than mere H.T. cells. The special chemicals, the quality of the zinc units and the insulating materials used, and the care with which they are assembled, all contribute to the high degree of performance you desire from a reliable battery.

Essential features of well-constructed batteries are silent operation, uniform discharge throughout, long life, and low internal resistance. Stringent tests at every stage of manufacture with careful wrapping, to ensure that the battery reaches you in the highest state of efficiency, are other features which safeguard the modern battery user. Every one of these features is present in the latest range of G.E.C. dry batteries, from the six-volt grid bias batteries up to the standard 159-volt H.T. batteries.

New "International" Type Valve

AN entirely new range of radio valves just introduced by the General Electric Company, marks a revolutionary departure from the usual British style of construction. The adoption of the octal type base, of American origin, which is self-locating in its socket, is considered by radio technicians as a real step towards world-wide standardisation.

Other outstanding features of the new valve range are a heater rating of 6.3 volts, 0.3 amp and combined A.C.-D.C. operation. The new valves, which are known as the Osram "International" type, embody many modern developments. One notable advantage is their economy in heater consumption, while the low voltage at which they are run tends very naturally to reduce the level of hum in both A.C. and D.C. receivers. The heater wattage

is only 1.9, compared with 4 watts for British mains valves in the past.

The octal base, which is gradually being accepted as standard throughout the world, is self-locating by means of a moulded key which slips into a groove in the socket. This greatly simplifies the insertion of a multi-pin valve into sockets situated in inaccessible parts of a chassis. Slightly smaller socket pins and metal top caps are fitted on the new valves and help to reduce their overall dimensions considerably.

The types introduced cover a wide range and have been designed and constructed with all the knowledge and technical experience that goes behind years of work in the radio field. They include two screen pentodes (straight and variable-mu), a heptode frequency changer, a high "m" triode, a double diode with separate cathodes, a double diode-triode, two output tetrodes, a full-wave rectifier, and a "Tuneray" indicator. The extreme sensitivity and accuracy of the last mentioned, which operates on the cathode-ray principle, gives the most precise visual tuning even with weak stations.

America Learns

THE executive chiefs of many of the important United States Radio Companies have paid many visits to London lately, and the latest arrival is W. S. Paley, head of the Columbia Broadcasting Corporation of America. One of the principal items he has come to study is the progress made in the B.B.C. television service. He admitted quite frankly that Britain is a long way ahead of the U.S.A. in this new science, and the pioneer work now being undertaken is being watched by every other country in the world. Another year will transpire before regular programmes on the other side of the Atlantic make their appearance, according to Mr. Paley, and then they will launch two alternative programmes for the initial service. With a country like America, he said that it was such a gigantic undertaking that it just was not economic to start spending millions of dollars before television was, in their opinion, a little nearer to being a practical proposition as the ordinary man's entertainment.

It is also learned that an agreement has been reached between the R.C.A. and the management of the New York 1939 World's Fair, whereby the R.C.A. will stage the complete story of radio and television and its relationship with both the world of to-day and the world of to-morrow. David Sarnoff, head of the R.C.A., stated that their work on television gave promise that by the time this Fair opens, it will be greatly advanced over its present-day position. Whatever the status, however, it was proposed to demonstrate to the American public the workings and possibilities of television and show how it is bound to have a profound influence on the lives of everyone.

Vitesse Coil Connections

WE have now received numerous satisfactory reports on the performance of the Vitesse. Many constructors were unable to obtain reception on this receiver in the first place, owing to reversal of the yellow and brown leads of the coil unit, and others have experienced I.F. stage instability owing to the grid and cap leads of V3 being too near each other. The yellow lead of the coil unit should connect to a switch contact, and the brown lead to the resistance in the front section. If these leads are reversed satisfactory reception cannot be obtained. Care should also be taken to connect the aerial lead to the correct socket—that is, to the socket joined internally to the yellow lead. In some cases we have found that the aerial and earth connections have been reversed.

Increasing Volume

IF signals are weak, after all the external trimmers have been adjusted, the coil unit cover should be removed and the coil trimmers adjusted. If it is found that coil trimmer adjustment does not improve signal strength the fixed condenser in the front section should be suspected. This is the band-pass coupling condenser, and if its value is too high low sensitivity is to be expected. This condenser should therefore be removed and a new one substituted—lowering the value will increase sensitivity. The trimmers in the first two sections should be readjusted after the condenser substitution has been made.

Hum with Eliminator

IT is often found that hum is experienced when a dry-battery H.T. supply is replaced by an H.T. mains unit. This may be due to the unit being unsuitable for use in conjunction with the receiver valves or to faulty smoothing condensers in the unit. In many cases, however, it is due to interaction between the choke or transformer in the unit and the L.F. transformer in the set. The remedy for this is to rotate the L.F. transformer on its axis until the position of least interaction is found—minimum interaction is generally obtained when the transformer axis is at an angle of 30 degrees with respect to that of the choke in the unit. As previously mentioned in these notes, the mains unit current rating should be equal to, or slightly higher than, the normal current consumption of the receiver.

Fan-worship

"FAN-WORSHIP" has grown to extravagant lengths and has become the inescapable penalty of fame in any sphere. Gale Pedrick has written a programme to show how it all began, and you can hear this (if you wish) on July 29th in the London Regional programme.

Gladiators and Olympian athletes doubtless had their fans, but they were harmless compared with those of to-day, when autograph-hunting is the mildest form of fan-worship. Irving and Alexander had their fans—Gladstone was an ardent fan of Wilson Barrett—but it was left to Lewis Waller to inspire the first organised band of fans. These were the "K.O.W.'s" or "Keen Order of Wallerites," who had a secretary, patrolled every Waller performance, and wore a badge with the great romantic actor's racing colours and his favourite flower.

Out of Control

FILMS arrived and fan-worship became a business. In Hollywood there was a "mart" where the prices of autographed photographs by stars were "quoted" daily according to their popularity at the moment. These "fluctuations" were watched with keenest interest by producers and distributors. Every new star had a club formed in his or her honour. Fan-worship began to get out of control. The story of Valentino is a classic example.

This broadcast will show that fan-worship can be sincere as well as sinister, and that, in its most genuine form, it affords relief from drab lives by bringing a star in close contact with those concerned. In certain cases as, for example, the English branch of the Valentino Associations, which has endowed beds in a hospital and unemployment centre and done similar good work, one sees how this manifestation of fan-worship produces beneficial results.

"Fan," which is to be produced by John Cheatle, will conjure up a scene in the gallery at a first night, and deal with the phenomenon of fan-mail, of which radio has had an ample share.

A PAGE OF PRACTICAL HINTS

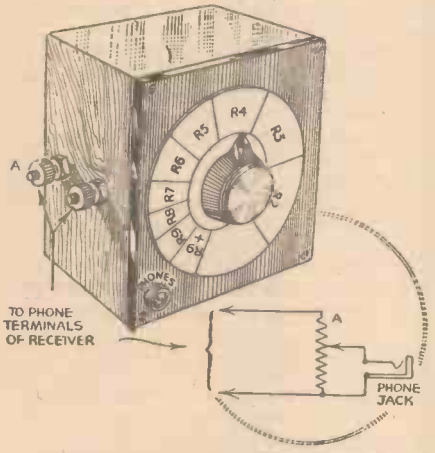
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Simple "R" Meter

A DEVICE which will give visual indication of signal strength is extremely useful to the short-wave DX enthusiast, as



A simple meter for giving visual indications of signal strength.

it not only makes it possible accurately to log signal strength, but enables day to day variations to be noted. Unfortunately, such devices usually depend for their action on a portion of the rectified current which supplies the A.V.C. circuit, and are useless for the more humble 0-v-1 or 0-v-2 receivers. However, a simple arrangement which the experimenter will find invaluable is shown in the accompanying diagram. It will be seen that the 'phones are tapped to the slider of a potentiometer. When searching for stations the slider is kept at "A" and when it is desired to measure the strength of a station the slider is turned until the signals are barely perceptible. A paper scale should be made up, as shown, and calibrated in terms of "R"; it will be noticed that R1 is not marked on this scale as this corresponds to barely perceptible signals. The potentiometer should have a maximum value of about 5,000 ohms, and should preferably be of the logarithmic or graded type, the broad end of the resistance strip being connected at "A."—D. TAYLOR (Stroud).

Handy Circuit Interrupter

A SPRING-TYPE clothes-peg makes a handy interrupter when a circuit has to be temporarily broken, such as when trying the effects of various resistances, chokes, etc.

A hole is drilled through both jaws and a terminal fixed in each. These may be of the type having a cheese-headed bolt as the main stem, or the following scheme may be adopted in order to ensure that a large surface area is available between the jaws so as to reduce the contact resistance. Screw

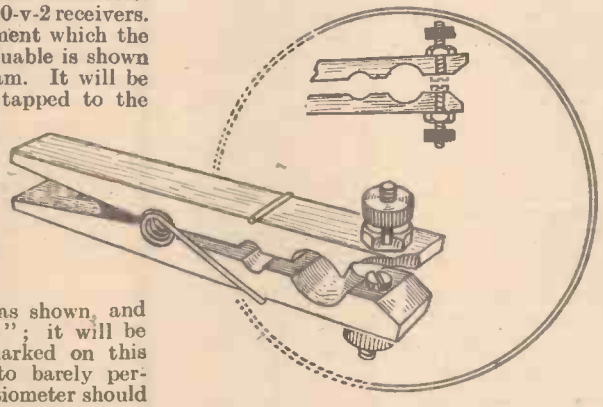
THAT DODGE OF YOURS!

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

up the lock nuts and when firmly attached file away the projecting portion of the terminal shank until it is level with the face of the nut. Make quite certain that the surface is quite flat. Leads may be attached to the terminals in the usual way.—A. DAVIE (Edmonton, N.18).

Novel Aerial-earth Switch

IN the ordinary type of aerial-earth switch the earth lead of the receiver always remains connected to the earth terminal of the set. The novel switch shown in the accompanying sketch is so arranged that when the aerial is earthed, the earth lead of the receiver is completely isolated, and static charges from aerial to earth are prevented from reaching the receiver. Details of construction of this simple switch are clearly shown in the illustration.—C. MUNFORD (Gibraltar).



A simple circuit interrupter.

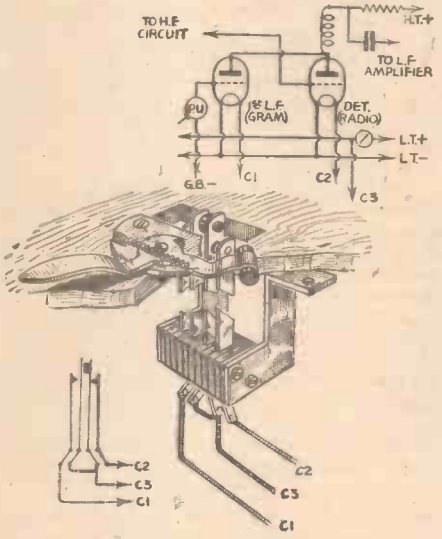
A Radiogram Switching Device

MANY PRACTICAL AND AMATEUR WIRELESS readers may have discovered that a valve used in the detector stage of a receiver does not always make a very good 1st L.F. amplifier for the gramophone pick-up.

In designing my radiogram, I contrived the following device.

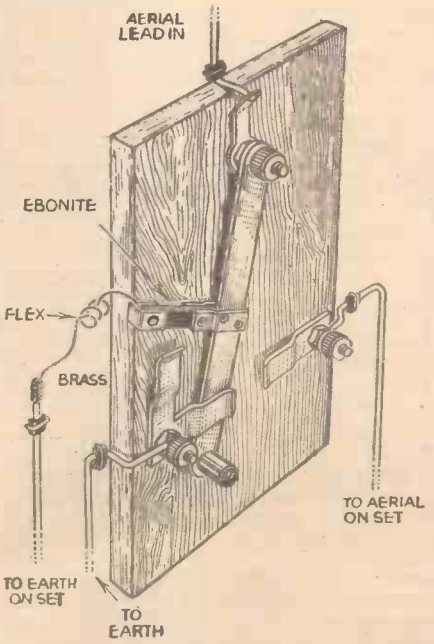
A key-type telephone jack-switch was obtained, dismantled and modified as in the accompanying sketch.

The switch was mounted on the gram. motor board, beneath the turntable, close to the motor stop. When the gramophone stop is in the "on" position the movement of the stop connects the L.T. circuit of the "gram." valve, at the same time releasing the turntable. When in the "off" position, the positive L.T. contact of the switch springs back to connect the L.T. circuit of the detector valve for radio, also stopping



A radiogram switching device constructed from a telephone jack.

the gram. motor. The scheme may be adapted for use in A.C. sets, by ganging the L.T. change-over switch with the gram. motor "on-off" switch.—F. C. EDWARDS (Nottingham).



An aerial-earth switch which completely isolates the earth lead when the set is not in use.

Making the Most of a Milliammeter

This Article, Specially Written for Beginners, Discusses the Choice and Uses of Milliammeters

Fig. 1.—An all-purpose Meter by Avo, which has as its basis a milliammeter as described in this article.

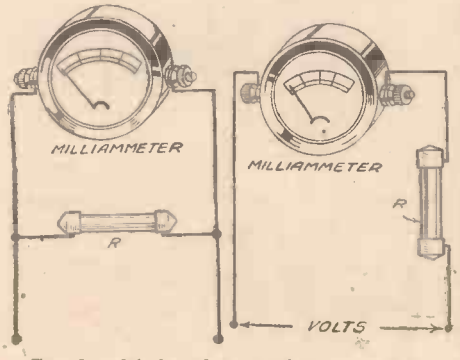
IT is no exaggeration to say that, given a good milliammeter, one can carry out the majority of essential tests on a receiver, but there is a ruling clause which must be added—the statement only applies if one knows how to use a milliammeter, and how to adapt it to enable such tests to be applied.

To commence with, a few words about the meter itself. Like other components, there are good, fair and hopeless models, and, unfortunately, one cannot always secure the type one desires, owing to cost and available cash.

Knowing this, I can only advise the intending purchaser of a meter to delay the transaction—if one's budget won't run to a *good* instrument—until such times as the reserve fund is large enough. Don't snap up a so-called bargain unless you are quite sure of all its details, and of its condition.

Moving-coil versus Moving-iron

Meters for direct current use can be divided into two classes, moving-coil and moving-iron, and where reliability and accuracy are required it is essential to use the moving-coil type. As the name implies, the needle of the meter is made to traverse the dial by the movement of a coil of wire, usually rectangular in shape, through which passes the current to be measured. The coil is pivoted, in very accurate bearings, within the field of a permanent magnet, the current being fed into the winding through delicate hair springs (Fig. 2), which also serve to regulate the movement and return the needle to zero when no current is flowing. It is only natural, therefore, that an instrument constructed on these lines will cost more than a simple moving-iron model, which does not call for such accuracy or delicacy of construction.



Figs. 3 and 4 show the method of connecting shunts and series resistances for multiplying the range.

A moving-coil meter is very sensitive, consumes very little power, and for this reason it can be used for registering minute quantities without imposing an appreciable load on the circuit under test.

The ill effects of a cheap instrument have been stressed so frequently in these pages that there is no need for me to elaborate on the inaccurate readings they can produce. For serious work they are useless, and no serious constructor or experimenter would think of using one when reliable information is required.

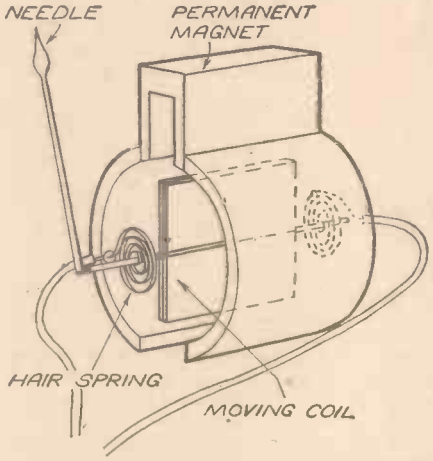


Fig. 2.—The method of construction employed in the milliammeter.

Assuming that you have to get a good quality meter, the next thing to decide is what range—i.e., what maximum reading—is the most useful for general work.

One cannot do better than select a meter having a range of 0 to 1 mA or, say, 0 to 1.5 mA, as it will then be possible to adapt it to all the ranges likely to be required.

Now supposing a current of twice the maximum scale deflection is applied, and that some means are provided which allow exactly half the current to be by-passed; in other words, only half the current flows through the meter, so that although the meter is showing a full-scale deflection there is actually twice the current flowing in the circuit under test. Providing the conditions are known, it is an easy matter to multiply the scale readings by two and thus get a true indication of the current in the circuit.

By-passing

This is what happens in a multi-range meter, though it is not necessary for the amount by-passed to be half. It can be any portion of the total—so long as one knows the exact ratio—but it is easier for calibration purposes if the ratio is made an even figure.

The by-passing can be provided by the simple arrangement shown in Fig. 3, where it will be seen that the resistance R is connected across the meter terminals (or in *shunt*). The value of R can be determined by experiment or by calculation. If one favours the practical method, it is only necessary to connect the meter in series with a low voltage supply and a resistance, the value of each being so adjusted that an exact full-scale deflection is obtained (Fig. 5.). To one terminal of the meter is then connected one end of a short length of fine resistance wire, and contact made between the other terminal and any part of the wire until it is found what length of wire (resistance) is required to reduce the needle deflection to, say, half, one-third, one-quarter, or one-tenth its full value. Once the correct length has been determined and the ratio has been decided on, then the meter readings must be multiplied by two, three, four or ten when the resistance is in position. It is, of course, vitally necessary to carry out these experiments accurately and make frequent checks until the resistance element is made up and fixed securely. By the way, it is always advisable to coil the wire, if its length permits, in the manner shown in the sketch, thus making it non-inductive.

Using Shunts

Several shunts can be made to allow different full-scale ranges to be obtained, each being brought into circuit, when required, by switches, but be sure and use good definite action switches, otherwise they themselves will introduce additional resistance—through bad contacts—and thus upset the effects of the shunts. All the above procedure can be avoided by using the simple formula $\frac{Rm}{n-1}$ where R is the shunt to be determined; Rm the

(Continued on next page.)

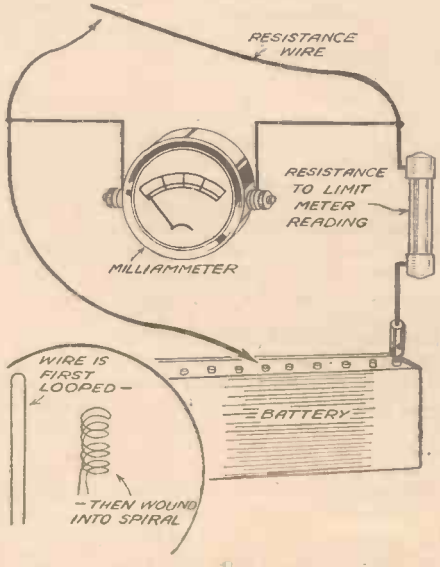


Fig. 5.—Method of making accurate shunts from resistance wire.

(Continued from opposite page.)

resistance of the meter, obtainable from the makers; and "n" the number of times it is desired to increase the full-scale reading. For example, if the normal maximum reading of the meter is 1.5 mA and it is wished to make it 150 mA, then "n" equals 100.

Voltage Measurement

The reading of current having been considered, we will now discuss the measurement of voltage with the same instrument.

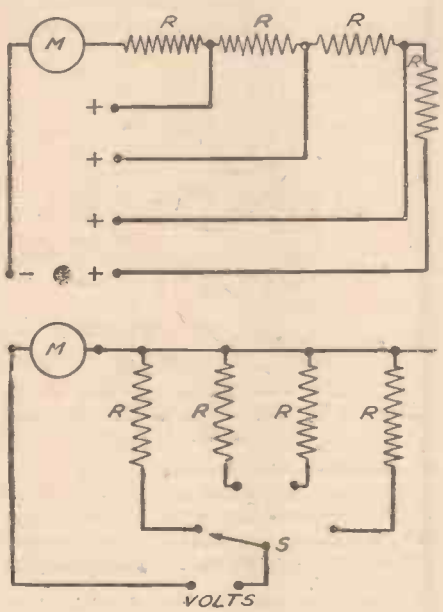


Fig. 6.—How to arrange the separate resistances to provide alternative readings.

A voltmeter is nothing more than a milliammeter with a suitable resistance connected in series. The resistance can be embodied in the construction of the meter, in which case it is sold as a voltmeter, or it can be external, thus allowing the meter to be used for current or voltage reading. The arrangement is shown in Fig. 4.

To enable various volt-reading ranges to be obtained with the one meter, a series of resistances can be used, each being brought into circuit by switches or plugs and jacks as desired. A suggested arrangement, together with an alternative not requiring switches, is shown in Fig. 6, while Fig. 7 shows a complete multi-range milliammeter and voltmeter.

To determine the value of resistances required, one can again apply a practical or theoretical method. For the first, a definite known voltage supply is required, say, 100 or 150 volts, and that is used to feed the milliammeter with a resistance in series, as in Fig. 4, but as the value of R is likely to be high it is not wise to consider winding or making them.

The object of the experiment is to determine the value of R which will give a full-scale, or certain pre-desired part of, deflection of the meter needle for the known voltage supply. If the normal full-scale reading is 1 mA, then it would be advisable to select a value for R that will allow 100 volts to cause the maximum deflection. Low voltages can, of course, be provided for by lower values of R; for example, it would be wise procedure to have one maximum reading of, say, 10 volts. Much time and other can be saved by applying the formula $R \frac{1,000 \times E}{I}$ where E is the desired full-scale reading, and I the normal full-scale reading of the milliammeter.

It sometimes happens that it is desired to increase the range of an existing *voltmeter*, therefore, it becomes necessary to apply a different formula which reads: $R = Rm \times (n - 1)$ where R is the additional resistance required, Rm the resistance of the voltmeter, and n, as before, the number of times it is required to increase the full-scale reading.

The resistance of the meter can be obtained by multiplying the normal full-scale reading by the "ohms-per-volt," which is usually specified by the makers on the instrument.

Precautions

One word of warning is necessary when using any multi-range instrument. When taking measurements of doubtful or unknown quantities, always have the shunts or series resistances set for the highest readings, and then adjust to the most suitable range. If the procedure is not adopted, serious harm can be caused to the meter by applying, possibly, excessive current or voltage. It will, no doubt, be obvious to many, that it would not be a difficult matter to measure resistances with a milliammeter or voltmeter. In fact, all that is necessary is an external voltage supply; a small dry battery is quite sufficient.

One of the easiest methods is to use a voltmeter and apply the following formula, but it is essential for the applied voltage to have a known and constant value.

R (in this case the resistance under test) $= \frac{e \times Rm}{E} - Rm$ where Rm is the resistance of the meter, e = the value in volts of the applied voltage, and E = the voltage as shown on the normal scale reading of the meter. If these suggestions are followed, and a little care and patience taken with the selection of resistances, assembly and wiring

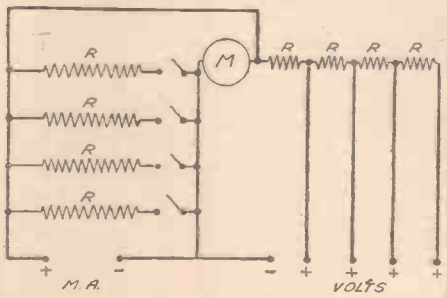


Fig. 7.—Complete circuit of the all-purpose meter as described.

a really first-class testing instrument can be made and, what is more, the total cost will be far below that of an equivalent commercial job.

UNIT CONSTRUCTION

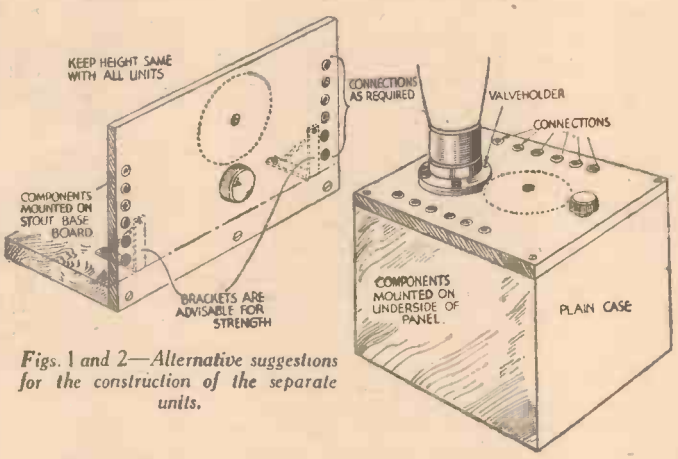
A Few Suggestions for Using old Components for Experimental Work are Given in this Article By RADIO ENGINEER

DURING the early days of broadcasting by radio, a very popular method of constructing a receiver was by means of units which could be coupled together to form various types of complete circuit.

The units were, in themselves, obtainable or made—speaking in a general sense—in two forms. They were either built up from components mounted on special panels which fitted into standard frames, or they were made and housed in compact cabinets or cases, the necessary connecting points being so arranged that short coupling wires could be used.

For example, one panel or case would contain the coils and condensers of the aerial tuning circuit; another a valve-holder and L.F. coupling, while others would take the form of the detector stage, H.F. stage and, say, output circuit.

By arranging a suitable combination of these units or sections it was possible to construct a receiver to suit one's pocket and requirements. The advantage of the whole idea being that modifications could be carried out with a minimum of trouble, as it was only a matter of adding or removing a section or two to increase or decrease the over-all size of the circuit.



Figs. 1 and 2—Alternative suggestions for the construction of the separate units.

That "Junk" Box

The idea lost popularity when constructing became an established section of the radio trade, and when this journal published guaranteed and well-designed receivers, known as a "junk" box or, in more respectful terms, a collection of components representing quite a good amount of idle money.

The collection invariably increases as the good work goes on, for the simple reason that different published circuits so often necessitate different and/or new components and valves.

It is the elimination of this accumulation of idle components that renders the idea of unit construction so worthy of consideration. I do not mean, for one moment, that the idea should take the place of proper receiver construction. Far from it; it should be used as an additional source of interest to the hobby; as a means whereby unlimited experiments can be carried out without any increase in expenditure, and without adding to the already plentiful stock of components.

It is not possible, nor is it proposed to lay down hard and fast rules regarding the type or style of units to be made. Such limitations would immediately ruin the elasticity of the whole idea and prevent it from being universal in its application. Each constructor must use his own initiative; he must adapt the scheme to suit his own particular requirements and gear, using the suggestions I give as the basis of his plans.

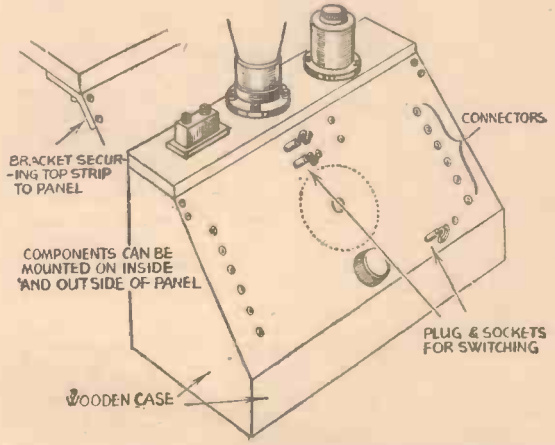


Fig. 4.—This form of construction possesses severa advantages but is slightly more difficult to build.

However, although the system is now no longer generally used, its virtues have not been completely ignored by the serious constructor/experimenter, and I would advise every amateur to give the idea serious consideration, if only for the reasons mentioned below.

One has only to be connected with radio constructing a short time to possess what is

For example, one might have a number of odd pieces of ebonite panelling to use up, while another might wish to make use of several suitable pieces of aluminium. One constructor might wish to make all panels vertical, another may want them horizontal, while a third might even prefer to use the sloping form of a control board, and so on.

There are, however, one or two points which the constructor should endeavour to make standard throughout the arrangement, even if it does necessitate spending an odd shilling or two. I refer to (a) the method of connecting the panels together and (b) the height of the panels.

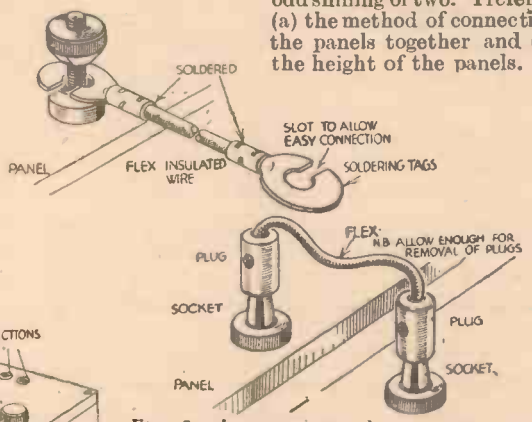


Fig. 3.—Inter-connection between units may be carried out by such schemes as those illustrated above.

Connecting the Panels

Two very sound and simple methods of connecting are shown in Fig. 3, but remember, whichever is adopted, use it throughout, otherwise considerable trouble may be experienced.

Note that one is formed with short lengths of stiff or flexible insulated wire, large soldering tags—with a gap cut in the side — being soldered on each end.

The second method consists of simple banana plugs and sockets to suit, care being taken, if metal panels are used, to see that they are properly insulated.

Always make sure of having an ample supply of connecting leads; nothing is more annoying—when carrying out experiments—than having to hunt round for an odd length of wire.

Remember how unsightly uneven panel or case heights will make the arrangement look. Determine the most useful size or height, and then cut your material accordingly, the odd pieces being kept for insulated mountings, or terminal strips, or brackets.

It will often be found more convenient to use plugs and sockets for parts of the circuits which call for any form of switching as they lend themselves more readily to modifications, the introduction of meters, and so forth.

(Continued on page 452)

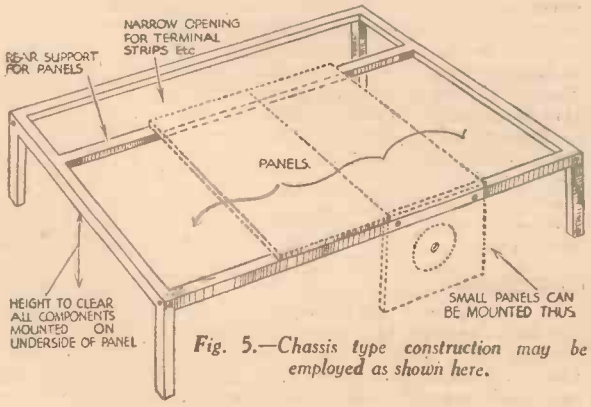
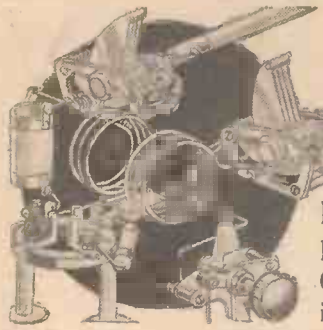


Fig. 5.—Chassis type construction may be employed as shown here.

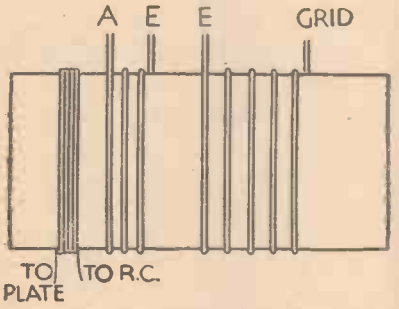


Short Wave Section

PRACTICAL SHORT-WAVE COIL DESIGN

In this Article Useful Information Is Given for Enabling Constructors Quickly to Select Coil Details for Any Tuning Range up to 125 Metres - - By H. B. SCHOFIELD

MANY descriptions of radio apparatus, receivers, etc., have appeared from time to time in this journal, but there are, doubtless, a great number of readers and constructors who will appreciate accurate and practical information on the construction of coils, particularly for the short-wave bands. From the tables on page 450 the constructor has at his disposal accurate data of 360 combinations of coils, of various diameters, coil lengths and inductance values. The widely different physical dimensions of the coils offer even to the experienced designer a means of obtaining the maximum efficiency in the design of multi-band short-wave receivers, where compactness is the first requirement or where the best coil efficiency is desired, irrespective of the physical size of the coil.



For the simple detector stage the necessary aerial, grid and reaction windings should be arranged as shown here.

Choice of Wire

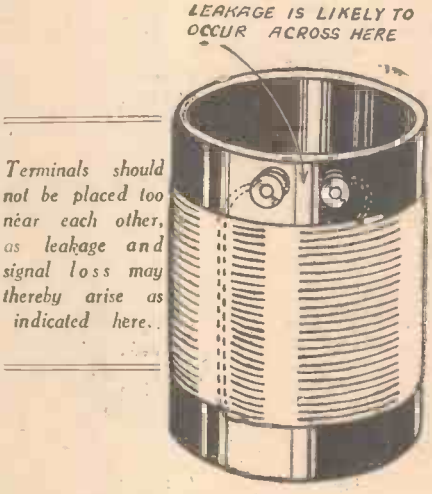
A coil with a winding width equal to its diameter is generally accepted to have the best electrical efficiency, all things being equal, i.e., the insulation factor of the coil former, and readers are advised to keep this in mind when choosing a coil from the table. Before proceeding to explain the table, two factors which enter into the construction of high-grade coils, where one wishes to obtain the best possible efficiency, are the choice of wire used, and the material of the coil former. For the very short-wave bands up to 25 metres, silver-plated wire is to be preferred, and has the great advantage of lowering the H.F. resistance of the coil, which is of the greatest importance when one appreciates the extremely minute signal voltages which a radio receiver is called upon to handle. As regards the coil former this must be of the lowest loss material—preferably with eight ribs instead of just being of the plain round type, and should have unshrinkable characteristics. It should be borne in mind that silver-plated wire and a cardboard coil former do not go well together.

Coil Sizes

In looking over the table you will find the diameter sizes are from ½in. to 1½in. as follows: ½in., ¾in. ⅞in., 1in., 1¼in. and 1½in. The coil winding widths are ½in., ¾in., 1in., 1¼in. and 1½in., the windings being spaced approximately one diameter of the wire gauge. In deciding the tuning range to be covered, the first requirement is to be definitely certain of the maximum and minimum capacity of the tuning condenser, for this requirement tells you the wave-range-coverage of the coil you select. The lower the minimum capacity of any tuning condenser, the greater the actual tuning range of the coil-condenser combination—the range extending on the lower end of the wavelength. Assuming your condenser has a minimum capacity of 15mmfd., when placed in circuit, valve capacities, wiring and trimmer capacities are immediately added to the minimum capacity of the coil and condenser circuit, the 15mmfd. readily changes to an increased value reaching up to 30mmfd. or even more. This you will see immediately chops off a portion of your tuning range.

Minimum Capacity

In looking at the table you will find that for all coil-combinations a minimum capacity of 30mmfd. has been selected for the computation of the highest tunable frequency (lowest wavelength). This value was chosen after many measurements on hundreds of actual radio receivers, and the reader can be safely assured that in many cases this value will be less, which will extend the tuning range over the coil combination he has chosen, which is all to the good. Do not forget also that the tuning range of any coil in the table, is for the coil only—it is very important that you remember this, for in wiring from the coil to plugs or switches, although the extra wiring length itself be only small, this will again extend the tuning range and ½in. of extra wire will make a great deal of difference—try it against a pre-calibrated scale. The table is quite easy to follow, so let us take an example. We have a former 1in. in diameter, some 18 S.W.G. wire, a tuning condenser with a maximum capacity of .00015 microfarads, and we wish to wind a coil which will tune to 25 metres. Looking at the table we find on the diameter of former column for 1in., using 18 S.W.G. wire and moving along to the maximum tuning column under .00015, that with



Terminals should not be placed too near each other, as leakage and signal loss may thereby arise as indicated here.

winding 7⅞ turns, wound over a width of ¾in., which is spaced at 10½ turns per inch we shall have a coil which will tune from 12 metres to 26 metres. With this same coil using a .0001 condenser, our tuning range will be from 12 to 21½ metres, and using a .00035 condenser, our tuning range will be from 12 to 40 metres. The writer hopes that from the table and notes many problems of readers will vanish, and that in the pursuit of that elusive DX station, a coil and condenser combination from the details which are given will end the chase.

Leaves from a Short-wave Log

Another Spanish Short-waver

EMISSORA P.F.I. (Pay-eff-ee) is the call of a Republican short-wave transmitter working at Barcelona (Spain); the channel used is 41.65 m. (7.206 mc/s). It is on the ether from G.M.T. 13.30-14.30 with a musical programme (gramophone records), and from 21.00 with news bulletins in French and English, the latter starting at 21.35. Listeners will be interested to know that QSL cards are obtainable if reception reports are posted to *Emissora P.F.I., Iberic Federal Party, Ronda Universidad* 1, *Barcelona* (*Spain*); they should prove later an asset to any collection.

Radio Renascenca

French listeners state that they have picked up a broadcast from a Portuguese station giving a transmission between G.M.T. 20.15-22.00 on 50 m. It is alleged to be operated by the Radiophonic Club of Portugal which works a simultaneous broadcast on 212.6 m.

Kuala Lumpur on Lower Channel

ZGE, Kuala Lumpur (Federated Malay States), has increased its power to 1.2 kilowatts and reduced its wavelength to 48.23 m. (6.22 mc/s). Broadcasts are carried out thrice weekly, namely, on Tuesday, Friday and Sunday from G.M.T. 11.40-13.40. The call is: *This is the Selangor Amateur Radio Society operating transmitter ZGE, Kuala Lumpur.* As a signature tune the studio has adopted that well-known melody: *Let's call it a day.* Standard Time in the Federated Malay States is seven hours ahead of G.M.T., and the approximate airline distance from London is 6,540 miles.

Another Cuban Call—

On 27.8 m. (10.79 mc/s) between G.M.T. 05.00-06.30, try for COGF, Matanzas (Cuba), which appears to have started up recently, and of which so far I have received no reports from British listeners.

(*Continued at foot of next page*)

Diam. of Former	No. S.W.G.	Turns per Inch Spaced approx. One Diam. of S.W.G.	Length of Winding	No. of Turns	Tuning Range (Min. Cap. 30 mmfd.) .0001 Min.	.0001 Max.	.00015 Max.	.00035 Max.
½″	18	10½	½″	5½	5	9	11	16
,,	,,	,,	⅝″	7⅞	6½	11½	14⅓	22
,,	,,	,,	1″	10½	7½	13½	17	26
,,	,,	,,	1⅛″	13⅛	8½	15½	19	30
,,	,,	,,	1¼″	15¾	9¾	18	21½	33
¾″	18	10½	½″	5¼	6¾	12½	15½	24½
,,	,,	,,	⅝″	7⅞	9½	17	20½	32
,,	,,	,,	1″	10½	11	20	24½	37
,,	,,	,,	1⅛″	13⅛	12¾	23	28	43
,,	,,	,,	1¼″	15¾	14½	26	31½	48
⅞″	18	10½	½″	5½	8	14½	17½	26½
,,	,,	,,	⅝″	7⅞	10½	19¼	23½	36
,,	,,	,,	1″	10½	12½	23	28	43
,,	,,	,,	1⅛″	13⅛	14½	26½	32	50
,,	,,	,,	1¼″	15¾	16½	30	36	55
1″	18	10½	½″	5¼	8¾	16	19½	30
,,	,,	,,	⅝″	7⅞	12	21½	26	40
,,	,,	,,	1″	10½	14	25½	31	47
,,	,,	,,	1⅛″	13⅛	16	30	35½	55
,,	,,	,,	1¼″	15¾	18	33½	40	62
1¼″	18	10½	½″	5¼	10½	19	23⅓	36
,,	,,	,,	⅝″	7⅞	14½	26	31½	49½
,,	,,	,,	1″	10½	17	31½	38½	58
,,	,,	,,	1⅛″	13⅛	20	36	44	66
,,	,,	,,	1¼″	15¾	23	42	50	73
1½″	18	10½	½″	5¼	12	22	27	41
,,	,,	,,	⅝″	7⅞	16½	30	37	56
,,	,,	,,	1″	10½	20	36	44	67
,,	,,	,,	1⅛″	13⅛	23	43	52	78
,,	,,	,,	1¼″	15¾	26½	48	58	90
½″	20	14	½″	7	6½	12	14½	22
,,	,,	,,	⅝″	10½	8¾	16	19	29
,,	,,	,,	1″	14	10	18½	22½	34
,,	,,	,,	1⅛″	17½	11½	21	25	40
,,	,,	,,	1¼″	21	13	23½	29	45
¾″	20	14	½″	7	9	17	21	32
,,	,,	,,	⅝″	10½	12½	22	27	42
,,	,,	,,	1″	14	14	27	33	50
,,	,,	,,	1⅛″	17½	17	30	37	57
,,	,,	,,	1¼″	21	19	35	42	65
⅞″	20	14	½″	7	11	19	23	35
,,	,,	,,	⅝″	10½	14	25	31½	48
,,	,,	,,	1″	14	17	30	37	57
,,	,,	,,	1⅛″	17½	19	34½	42½	65
,,	,,	,,	1¼″	21	22	40	48	72
1″	20	14	½″	7	11½	21	26	40
,,	,,	,,	⅝″	10½	15½	28	34½	53
,,	,,	,,	1″	14	18½	34	41	63
,,	,,	,,	1⅛″	17½	21½	39	48	71
,,	,,	,,	1¼″	21	24	45	54	82
1¼″	20	14	½″	7	14	25½	31	47
,,	,,	,,	⅝″	10½	19	35	43	65
,,	,,	,,	1″	14	23	42	51	74
,,	,,	,,	1⅛″	17½	27	48½	59	90
,,	,,	,,	1¼″	21	30	55	67	103
1½″	20	14	½″	7	16	29	35½	54
,,	,,	,,	⅝″	10½	22	40	49	73
,,	,,	,,	1″	14	26½	48	59	90
,,	,,	,,	1⅛″	17½	31	56	69	105
,,	,,	,,	1¼″	21	35	63	78	120

Diam. of Former	No. S.W.G.	Turns per Inch Spaced approx. One Diam. of S.W.G.	Length of Winding	No. of Turns	Tuning Range (Min. Cap. 30 mmfd.) .0001 Min.	.0001 Max.	.00015 Max.	.00035 Max.
½″	22	18	½″	9	8½	15	18½	28
,,	,,	,,	⅝″	13½	11	20	25	38
,,	,,	,,	1″	18	13	24	29	44
,,	,,	,,	1⅛″	22½	15	27	33	51
,,	,,	,,	1¼″	27	17	31	37	57
¾″	22	18	½″	9	12	21½	26	40
,,	,,	,,	⅝″	13½	16	29	35	54½
,,	,,	,,	1″	18	19	34	42	64
,,	,,	,,	1⅛″	22½	22	40	48	72
,,	,,	,,	1¼″	27	25	45	54½	82
⅞″	22	18	½″	9	13½	25	30	45
,,	,,	,,	⅝″	13½	18	32	40	62
,,	,,	,,	1″	18	22	40	47	71
,,	,,	,,	1⅛″	22½	25	45	55	82
,,	,,	,,	1¼″	27	28	50	62	92
1″	22	18	½″	9	15	27	33	50
,,	,,	,,	⅝″	13½	20	36	45	68
,,	,,	,,	1″	18	24	44	53	81
,,	,,	,,	1⅛″	22½	27	50	61	92
,,	,,	,,	1¼″	27	31½	57	70	107
1¼″	22	18	½″	9	18	33	40	61
,,	,,	,,	⅝″	13½	25	45	55	82
,,	,,	,,	1″	18	30	53	65	100
,,	,,	,,	1⅛″	22½	34	62	76	115
,,	,,	,,	1¼″	27	39	70	85	135
1½″	22	18	½″	9	20	36½	46	70
,,	,,	,,	⅝″	13½	28	51	62	96
,,	,,	,,	1″	18	34	62	76	115
,,	,,	,,	1⅛″	22½	40	72	88	135
,,	,,	,,	1¼″	27	45	83	100	150
½″	24	22½	½″	11¼	11	19	23½	35½
,,	,,	,,	⅝″	16⅞	14	25	30	42
,,	,,	,,	1″	22½	16	29	36	55
,,	,,	,,	1⅛″	28	18½	34	41	63
,,	,,	,,	1¼″	33¾	21	38	46	72
¾″	24	22½	½″	11¼	15	27	33	50
,,	,,	,,	⅝″	16⅞	20	36	45	68
,,	,,	,,	1″	22½	23	43	52	80
,,	,,	,,	1⅛″	28	27	50	60	92
,,	,,	,,	1¼″	33¾	30	56	68	105
⅞″	24	22½	½″	11¼	16½	31	37	56
,,	,,	,,	⅝″	16⅞	22½	41	51	76
,,	,,	,,	1″	22½	27	49	60	90
,,	,,	,,	1⅛″	28	31	55	67	100
,,	,,	,,	1¼″	33¾	35	64	78	120
1″	24	22½	½″	11¼	17½	33	41	65
,,	,,	,,	⅝″	16⅞	25	46	56	86
,,	,,	,,	1″	22½	29½	54	65	100
,,	,,	,,	1⅛″	28	34	63	77	115
,,	,,	,,	1¼″	33¾	39	70	86	135
1¼″	24	22½	½″	11¼	22	41	50	76
,,	,,	,,	⅝″	16⅞	31	55	68	105
,,	,,	,,	1″	22½	36½	65½	80	125
,,	,,	,,	1⅛″	28	43	78	95	147
,,	,,	,,	1¼″	33¾	48½	88	107	165
1½″	24	22½	½″	11¼	26	47	57	88
,,	,,	,,	⅝″	16⅞	35	63	78	120
,,	,,	,,	1″	22½	43	78	94	145
,,	,,	,,	1⅛″	28	50	91	110	170
,,	,,	,,	1¼″	33¾	56½	103	125	192

Note.—All tuning ranges are in metres, also the minimum capacity is the same for the three examples of tuning capacities.

LEAVES FROM A SHORT-WAVE LOG

(Continued from previous page)

—And an Alteration in Call-letters

CO9JQ, Camaguey (Cuba), is stated to have reverted to its original call-sign; COJK, but continues to work on 34.62 m. (8.665 mc/s). It may be identified by its bugle interval signal. The daily schedule is: G.M.T. 22.30-23.30 and from midnight until 03.00. Address: 4, rua General Gomez, Camaguey (Cuba).

Costa Rica Reappears

TIEP, San José (Costa Rica), with its English slogan: *The Voice of the Isthmus*, was recently logged on 44.91 m. (6.678 mc/s). The best time for a search is between G.M.T. 01.00-04.30. At 04.00 a studio clock was heard chiming 10.0 p.m. standard time, being 6 hours behind G.M.T. QSL cards entitled "*Un recuerdo* (a record), *de la Voz del Tropico* (of the Voice of the Tropics) *a sus buenos amigos* (to its good friends) may be had if reports are sent to Senr. E. Pinto Hernandez, Apartado Postal, 57, San José (Costa Rica).

A Busy French Relay Station

TYA2, Paris (France), a commercial transmitter working telephony with shipping in the Mediterranean, and also with Algiers, is frequently used for the relay of the Paris programmes for rebroadcast overseas. This 15-kilowatt station operates on 33.19 m. (9.04 mc/s), and may sometimes be confused with FVA, Algiers, on 33.48 m. (9.96 mc/s) which takes the Radio Alger medium-wave radio entertainments.

Broadcasts from Stockholm

With the opening of the new transmitter at Motala the Swedish programmes are now available daily via SBG, on 25.63 m. (11.705 mc/s), from G.M.T. 1600-18.30, and on 49.47 m. (6.065 mc/s) from G.M.T. 18.30-22.00, when the studio closes down. On the lower wavelength broadcasts are made on Sundays from G.M.T. 11.00-14.00, as occasion arises.

Impressions on the Wax

New Rex Releases

BRIAN LAWRENCE and his Lansdowne Orchestra are rather prominent in the new Rex releases with tunes from the films. First of these is "With Plenty of Money and You" and "Let's Put Our Heads Together," both from "Gold Diggers of 1937," on *Rex* 9052, followed by "September in the Rain," from the film "Melody for Two," and "What Will I Tell My Heart,"—Rex 9053. Brian Lawrence also appears with Fred Hartley and his Quintet singing "Seal It with a Kiss," from the film "That Girl from Paris," and "In the Sweet Long Ago," on Rex 9058, and then that popular tune "There's a Small Hotel," from "On Your Toes," and "The Night is Young and You're so Beautiful," on *Rex* 9020.

Vocals

IF you like hill-billy tunes, then you are well catered for by Bob Mallin and his guitar, who sings "Across the Great Divide" and "On the Trail where the Sun Hangs Low"—*Rex* 9048—and "Cowboy" and "A Cowboy's Wedding Day," on *Rex* 9018.

The inimitable Gracie Fields makes a very attractive recording of "Rose Marie" and "Indian Love Call," two old favourites, on *Rex* 8893, and Irene Price (the English Shirley Temple) sings two of the hits from the Shirley Temple film, "Stowaway"—"Good-night my Love" and "You've Gotta S.M.I.L.E. to be H.A. double P.Y.," on *Rex* 9040.

Two Brunswick Albums

IN an effort to provide a comprehensive guide to swing music, Brunswick this month present two albums of records which cover the entire twenty-one years that separate the first-known recordings of swing music from those of the present day. No matter whether you are a seasoned enthusiast or an interested beginner, these two albums are essential to your enjoyment.

With regard to these albums, Mr. L. Hibbs, best known as the founder and editor of *Swing Music*, has compiled a booklet giving a graphic picture of the romantic background of swing. The booklet also contains 16 pages of pictures, and alone costs 1s. 6d. Each album of eight records costs 21s.; whilst the price of each record if bought separately is 2s. 6d.

H.M.V.

THERE are a number of attractive records in the H.M.V. releases for this month. Elisabeth Schumann gives a fine rendering of Solveig's Song, from "Peer Gynt," coupled with the "Cradle Song," by Smetana, on *H.M.V. DA* 1544. Kirsten Flagstad, who has made a great reputation at Covent Garden, sings two Norwegian songs—"Lykken Mellem To Mennesker," and Grieg's "El Hab"—*H.M.V. DA* 1516. Margherita Perras adds another fine recording of the Bach-Gounod "Ave Maria," together with Handel's "Il Pensieroso"—*H.M.V. DB* 4464.

From the Films and Shows

FRANCES DAY sings "Artificial Flowers" and (with John Mills) "A Little White Room," two of the outstanding numbers from the new show "Floodlight," at the Saville Theatre, London—*H.M.V. B* 8590. Cicely Courtneidge obliges with two of her funniest songs, "Why Has a Cow Got Four Legs," and "The South is the Place for Me," on *H.M.V. B* 8588. Paul Robeson has two songs from his new film—"Ho! Ho!" (The Wagon Song) and "Climbing Up" (The Mountain Song), from "King Solomon's Mines"—*H.M.V.* 8586. Peter Dawson's robust style suits "The Silver Patrol," from the film of the same name, and "Old Plantation," from the 1937 "Cotton Club Parade"—*H.M.V. B* 8583. Max Miller is very much himself in "Weeping Willow" and "You Can't Go Away Like That"—*H.M.V. BD* 432. A most unusual record is the Comedy Harmonists' arrangement of the Overture to Rossini's "Barber of Seville." There are no words, and the adroit manner in which these singers vocalise the quick passages written originally for the orchestra, is most remarkable—*H.M.V. B* 8582.

Light Instrumental

THERE is a bright selection of the tunes from Gershwin's "Shall We Dance." It will be remembered that Gershwin was the composer of "Rhapsody in Blue." This selection is played by Louis Levy and His Gaumont-British Symphony on *H.M.V. BD* 435. Anton and the Paramount Theatre Orchestra, with Al Bollington at the organ, play a charming medley of Stephen Foster's Plantation Melodies, on *H.M.V. BD* 431. Django Reinhardt, who is one of the leading "swing" guitar exponents, gives two pieces with such facility that it is hard to believe that the instrument is not a harp, allowing full play for both hands. The titles are "Parfum" and "Improvisation," both composed by the soloist—*H.M.V. B* 8587.

Dancing Time

JACK HYLTON and his Orchestra play two hits from the new Lehar musical comedy—"Paganini"—"Girls Were Made to Love and Kiss" and "Love, Live for Ever," on *H.M.V. BD* 5217. Roy Fox's contributions are mostly hits from the new films—"Will You Remember," from "Maytime," and "I've Got Beginner's Luck," from "Shall We Dance?"—*H.M.V. BD* 5224, "Let's Call the Whole Thing Off" and "They Can't Take That Away from Me," from "Shall We Dance?"—*H.M.V. BD* 5226, and "Where are You?" from "Top of the Town," and "Carelessly," on *H.M.V. BD* 5222. Fats Waller has two hits in "The Love Bug Will Bite You" and "Boo Hoo," on *H.M.V. BD* 5229, and Billy Bissett and his Orchestra at the Mayfair Hotel play two tuneful numbers—"On a Little Dream Ranch" and "In a Little French Casino," on *H.M.V. BD* 5227. A newcomer to the H.M.V. list is Ozzie Nelson, whose orchestra plays "Poor Robinson Crusoe" and "Whoa Babe" on *H.M.V. BD* 5228.

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.

Slough and District Short-wave Club

A PRELIMINARY meeting of an informal kind was held on July 7th at 26, King Edward Street, Slough. Mr. Paine (G6PR) was elected chairman of the club, and other officers were elected. Mr. Paine then gave a most interesting talk on "Frequency Measurement," and afterwards answered questions put by those present. Readers interested in short waves, expert or otherwise, will be welcomed to this newly-formed club. Further particulars can be obtained from J. H. White, 20, Chalvey Road East, Slough.

Southend and District Radio and Scientific Society

THIS society held a very successful direction-finding contest on June 27th, when 23 members scoured Essex with portable receivers in an endeavour to trace a hidden transmitter, operating on a wavelength of 155.8 metres. On this occasion the transmitter was well concealed and only one competitor—Mr. Maurice Tapson (G6IF)—succeeded in finding it, arriving only a few moments before the conclusion of the transmissions.

A series of similar events will be held during the summer months, and the Hon. Secretary, Mr. F. S. Adams, of 27, Eastern Avenue, Southend-on-Sea, will be pleased to hear from any members of other societies who would like to take part. Indoor meetings are also being held at intervals during the summer and the full programme of lectures will be resumed in September.

The Deptford Men's Institute Short-wave Radio Club

THE last official meeting of the above club was held at the Clyde Street L.C.C. School, S.E.8, on Tuesday, June 29th, which concluded a very successful 1936-1937 session.

The last actual meeting of the club was on the occasion of the National 5-metre Field Day, on July 4th, when club members operated portable 5-metre transmitters and receivers in the neighbourhood of Keston Common, Kent.

Contacts were consistently maintained on very low power between the transmitters operating on the common and in the district, and there were also contacts with fixed stations in Kent and Surrey.

The combined number of stations heard by the receiving groups include G2HG, G5OX, G6NF, G2MV, G5ISP, G2OD, G5WW, G5RD, G5DT, G6KW, G8LI, and others not identified. The occasion was voted a great success by all members taking part. The new session commences on September 28th, and all readers able to reach Deptford, and who are interested in S.-W. work, are cordially invited. Inquiries to the Hon. Sec., Mr. A. Wilson, 11, Bennett Street, S.E.13.

Bradford Short-wave Club

THE club's morse instructor and technical adviser is returning to the club on Friday, July 23rd, and it is hoped to complete with the class the final speed practice, up to "full" licence test standard. After this it should be a simple matter for those who wish to go still further to get their reading practice from almost any short-wave C.W. transmission.

The instructor is Mr. K. Abbott, of the Radio Interference Department of the G.P.O., and he has had extensive experience with the Cunard Line. Anyone interested is invited to bring a pair of 'phones and join in. Hon. Sec., Mr. G. Walker (2AWR), 33, Napier Road, Thornbury, Bradford.

Newcastle Radio Society

COMMODIOUS headquarters have been obtained at 2, Duke Street, Newcastle-on-Tyne, where prospective members will be welcomed at the meetings on Thursdays from 7 to 10 p.m., and Sundays 6 to 9.30 p.m. A programme has been arranged for new-comers to radio, which is also a refresher course for the experienced, and ranges from the crystal set to the multi-valve broadcast and short-wave receiver. Practical construction is followed by a talk on theory and design. Morse instruction is given in the final half-hour of every meeting, and non-members are invited to attend to gain some knowledge of club life. A visit to the Newcastle Studios and transmitter is shortly to be arranged and additions to our party can be planned if applications are made to the Hon. Sec., G. C. Castle, 10, Henry Street, Gosforth.

Radio Society of Great Britain (Bristol Area)

AT a meeting of the above society held at King's Corridor, Old Market Street, on Thursday, July 1st, an interesting demonstration was given by Messrs. Lissen of their new Hi-Q short-wave components. A feature of the demonstration was the exhibition of a coil unit capable of tuning from 4.8 metres to 90 metres, and a slow-motion dial which has a scale equivalent to one over 8ft. in length. Everybody is welcome at the meetings held by this society, and new members will be given a cordial reception. The secretary, A. J. Webb (2AJW), 12, Mervyn Road, Bishopston, Bristol, 7, will be pleased to answer all inquiries.

UNIT CONSTRUCTION

(*Continued from page* 448)

Cases

Alternative suggestions are shown in Figs. 1 and 2, for cases or panel arrangements. All have their advantages and disadvantages; personally I favour the arrangement shown in Fig. 4, and although it is a little more trouble to make, the sloping panel seems ideal from the point of view of manipulation of the controls, while all the components are well protected from dust and stray wires.

Note that the top strip, on which the valve-holder is mounted, is fastened to the panel, thus allowing the complete assembly to be removed easily.

Chassis Construction

What might be termed the other class of unit construction is shown in Fig. 4, where it will be seen that a wooden chassis has been constructed to hold panels cut to a predetermined size.

The arrangement is very much easier to make as it eliminates all case or box work, but it is not so flexible as the first suggestion. In fact, it becomes more nearly a constructed receiver of rather crude design rather than a neat assembly of "units." However, it has certain advantages inasmuch that it can be picked up bodily, it is cheaper to make, and less skill or work is required.

Letters from Readers

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

Signal Surges

SIR,—With reference to R. G. T.'s query in your issue of July 3rd, I too have experienced these noises, and cured them by adequate anode resistances, together with balancing the voltages on the screen and anode of the screened grid.—JOHN MULVANY (Worthing).

From a Reader in the United States

SIR,—Though it has been quite awhile since I last wrote, I am still a regular reader of your fine publication which I receive weekly from a friend on your side of the pond. With regard to the Costa Rican station mentioned in the June 19th issue as TILX, no doubt you refer to TILS, of San José, which operates daily from 5.0-10.0 p.m. (C.S.T.) on 5,905 kc/s. There was some discussion recently, as some logs listed this station as TIMS, but I reported to them, and received a veri bearing the letters TILS. With summer in full swing, DX is not very good. VK2ME, 3ME, 3LR, VPD2, JVN, PLP and PMN, etc., continue to gain in signal strength almost daily, but we consider these stations as "locals," and do not bother to listen to them much. W1OXDA, the schooner *Morrissey*, is again being heard on 20 metres in QSO with other 'phones. It is usually heard in the afternoon and occasionally around midnight, operating on the H.F. end of the band. One of the newer South American stations is OAX4P, "La Voz de Haunclayo," Haunclayo, Peru, varying between 5.96 and 6.00 megacycles. I do not know the complete schedule of this station, though it is best heard here from 9.0-10.0 p.m. (C.S.T.).

I now have cards from 47 countries; amateur, broadcast, and comm. 'phone, and since last July I've received 123 cards. Thank you for all the correspondents I have gained through your magazine. Of course, I have not been able to keep up a correspondence with all of them, but have maintained contact with a few, and correspond with them regularly. I should like to hear from more of your readers interested in DX'ing, and who are in their twenties. Wishing your magazine the best of success.—WARREN H. STARK (2117 North 62nd Street, Wauwatosa, Wisconsin, United States).

G6SL—Illicit Use of Call sign

SIR,—We shall be obliged if you will give publicity to the fact that the call-sign of the experimental station at these works (G6SL) is being illicitly used on the 7 m/c amateur band. Some time ago Morse contacts were reported and recent information indicates telephony transmissions of particularly bad quality. The transmissions from G6SL are confined to the 56 m/c band, and at present the station is in the process of reconstruction.

If any readers can give us information which will enable us to trace the offender, we shall be most grateful.—STRATTON AND CO., LTD. (Bromsgrove Street, Birmingham, 5).

CUT THIS OUT EACH WEEK

Do you know

—THAT dust across an insulator between terminals can cause serious leakage.
—THAT care should be taken not to bend the split end plates of a variable ganged condenser as the matching between sections may thereby be upset.
—THAT the chassis of a car may be used as an earth connection when using a car-radio receiver, although it is not in contact with the earth.
—THAT in cases where a chassis is not disposed horizontally, the valves should be examined at frequent intervals in case they have become displaced and are making bad contact.
—THAT if a lightning-arrester is fitted to the aerial it should be covered by means of a waterproof box or similar arrangement to prevent leakage due to moisture.
—THAT a flat filed on a spindle will ensure that a control knob is always placed in the same relative position for calibration purposes.

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

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

A Five-valver for Overseas!

SIR,—Re Mr. Wiggill's letter in the July 3rd, issue of PRACTICAL AND AMATEUR WIRELESS, suggesting that you publish a design for a 5v. short-wave set, I should like to express my interest in this.

I would suggest a design embodying the following features:—

Coil switching, 5-valve superhet, F.C., 2 I.F., DDT and A.V.C., pentode output, range 12-100 and 200-550 metres.

I would also suggest an add-on H.F. unit for those who should require this. I also think that a separate power unit embodying the new Bulgin Vibrator could be used rather than a design in which this was built in. One has to remember that not all people abroad have easy facilities for battery charging, and to such people H.T. by means of dry batteries may be more economical than *via* a vibrator unit.

I am at present on leave in this country, but while abroad last trip I used a straight circuit consisting of an aperiodic H.F. Pen, Det, 1st and 2nd L.F. feeding into an amplifier consisting of 2 Mullard PM22C valves in push-pull. H.T. of 150 volts 40mA was obtained from a Milnes unit. Results were very good on all wavelengths, but the trouble was (and is to-day more or less unavoidable except by use of a superhet) that selectivity was poor. I defy anyone using a straight circuit in West Africa to sort out the various programmes on 31 metres after dark. A superhet is needed, and I am waiting to see you publish a design on these lines, as I am quite certain that the amount of interest that would be taken by your short-wave readers would amply justify it.—D. T. SMITH (Weston-super-Mare).

A Good DX Log: Correspondent Wanted

SIR,—Not having seen a short-wave log from this part of London before I am submitting mine. Being a schoolboy, it may be of interest to other young readers. My receiver is an o-v-1.

C.W. stations heard during the last three months are: ZL3KB, 4GW, VK2DA, 3OW, 3XD, 5GF, 6FL, K4DTH, 4EJF, 4UG, K5AA, K5AC, 5AF, 5AG, 7FYI, VS7MB, VU2BA, 2DY, 2DR, XE1AG, NY1AA (7 mc/s), LU7AZ, PY3BP (7 mc/s), CX1BG, W7AMX, U9MF, 9ML, ZS1AH and VP2TG. 'Phone stations also heard here during the last three months are W6ITH (28 mc/s), K4ENY, CE1AR, 3DW, HK1AN, 3JA, CX3GA, HI5X, HI7G, OA4AL, 4AN, 4R, YV5ABE, 5AN, VP5PZ, PK1MX, VU2CQ, OQ5AA and OQ5RM (both Belgian Congo). On 56 mc/s: G2HG, 2KI, 2KX, 2NH, 5HF, 5JW, 5KH, 5MA, 6OW, 6RS, 8FV and 8VK.

I should very much like to correspond with any overseas reader. My age is 16 years.—F. E. ROSE (14, Parkway, Raynes Park, London, S.W.20).

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are drawn full size.

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

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

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

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

PRACTICAL WIRELESS	Date of issue.	No. of Blueprint.
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Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
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One-valve : Blueprint, 1s.		
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Leader Three (SG, D, Pow)	22.5.37	PW55
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen(RC)	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF) Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
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Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
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Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, H.F Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
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F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
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D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve: Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES		
Three-valve : Blueprints, 1s. each.		
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Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
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One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
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New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
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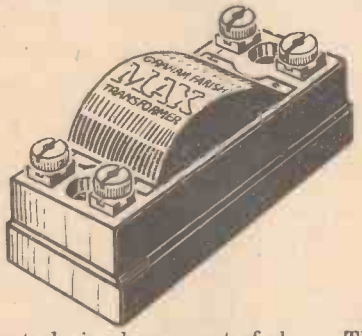
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF, Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C.4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consolectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, O, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-Valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen)	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D. Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	*Jan.* 19 '35	AW463
The Carrier Short-waver (SG,D,P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-Wave World-Beater (HF, Pen, D, R.C., Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM309
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New-Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Transformer Ratios

"I understand that it is possible to obtain more than the transformation ratio given on an ordinary L.F. transformer by using certain methods of connection. I wonder if you could tell me how to do this."—A. P. R. (Catford).

WHEN the transformer is included in the usual way in the anode circuit the ratio will be as indicated by the makers. If, however, you adopt the parallel-fed method then the primary and secondary windings may be joined in series



so as to be in phase or out of phase. Thus the ratio will be altered, and if in phase an additional 1 to 1 will be obtained, whilst if out of phase a loss of 1 to 1 will be obtained. With a 5 to 1 transformer, therefore, you can obtain 4 to 1, 5 to 1 or 6 to 1. A special component is manufactured for this arrangement by Messrs. Graham Farish, and is shown above. With this particular transformer, using the parallel-fed arrangement it is possible to obtain ratios of 1-1, 1-2, 1-3, 1-4 and 1-6. This component costs 4s. 6d.

Valve Connections

"I have been using a set and amplifier in which American valves were employed and after some tests I have replaced one or two valves by English types. I cannot, however, find a suitable substitute for the 24 H.F. valve and have tried several English S.G. valves without success. Every one I have plugged in has resulted in no signals. I have naturally modified the heater supply to accommodate the correct voltage, but I wonder whether there is any other peculiarity which prevents me from making the necessary substitution."—F. G. D. (Edgware).

YOU have undoubtedly overlooked the fact that in the American valve the top cap is a grid connection, whereas in the English S.G. valve the anode is brought out to the top cap. This will, of course, make a considerable difference and no signals will be heard by merely changing valves. You will have to change over the lead to the cap and that to the anode pin on the base which, in the American valve is that on the left of the heaters, looking at the underside of the valveholder and with the heaters at the bottom.

Tone-control Circuits

"I am anxious to try out the tone-control circuit shown in Fig. 5 on page 389 of your July 10th issue, but no values are given for the various condensers and resistances. I should be glad, therefore, if you could give me the approximate values for these components."—P. H. B. (Stoke-on-Trent).

RULES

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

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

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

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

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

THE values recommended by the writer for the Fig. 5 arrangement are as follows: R1—100,000 ohms; R2—300,000; R3—1 megohm (tapered); C2—.00025 mfd. and C1—.01 mfd. In this arrangement the critical value for the high and low-note boosts is 2,000 c.p.s. and 150 c.p.s.

Local Station Quality Sets

"I would like to construct the battery set using 230 XP's in the output stage. Will you please name two suitable push-pull transformers which could be used for this design? I have a moving-coil speaker with 10-ohms speech coil and matching transformer which I should like to use."—A. J. (Dartmouth).

AS your speaker is fitted with a matching transformer, this may be used if it is provided with a centre tap. If not, you should use an output choke (centre-tapped) or remove the speaker transformer and use an output transformer designed to provide a correct match for a 10-ohm speech coil. We recommend either the Varley H.D.P.P. or the Ferranti A.F.5c for the input component and the Varley DP.7 output transformer or Ferranti OPM6c. If your speaker has a centre-tap then the Varley DP31 choke may be used.

An H.T. Problem

"I have a Heayberd H.T. eliminator which I use in place of an H.T. battery. There are 4 plugs, H.T. —, H.T. 1, S.G., H.T. 2, and H.T. 3. Can you please give me the voltages supplied by this unit? I am also anxious to run a trickle-charger off this eliminator. I would require to charge at 2 volts 40 A.H. from the H.T.3 plug. Can you give me the value of the resistance required to do this if it is possible?"—D. B. (Beddington).

IT is impossible to give you the output from the unit as the exact type is not known. There are various models made by the firm in question and the output varies according to the service for which the unit is intended. With all H.T. battery eliminators, however, the current supplied will only be a matter of a few milliamps, whereas to charge an accumulator you require at least ½ an amp. Therefore, you cannot carry out your charging arrangement, for which purpose you will have to obtain a special metal rectifier as mentioned in our recent issue when we dealt with battery charging. (See our issue dated July 3rd last.)

1937 Crystal Set

"I am anxious to make the 1937 Crystal Set and should like the address of the Jewel Pen Company, who supply the crystal which is specified."—J. A. F. (Eton College).

THE address of the Jewel Pen Company is 21, Gt. Sutton Street, E.C.1.

Experimenters' 1-valve Set

"I wish to increase the selectivity of the one-valver by the Experimenters which I have just built. On consulting the diagram I find that a pre-set condenser of .0003 mfd. should be used, but note that a reference to .003 mfd. is given. What value should I use in this case?"—R. W. D. (N.W.11).

THE maximum capacity of the pre-set condenser used in the aerial lead should be about .0003 mfd. There is no objection in using a component having a value of .0005 mfd. and if you so desire you may even use a fixed condenser. In this case various values should be tried from .00005 mfd. up to .0005 mfd. In your particular district with this receiver you will probably find that a .0001 mfd. fixed condenser will be quite satisfactory, but the advantage of the pre-set condenser is that you can adjust it and thereby find the optimum value for your particular local conditions, aerial length, etc.

The coupon on page 456 must be attached to every query.

Miscellaneous Advertisements

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

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Surplus, Clearance or Secondhand, etc.

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Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

1937 Short-wave Catalogue only (3 times enlarged) price 1½d., post free.

44, HOLLOWAY HEAD, BIRMINGHAM 1

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

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

WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted or rewound. Fields altered. Prices Quoted including Eliminators, Loudspeakers, Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service. Estimates Free. L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 163a, Strand, W.C.2. Over Denny's the Booksellers. Temple Bar 9338.

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NEW 1937 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT, 13 to 86 Metres without coil changing. Complete Kit and Circuit, 12/6. VALVE] GIVEN! FREE ! DE] LUXE MODEL 14 to 150 Metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

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SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils, 14-150 metres, 4/- set, with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

COIL FORMERS in finest plastic material, 1¼in. low-loss ribbed, 4- or 6-pin, 1/- each.

The New **"Premier" Short Wave CONDENSERS,** with Trolitul insulation. Certified superior to Ceramic. All-brass Construction. 15 mmfd., 1/4; 40 mmfd., 1/7; 100 mmfd., 1/10; 160 mmfd., 250 mmfd., 2/6. S.W. H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion, .00015 Tuning, 3/9; .00015 Reaction, 3/3.

Famous **EUROPA MAINS VALVES.** 4 v. A.C. and 20v. .18 Universal. All standard types, 4/6. I.H. Pentodes and F.W. Rectifiers, 5/6.

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

AMERICAN VALVES. Genuine American **HYTRON** and **TRIAD** first-grade Valves. 3 months guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves all types, 6/6 each. Genuine American **DUOTRON** Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. **OCTOL** bases, 9d. each.

3-WATT A.C. AMPLIFIER, 2-stage for mike or pick-up. Complete kit of parts with 3 valves, 40/-. Wired and Tested, £2/15/0.

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

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each. **PICK-UP HEADS** only, 4/6 each.

PREMIER MAINS TRANSFORMERS, wire-end type with screened primaries, tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. **H.T. 8 & 9 or H.T.10** with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., 8/6. 250-250 v. 60 m.a., 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 8/6. 350-350 v. 120 m.a., 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 10/6. Any of these transformers with engraved panel and N.P. terminals 1/6 extra. 500-500 v. 150 m.a., 4 v., 2-3 a., 4 v., 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., **17/6 SPECIAL OFFER PHILIPS MAINS TRANSFORMERS.** 250-250 v. or 300-300 v. at 800 m.a., 4 v. 5 a., C.T.; 4 v. 1 a. Tapped Primary 100-250 volts 6/11. 450-450 v. at 150 m.a. or 500-500 v. 100 m.a., 4 v., 4 a. C.T. 4 v. 4 a. and 4 v. 3 a. Screened Primary. Tapped Input 100-250 v., **12/6. AUTO TRANSFORMERS,** step up or down, 60 watts, 7/6; 100 watts, 10/-. **SMOOTHING CHOKES** 25 m.a., 2/9; 40 m.a., 4/-; 60 m.a., 5/7; 150 m.a., 10/6. Speaker Replacement Chokes, 2,500 ohms, 60 m.a., 5/6.

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ROLA latest type P.M.s, 15/-. **R. & A.** mains energised 2,500 ohms field, 10/6 each; **Jensen P.M.s,** 10/6.

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TUBULAR CONDENSERS, non-inductive all values up to 5 mfd., 6d. each. 1 Watt Resistors, 6d. 4 Watts, 1/-.
All Goods previously advertised, still available.

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PRACTICAL AND AMATEUR WIRELESS, 24/7/37.

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12 Summerhill

FIRST STEPS IN SERVICING—See page 464.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3d. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

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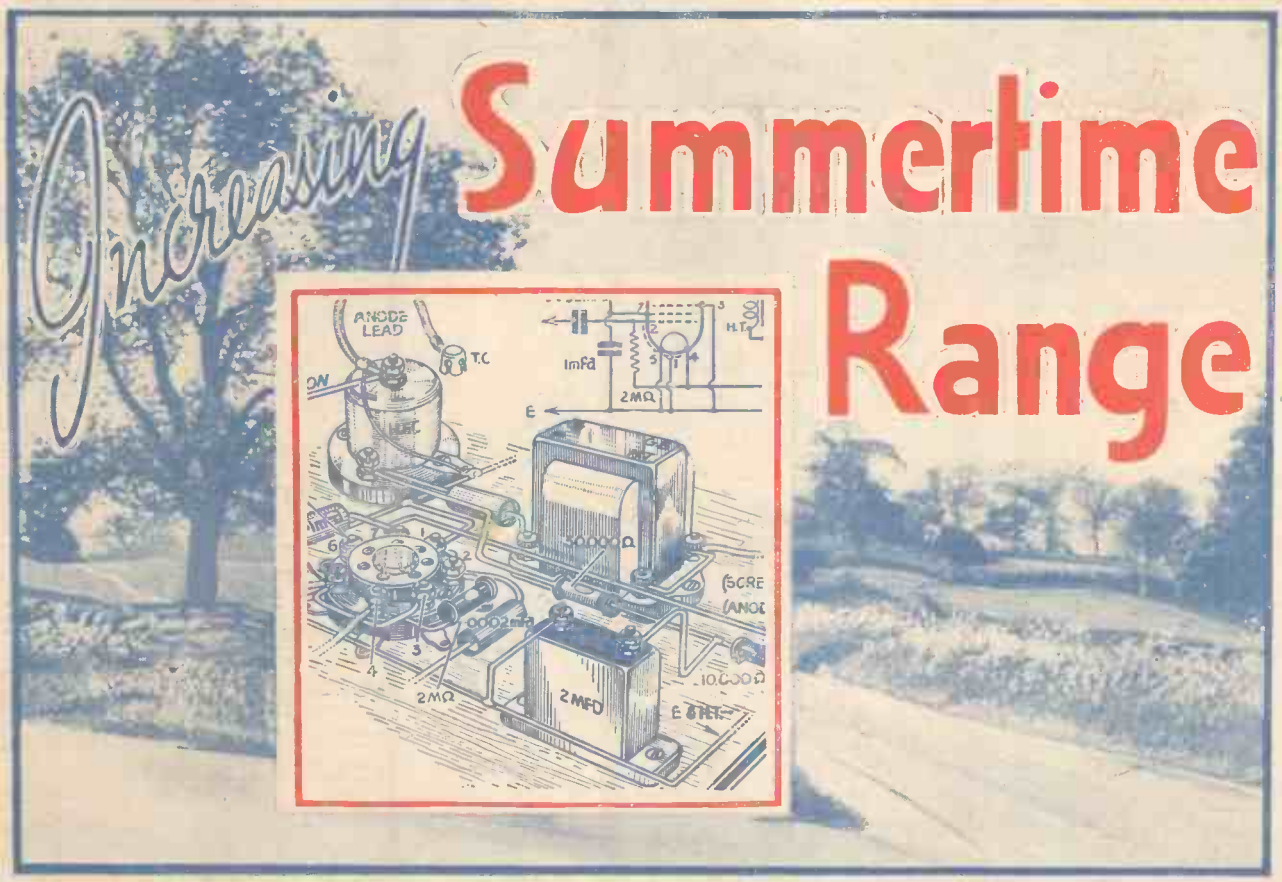


ABOUT INDOOR EARTHS—See page 461

Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. X. No. 254. July 31st, 1937.

ROUND *the* WORLD *of* WIRELESS

Summertime Range

PRACTICALLY every listener now realises that the long hours of daylight and the accompanying atmospheric conditions result in a serious shortening of the range of reception, as well as an increase in the atmospheric noises which the receiver picks up. Many listeners, therefore, feel disappointed during the summer months and feel that radio is not worth while, failing to realise that with a little care it is possible to bring back performance to the same efficiency as is obtained in the remaining period of the year. In the article on page 468 we deal with the various devices which may be built or incorporated for this purpose, and, of course, the most effective for those using a simple detector stage, is the inclusion of an H.F. amplifier. This may be built as a small add-on unit which may be disconnected when it is not required. Other points of importance are the maintenance of a good moist earth connection when a buried earth is used, the cleaning of the aerial system to remove dirt and carbon deposits which may be accumulated during the past season, and the general all-round inspection and tightening of connections which every keen listener should carry out periodically. The remaining details will be found on page 468.

Television Ceases

ON the 24th of this month, the television transmissions officially closed down for three weeks, but it must be remembered that a slight modification has been made in the plans originally proposed by the B.B.C. Instead of a complete cessation of programmes, certain special items will be broadcast during the three weeks overhauling period, and apart from broadcasts of the Davis Cup, special test transmissions for set designers and others will be given.

New Gramophone Records

IT is announced that a new gramophone record company is to be started in England to develop and market "Master" records. These discs are well known in America, and the new company will endeavour to achieve the same standard in this country by recording outstanding British artists in a series of new style music recordings.

Aircraft Radio Guide

FOLLOWING the lead set in Europe, American air lines are now experimenting with the directional aircraft radio guides to reduce the number of accidents which have occurred in the U.S.A.

Musical Rivalries

THE most famous musical rivalry is that existing between Piccini and Gluck. A heated conflict was waged between partisans of these two composers, and Piccini is now practically forgotten, although he was the composer of several operas which were famous in their day. A musical programme based upon this particular subject will be presented by A. Brent-Smith, the Gloucester composer, from the Midland station on August 5th.

Radio Sleep

ANOTHER short-wave experiment has resulted in a measure of success in the Soviet. A scientist has succeeded by means of certain electrical apparatus in inducing sleep in a frog, and subsequent tests on animals have shown that it is possible to use the apparatus without ill-effect. The scientist eventually tried out the apparatus on his own body, and successfully produced sleep which ceased immediately the apparatus was switched off.

ON OTHER PAGES.

The Pipers' Guild

ON August 3rd Welsh listeners will hear a programme of Music Making on Bamboo Pipes, given by members of the Seventh Summer School of the Pipers' Guild from Bangor. The Guild was founded in 1933 and has now over a thousand members in the British Isles with five affiliated guilds abroad—in Ireland, Belgium, Denmark, France and Switzerland.

Seashore Life

IN the last talk of the series "Life Here and There," to be given from the Northern transmitters on August 2nd, the marine biologist, J. H. Orton, Professor of Zoology at the Liverpool University, will discuss such things as shrimps and seaweed, as well as other items to be found in Northern seashore rock pools.

New Game Laws

A BILL introduced in Northern Ireland last autumn has changed the dates of the seasons for shooting partridge, woodcock and snipe, and shortened the season for shooting all species of duck. Sir Dudley McCorkell will inform listeners in the Northern Irish programme on August 6th of the reasons underlying these new laws.

Eisteddfod Week

THE Royal National Eisteddfod of Wales is to be held at Machynlleth during the week beginning August 1st, and the first broadcast will be on August 1st, when listeners will hear a Welsh service from Machynlleth Parish Church. The address will be given by the Rt. Rev. the Bishop of Llandaff. On August 2nd the opening ceremony will be broadcast from the Eisteddfod Pavilion, and will include short speeches of welcome by the President, Lord Davies, and the Archdruid, Rev. J. J. Williams. On August 3rd there will be two broadcasts in connection with the Eisteddfod. The first will be from the Eisteddfod Field, when numerous personalities will be introduced to the microphone; the second from the Eisteddfod Pavilion, when a Children's Concert will be broadcast.

On August 4th Sir Adrian Boult will conduct the Eisteddfod Choir and Orchestra in a Choral and Orchestral Concert, with Mary Jarred (contralto) and Harriet Cohen (pianoforte).

In the National programme on August 5th, the ceremony of the Chairing of the Bard will be broadcast. This will include the Adjudication of the Chair Poem and the Presidential Address by the Rt. Hon. D. Lloyd George.

ROUND the WORLD of WIRELESS (Continued)

Holiday Concert Party

THE Holiday Parade Concert Party, produced by George Hay and Gordon Lane, will broadcast a variety programme from the King's Hall, Aberystwyth on July 28th. There will be three vocalists, George Sylveston (bass-baritone), who is an R.A.M. exhibition scholar; Gaston Thomas a Welshman, principal tenor of the O'Mara Opera Company; and Patricia Davies (soprano), who is a pupil of Stiles Allen. This will be the first broadcast by this Concert Party, and it is understood that the comedian and Madge Hayden (comedienne) have some amusing things in store for listeners.

Bubbles from Boscombe

"BUBBLES," a concert party presented by Will Seymour, will be broadcast from the Pier, Boscombe, on August 7th. The artists will include Renee Houston and Donald Stewart, the Savoy Junior Band, and Mabel Constanduros in another Buggins episode.

Dante, the master of magic, brings a new kind of baby from under the cloak—the Pye "Baby" Q But it speaks so nicely, and is so small and well-behaved, that it is a universal favourite.

Musical Mixture

A PROGRAMME entitled "Musical Mixture," to be broadcast on August 3rd in the Western programme, will include Fudge and Huckman in Syncopated Piano Duets; the Three Nomads in Close Harmony; and Emilio, the Wonder Boy Accordionist.

Irish Guards Band

CAPTAIN J. L. T. HURD will conduct the band of His Majesty's Irish Guards on August 3rd, in a popular Midland Regional programme broadcast from the Pump Room Gardens, Leamington Spa.

INTERESTING and TOPICAL NEWS and NOTES

The band had the distinction of being the only band in the British Army to play in three Peace Processions—London, Paris, and Belfast.

Variety from Worcester

ON August 3rd, theatre variety will be broadcast from the Royal, Worcester, where the bill will include The Four Aces, harmony vocalists; Mary Fuller, in comedy songs; the Geddes Brothers, musical clowns; and Peter White, comedian.

Navy Week

NAVY Week opens on July 31st in Chatham, Portsmouth and Plymouth, and on August 2nd Western listeners will hear a broadcast from Plymouth which will include a description of the scene on Plymouth Hoe from Smeaton Tower; a bird's-eye view of Plymouth from an aeroplane; the ancient ceremony of "Crossing the Line" from the Royal Naval Dockyard, Devonport; and the Harmonica Band of H.M.S. Rodney, from the Alhambra, Devonport.

Organ Recital from Aberdeen

HAROLD COOMBS will be heard again at the organ of the Capitol Cinema, Aberdeen, on August 5th. He will play Selection, "Merrie England," by German; Foxtrot, "Vagabond Fiddler," by Sherman Myers; "Moon Flower," by Henman, and popular Medley, arranged by Coombs.

Malvern Festival Review

THE ninth Malvern Festival will be represented in the Midland programme on August 1st, by scenes of excerpts from the famous plays. These will be chosen and linked together by Sir Barry Jackson, who directs the Festival in co-operation with Mr. Roy Limbert, of the Malvern Theatre. There will be two Shaw plays, "The Millionairess" and "The Apple Cart"; sixteenth-century plays, "Susanna" and "Gammer Garton's Needle"; Sheridan's "The School for Scandal"; Fielding's "Tom Thumb the Great"; and "Return to Sanity," by G. W. Rushton and T. South Mack, a recent play. The players will include Sir Cedric Hardwicke, Hugh Miller, and Elspeth March.

Bournemouth Municipal Orchestra

ELSIE SUDDABY (soprano) will be the vocalist in a concert by the Bournemouth Municipal Orchestra, conducted by Richard Austin, to be broadcast from the Pavilion, Bournemouth, on August 1st.

New Style Dance Orchestra

AL DURRANT and his New Style Dance Orchestra, with Richard English, George McDowell and Leslie Hopkins, will broadcast in the Western Programme on July 28th. Each member of the orchestra plays three or four instruments.

Miss Aileen Stanley, singer of popular songs, is well known as an artiste on the stage, radio and television. At present she is playing with great success in the cabaret at the Café Anglais.

Light Music

JEAN SALDER and his Serenaders will broadcast a short programme of light music on August 1st. This is the first broadcast by the Serenaders in the West of England programme, but it will be their thirtieth broadcast.

SOLVE THIS!

PROBLEM No. 254

When Spicer's home-constructed superhet was given a preliminary test a whistle was heard at the wavelength setting of the stations normally heard on the medium and long-wave bands, but music and speech could not be formulated. On the short-wave band, however, the receiver seemed very sensitive, and numerous morse transmissions were picked up at good strength. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 254 in the top left-hand corner, and must be posted to reach this office not later than the first post on Tuesday, August 3rd, 1937.

Solution to Problem No. 253

A .2 amp. half-wave rectifier should be connected between the mains end of the heater dropping resistance and the H.T. smoothing choke, and to obtain optimum results the value of the heater dropping resistance should be slightly lowered to compensate for the heater resistance of the rectifier.

The following three readers successfully solved Problem No. 252, and books are accordingly being forwarded to them: J. W. Bearon, 38, Maxwell Street, Crewe; W. J. Heathwood, 8, Buccleugh Street, Glasgow, C.3; T. C. Cornish, 105, Lawn Avenue, Gt. Yarmouth.

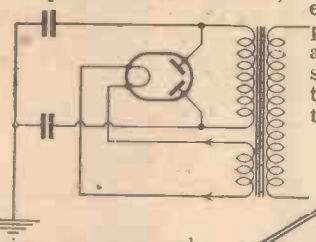
RADIO FAULT TRACING-8

Modulation Hum and Interference are Amongst the Subjects Dealt With in This Concluding Article of the Series

EXCESS hum that comes in only when the receiver is tuned to a station is produced whenever a low-frequency A.C. voltage modulates the H.F. oscillations in any of the pre-detector stages.

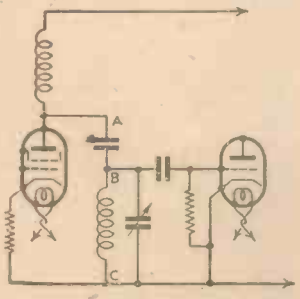
The fact that the hum appears to be "tunable," as distinct from the ordinary case of mains hum previously considered, does not necessarily clear the main smoothing system and, as a matter of fact, the smoothing condensers and chokes should be checked over as the first move.

A failure of insulation between cathode and heater of an H.F. valve, causing A.C. potentials to be impressed on the cathode, is a possible cause of modulation hum, so valve substitution may provide the cure.



As far as the valves on the H.F. side of the receiver are concerned, the "smoothness" of the anode and screen voltage supplies, although mainly dependent upon the main smoothing system, is to a small extent also dependent upon the decoupling resistances and condensers and bias resistance by-pass condensers, and these items should be tested. Furthermore, the valve operating voltages should be checked as any abnormal asymmetry of working characteristic can be a contributory cause of modulation hum.

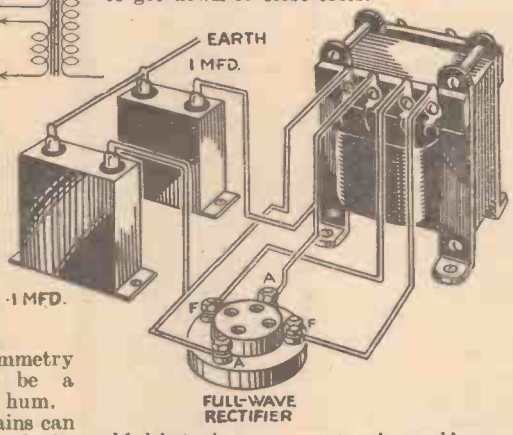
High-frequency on the supply mains can cause modulation hum trouble, and the modern A.C. receiver usually employs a mains transformer which has an earthed electrostatic screen between primary and secondaries, the screen being provided to keep mains H.F. out of the receiver. The earthing of the screen is an important matter, and a break between screen and earth must be considered as a possible fault. In the cases of D.C. and universal receivers, it is common practice to have mains H.F. filters, and any chokes and condensers so employed should be tested. Possible faults are shorting turns or open-circuited condensers. In A.C. sets of earlier design the mains H.F. problem was often tackled by using a condenser between one side of the mains and earth, or two condensers in series across the mains with the centre point earthed.



In this arrangement the ripple voltage across the grid circuit BC is practically negligible.

Crackling Noises

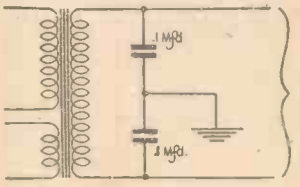
It should perhaps be mentioned, as a matter of form, that noise trouble can be caused by interference picked up from sources external to the receiver. As far as receiver faults are concerned, crackling or spluttering noises are the result of rapidly-varying contact resistance or rapidly-varying insulation leakage, and there is hardly a wire or a component in any of the electrical circuits that could not be a potential offender. Since, at first, practically everything in the receiver is under suspicion, it is desirable that, as a first move, the faulty stage be located. It is then time to get down to close tests.



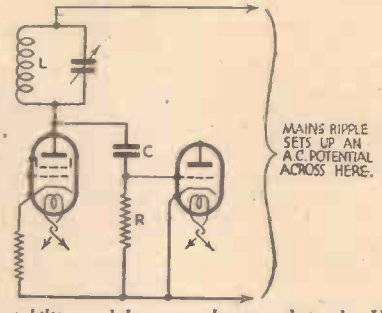
Modulation hum may sometimes be cured by means of fixed condensers connected as shown here.

With a battery or A.C. mains receiver, pulling out valves one by one (with the exception of the output valve) will often prove to be a satisfactory way of tracking down the faulty stage. Alternatively, cutting out valve inputs by short-circuiting grid leaks, grid windings, etc., can be employed, and will certainly be the best way with D.C. or universal receivers employing valve heaters in series.

If the noise trouble is still present with all stages cut out, with the exception of the output stage, the fault may quite possibly be in the supply system (batteries, mains rectifying system, or mains transformer). Sometimes the fluctuations caused by the fault will be sufficiently great to show up as noticeable variations of valve anode current, and milliammeter tests in the various anode circuits may possibly be useful.



When the fault is definitely known to be in one particular stage, the valve belonging to that stage should be substituted for test purposes. Once the valve has been cleared it comes to a matter of very close tests of circuit components and wiring.



Instability and hum can be caused in the H.F. stage as the grid is joined to a point midway between L and R as shown here.

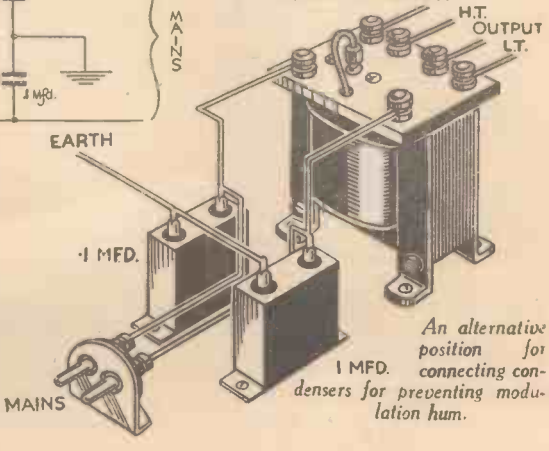
Frequently, intermittent contact troubles in wiring, windings, or resistances can be found by applying short-circuit tests with the receiver in action. Needless to say, where resistances are concerned short circuits should be applied judiciously, never applying a short circuit where a burn-out or an overload may be caused.

It is very often the case that the crackling noises can be exaggerated, or diminished, by pressure on, or slight movement of, the component or wire containing the fault. In view of this fact, "poking about" with the receiver switched on is a legitimate testing method, and a useful tool for the purpose is a bone knitting needle. It is quite possible that the fault may be tracked quite quickly by prodding around the chassis and listening for any changes in the noise trouble as various items are pressed or moved slightly. There is one snag which may crop up, however; sometimes when the faulty part is suspended between wires, or is one of several parts that are panel-mounted, it may happen that pressure on a neighbouring part mechanically disturbs the faulty one. In such a case the wrong part may be blamed until the tester finds out his mistake. It is wise policy, when it is found that disturbing any particular part causes changes in the amount of noise, to operate on the immediately adjoining wires and components before jumping to conclusions. If this precaution is taken, the snag referred to should not lead to any difficulties.

Final Hints

As the old hands know, there is more in fault-tracing work than the possession of theoretical knowledge, plus good testing apparatus. Some

(Continued overleaf)



An alternative position for connecting condensers for preventing modulation hum.

RADIO FAULT TRACING

(*Continued from previous page*)

service jobs are bound to be difficult from the very nature of the faults but, quite apart from such cases, it is the easiest thing in the world to make any particular job unnecessarily difficult and the following pieces of advice are profferred in the hope that they may help the beginner :

Never fail to use your eyes.

The writer must confess that he once employed a most complicated series of meter tests to track down a fault which was causing very queer symptoms. When the fault was located it turned out to be that of a displaced bare wire shorting against another—a most glaring fault that was plainly visible. Since that occasion the writer has never allowed himself to forget that eyes were made before meters. A close, visual inspection of a chassis will very often ease the position immensely. Look especially for displaced wiring, signs of over-heating or burning, loose blobs of solder or other particles, badly-soldered joints, smears of flux, acid corrosion, and frayed flex wires.

Take the fullest advantage of your testing gear.

When a particular meter test is not proving to be very helpful an alternative meter test may greatly improve matters. As an example, consider the case where it has been found that there is some fault which is putting on a high resistance leak between an H.T. line and chassis. There are a number of fixed condensers any one of which may be the culprit, and it is decided to disconnect these one by one and to watch for the disappearance of the leak fault. It so happens that the leak resistance comes in shunt with part of a resistance potentiometer network and, owing to the presence of the latter, an ohmmeter indication would give only a very slightly changed reading as a result of the fault clearance. In such a case it would be far more satisfactory to employ a voltmeter indication between the H.T. line and chassis.

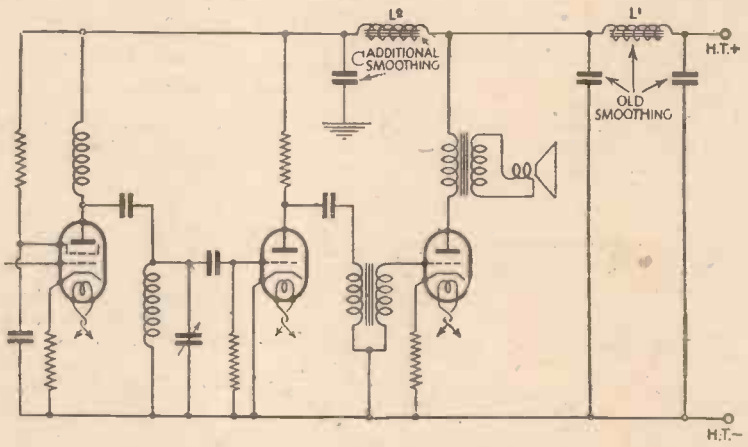
Always assume the simple before the complex.

It does not by any means follow that because the faulty symptoms are unusual, or puzzling, that the fault itself is necessarily of abstruse character. Suppose you met a case of a superhet with which plenty of stations can be heard if a quick run round the dial is made, but which exhibits the peculiarity that it is almost an impossibility to tune in any one station properly. To make the situation clear, it should be understood that if the tuning control is turned slowly until the maximum of the wanted station is heard and one passes through the maximum (as would normally be the case when tuning in), the attempt to come back to the exact maximum is defeated because it is found that the tuning has apparently changed slightly. What would your first ideas be about such a case ? Actually, the trouble can be caused by a slight back-lash slip on the condenser drive. That fault is simple enough, but could easily catch anybody for a time, particularly if the back-lash does not affect the pointer (or dial), and if it is only just sufficient to make close tuning difficult.

Beware of consequential faults.

A decoupling condenser breaking down might lead to the burning out of a resistance. Possibly the resistance fault would be very quickly located, but it would not be a satisfactory procedure to replace the resistance in the hope that this would put the receiver right. Actually the resistance fault would be the consequence of the condenser breakdown, and merely replacing the resistance would not cure the main trouble. To prove that a fault is consequential in character by the process of demonstrating damage to a replacement is a very undesirable way of going about a job. No hard-and-fast rules can be given as to how consequential damage can be recognised, but the possibility should certainly be considered in such cases as the following :

Valves with open-circuited filaments.
Overheated or burnt-out resistances.
Overheated chokes or mains transformers.
Soft rectifier valves.
Rectifier valves with low emission.



Additional smoothing can be incorporated as shown here.

PROGRAMME NOTES

Music Items

A CONCERT of light classical music will be broadcast from the Casino at Knocke on August 1 (National), in which Charles Panzera will be the soloist.

On August 2nd (National) the B.B.C. Symphony Orchestra will be conducted by Hans Adolf Winter, premier conductor of the broadcasting station at Munich. The programme will consist of Elgar's Overture, "In the South" ; Wagner's "Siegfried Idyll," and the Suite, "Tsar Saltan," by Rimsky-Korsakov. An exchange visit will be paid to Munich by a B.B.C. staff conductor, Clarence Raybould, who has been invited to conduct there by the German broadcasting authorities.

The Symphony, "A Rustic Wedding," by Goldmark, will be broadcast under the direction of Julian Clifford on August 3rd (National). Goldmark, who died in 1915, was a Viennese composer, and author of the well-known opera, "Queen of Sheba," which was performed for the first time in England by the Carl Rosa Company in Manchester, in 1910.

Comedy Opera

WITH the aid of London principals a radio version of Alfred Cellier's comedy opera "Dorothy" will be broadcast on July 28th in the Midland programme, and on July 29th on the National wavelength. The work has been adapted by Martyn C. Webster, who will produce, and Reginald Burston, who will conduct the B.B.C. Midland Orchestra. An interesting point is that Mr. Burston conducted at the stage show of "Dorothy" during its post-war revival. "Queen of My Heart" is the best known number in this opera. A large cast includes Wynne Ajello in the name-part ; Jan Van der Gucht as Wilder ; Sybil Evers as Lydia ; Arnold Matters as Harry Sherwood ; Aubrey Standing, Godfrey Baseley, Alfred Butler, Denis Folwell, Fred Forgham (of Leicester), Ethel Williams, Dorothy Summers, Vera Ashe, and Hugh Morton.

Variety to Come

SPECIAL dance music production programmes will be broadcast (during the next few weeks) by Louis Levy, Jack Payne, Debroy Somers and Peter Yorke, while Jack Hylton will present three variety programmes which, with his Band, will bring past, present—and, perhaps, future—stars of variety to the microphone. Victor Silvester and his Band, whose recent programmes, listeners will remember, were completely devoid of vocalists, will also be heard again. A dance music series has already commenced, by John Burnaby, entitled "The Song is Ended"—which will recall "hits" of the period from 1920 to 1930.

Modern Follies : Northern Ireland

WHATEVER the temperature may be, the calendar informs us that summer has come, and with it the season of Concert Parties. And so on August 3rd the microphone will go to the Floral Hall, Bellevue, Belfast's pleasure garden on the Cave Hill, where Fred Beck is presenting "The Modern Follies." Fred Beck is very popular in Belfast, and has been responsible for many concert party productions in the city, and the broadcast of his latest show, "The Modern Follies," will be welcomed by many who cannot see it for themselves at the Floral Hall.

Recital from Cheltenham

MARIE HALL, the well-known violinist, and Philip Taylor, director of music at Cheltenham College and honorary conductor of Cheltenham Orchestral and Choral Societies, are to give a violin and organ recital from Cheltenham College on August 4th in the Midland Regional programme. The organ is a three manual, with fifty-five draw stops. It was built by Harrison and Harrison, and is one of the most up to date of public school organs.

ABOUT INDOOR EARTHS

Suggestions for Different Types of Earth Connection Which May be Used by Flat Dwellers and Others Who Have No Outdoor Facilities

By W. J. DELANEY

LAST week we discussed the best method of arranging an aerial in situations where it was not possible to erect the usual outdoor arrangement. As a natural sequence we must now discuss the earth connection to be used in such cases. It has been found, perhaps unfortunately, that many receivers, especially commercial models, will not function satisfactorily if a good earth connection is omitted. In many cases, indeed, a loss of efficiency of at least 50 per cent. will be experienced if a poor earth is employed. In certain circuits it is also possible that instability will be experienced in such cases, and where an H.F. volume control is fitted it is often found that without an earth connection this can only be advanced a short distance before the receiver bursts into oscillation. Firstly it must be borne in mind that for an earth connection it is not necessary to get at the actual ground in order to bury a wire. There are many places in a normal residence where access may be had to some metallic body which itself is in good contact with the earth and thus this may be employed as an "earth" connection. Similarly, in a car or boat the metallic chassis or body will serve in a similar manner.

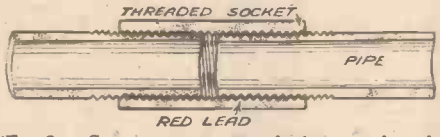


Fig. 2.—Some pipes are painted when joined, and thus a high resistance may be set up, resulting in inefficiency.

Water Pipes

The first metallic body in a house which comes to the mind when considering this important item is the water piping, but it is first necessary to remember that this may require careful examination before it is employed. Fig. 1 shows in diagrammatic form the usual water system of a house, from which it will be seen that there may, perhaps, only be one short length of pipe available which is in direct contact with the earth. The main pipe will no doubt enter at some convenient point where a main tap is provided so that the supply may be turned off in the event of a burst pipe. From that point it may pass inside the wall to a tank situated in the roof, and there may in addition be one or more taps fed from this pipe on its way to the cistern. Therefore, only these pipes may be considered as good earth connections for the following reason. The joint between successive sections of a water pipe are often painted when they are fitted, and the paint may easily fill the thread at the joint in such a manner that, from an electrical point of view, a high resistance is set up. Obviously, such a pipe will be divided into sections, and by connecting the receiver to an "upper" section, a high resistance will be interposed between the earth terminal and the ground, resulting in a poor earth connection and perhaps instability as already mentioned. Therefore, when using the water pipes for earth, make quite certain that the main pipe is selected, and try, if possible, to connect your earth terminal to the nearest section to the buried pipe. If connection has to be made to the ordinary piping, the paint or dirty surface should first be thoroughly cleaned and a proper earthing clip employed.

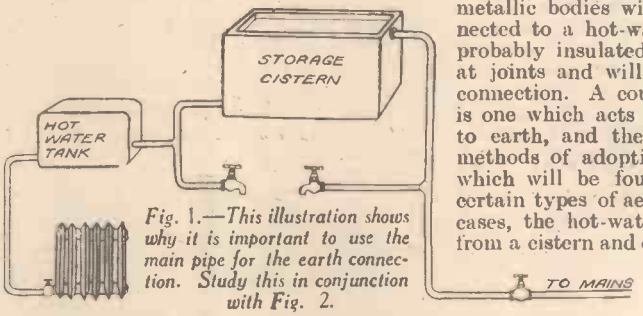


Fig. 1.—This illustration shows why it is important to use the main pipe for the earth connection. Study this in conjunction with Fig. 2.

If the brass tap is employed this also should be well cleaned and if possible the earth lead should be soldered to it. Do not attempt to solder to a lead pipe, and also drain off the water before soldering to the tap to prevent cooling of the soldering iron.

Gas Pipes

Although the gas pipes also go into the ground, they should on no account be employed for a wireless earth connection. There are two reasons for this. Firstly, the joints are thoroughly painted to prevent gas leakage and thus the electrical efficiency is very low, and secondly, there is a serious risk of danger should a mains unit or any other connection to the mains be employed. Due to the insulation at the joints, there may be an air space between two adjacent sections, across which arcing could take place. Although, theoretically, an explosion cannot take place until the gas is mixed with air, there remains a risk due to leakage, and also to static charges which may accumulate in the aerial circuit.

Hot-water Systems

Hot-water pipes, radiators and similar metallic bodies will, in general, be connected to a hot-water tank which is also probably insulated in the electrical sense at joints and will not form a good earth connection. A counterpoise earth system is one which acts by virtue of a capacity to earth, and therefore there are several methods of adopting this form of earth, which will be found very efficient when certain types of aerial are used. In some cases, the hot-water piping, water piping from a cistern and other metallic bodies not in direct contact with earth will often serve as counterpoise connections and provide good results and should therefore be tried before other schemes are tried. If possible, such metallic bodies should be chosen so that they run parallel with the aerial, and thus the location of the earth will probably be the first step in erecting an indoor aerial and earth. For the same reason the positions of such metallic bodies will be found before the aerial is erected, in order that no screening effects will be introduced.

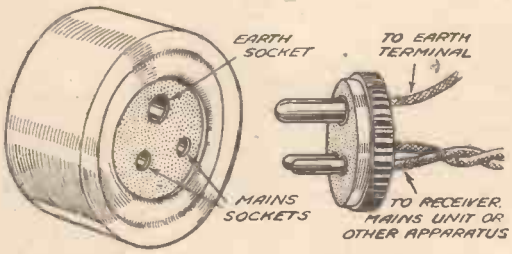


Fig. 3.—An ideal indoor earth connection may be made to the earthing pin on a 3-wire mains system as shown here.

Electric Systems

Where electric mains are present in the house a much more efficient earth may be utilised by connecting to the metal conduit or lead-covered cable used for the mains leads. The earth connection used by the electric supply companies has to be very efficient and all sections of conduit are bonded, and the companies test the soundness of the earth connection when the mains leads are fitted with a special apparatus. Modern systems utilise a separate earth connection and the mains sockets are provided with three connections, one for earth. Thus, the earth terminal may be joined to this pin on the mains plug used with the receiver, or, if a battery receiver is in use, to the pin on the nearest mains plug. In the majority of cases this will be found the best earth connection to employ and will sometimes prove far superior to the usual buried metal earth. Naturally, it is necessary to try out the different schemes suggested in order to find the most suitable for individual conditions.

TRANSMITTING TOPICS

In This Article the Author Discusses Morse Practice, Oscillators, Frequency Multipliers, and Modulators

By L. ORMOND SPARKS

What Are You Doing?

THIS question is prompted by observations I have made during the past ten days, and as it is of some importance, I am going to risk being told to "mind my own business."

I know it is summer time, and that the temptations to get out in the open are many, but surely there is no need completely to shelve the gear and hobby you were so keen on getting.

During the last week or so I have had the pleasure of visiting certain enthusiasts who I knew to be very keen on this transmitting business, and, to be quite frank, I was hoping to find that considerable progress had been made in their work and station. When I came back from my little tour my hopes were badly damped, though not quite shattered.

In case *you* are in the same boat as my friends, the details of what I observed will not be amiss, if only to justify my opening question.

Morse Code

If you are one of those who has not progressed with the "de" "dah" business, I know you will hate the very mention of Morse Code. Whether you like it or not, it is best to make up your mind to master it, because mastered it has to be; that is, of course, *if* you are going to do *anything* with transmitting.

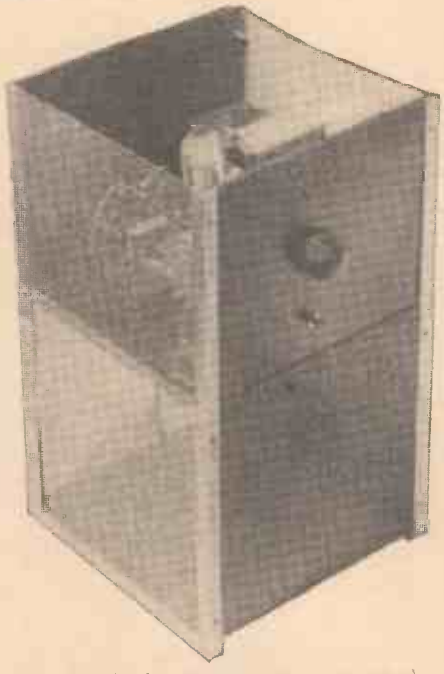
If you are out for a motor trip, hike or cycle ride, or if you are by the sea, in the country or sitting in your garden, there is always that odd half-hour which could be devoted quite easily to a little steady practice of the code. A small buzzer and dry battery does not take up much room or weigh enough to worry about, and being out in the open—under ideal conditions—will make the whole thing seem less irksome, *if* it is that way with you. All this may seem like a lecture, but it is a case of bringing the fact home to you that *you have got* to master the code. Speaking from experience, it is not a difficult matter to find three or four amateurs to meet, say, once or twice a week and form a little class, each taking it in turn with the key. I would suggest, however, that you send groups of assorted letters. Don't use words or work through the alphabet—after you know the code—as such methods lend themselves too readily to guessing.

The A.A. Licence

Since you obtained your A.A. what work have you carried out which has taught you anything? If you have anything to report which might be of interest to other transmitting amateurs, why not drop me a line and let others share in your investigations?

There has been described in past issues sufficient gear to enable most of the essential tests to be carried out, and it is up to every A.A. holder to have such equipment as part of his station.

There is no fun, sense or reason in simply making up a transmitter and assuming it is all O.K. Get in the habit of carrying out every test and experiment you can think of or read about. You will gather a whole heap of valuable information and experience; then, when the time comes for your "full" licence, you will feel quite competent to tackle the construction and operation of a big job. Here are a few suggestions. By the way, apart from the Log-book which you are supposed to keep, and which should contain all details of the time, etc., when you are operating your station, keep a large exercise book for the recording of all experiments and their results. You will find it most handy for reference.



A single-valve 'phone transmitter as described in our issue for January 2nd, 1937.

Oscillators

Fit up a small test panel to enable all forms of oscillators to be tried and compared, making careful note of operating conditions, characteristics, output and circuit requirements.

Work right through the range from the simple Hartley to crystal-controlled triodes and pentodes, on to "electron-coupled" and the Tritet.

This subject provides ample scope for interesting experimental work and, as it might be regarded as the basis of transmitting circuits, too much time cannot be spent on investigation.

The effect of various forms of couplings—so vital to enable the oscillator to drive subsequent valves—is another item which demands a thorough understanding.

"Doubling" or Frequency Multipliers

These are the next things to be considered. In single frequency transmitters they are, of course, not employed, so it is quite possible that a user of such a circuit—like the 2½ Watt Transmitter—will not have had the opportunity to become familiar with their design and operation; therefore, I suggest that a simple circuit should be rigged up to allow experiments to be made. Note the fundamental output of the oscillator, and then compare that obtained at the various harmonics. Note the effect of doubling on the efficiency of the outfit, and pay particular attention to the bias and operating conditions. Note how they differ from ordinary receiver work.

Power Amplifiers

This section provides a most interesting subject. There are numerous circuit arrangements that can be tried, there are also the questions of circuit requirements—voltage and current—output, stability and, of course, efficiency.

Aerial Coupling

Endless experiments can be made in this direction. It is not necessary, as so many seem to think, for a full licence to be held before this and the other suggested work can be carried out. Therefore, all forms of aerial couplings can be tested, their effect on the circuit noted and the whole subject thoroughly explored—even with an A.A.

Modulators

Although most amateurs are fairly conversant with ordinary L.F. amplifiers, the care required for decent modulation (speech) calls for particular attention to the L.F. amplifying arrangements with a transmitter.

Apply all tests for distortion, taking the matter to finer limits than usual. Experiment with microphones, volume controls, input circuits, gain, loading, and power supply smoothing.

Examine all forms of applying the modulation; devote a good amount of time—if much key work is to be done—to key filter circuits, the various ways of inserting the key control and, finally, the note obtained and the characteristic of the signal.

If these suggestions receive consideration, the A.A. man will do more to equip himself for his "full" licence in a matter of months than those who just tinker aimlessly about will do in as many years.

Get busy, as in the near future I hope to describe a Ten-Watt Three Band A.C. Transmitter.

SOMETHING NEW IN STATIC SUPPRESSORS

In this Article Two Simple Circuits for Cutting Out Interference are Described which Operate the Opposite Way to Q.A.V.C.

IT is universally agreed that a really efficient and inexpensive inter-station noise suppressor is one of the greatest needs of the modern receiver designer.

Existing Q.A.V.C. circuits, however, have all one very great defect, which is that they enormously reduce the sensitivity of the receivers in which they are incorporated.

For this reason, manufacturers of receivers fitted with Q.A.V.C. circuits usually provide a switch whereby they can be cut out if signals of low field strength are to be received. These circuits do not noticeably affect the volume of strong signals, however, and thus their main advantage is that they enable the listener to tune from one strong signal

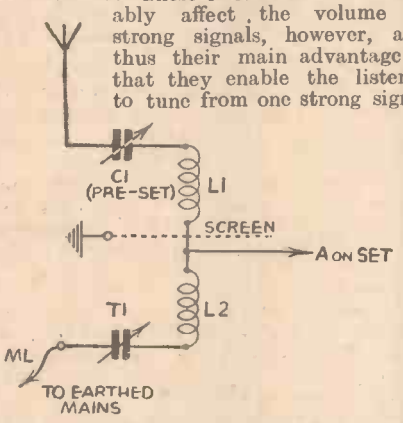


Fig. 1.—A simple circuit for cutting out interference. L1 and L2 are 40 to 60 microhenries each. C1—.0001 to .0003 mfd. T1—.00005-.00025 mfd.

to another without the usual accompaniment of overwhelmingly loud inter-station noise.

Operating Principle

However, here is a new idea in noise suppressing circuits which operates in precisely the opposite way—that is, it weakens powerful "local station" signals, but does not noticeably attenuate low field strength signals. Naturally this system is greatly to be preferred in many cases, as the following example will prove.

If a receiver fitted with a standard Q.A.V.C. circuit is adjusted completely to eliminate all inter-station noise, it will be found in most city localities that this operation has also completely "wiped out" the Luxembourg signal as well, while leaving the volume of the Droitwich signal practically unaltered.

With this circuit the volume of Droitwich would be noticeably reduced, but Luxembourg would be found at its original volume, completely freed of its former background of man-made interference.

It is obvious which is the better system, as strong signals, solely because they are of high field strength, are never marred by a noisy background, and the loss of a few milliwatts from the "local station" type of signal is surely well worth the great benefits conferred by this new circuit. The basic principle embodied in the circuit is extremely simple, and can be applied in a variety of different ways to the modern mains-operated superhet.

A Simple Circuit

Figure 1 illustrates the simplest possible way in which the idea can be successfully utilised. In this diagram, coils L1 and L2 are wound on a common former, but with a circular copper screen between them to prevent any unwanted capacitative coupling between the windings.

The normal aerial having been connected to condenser C1, and the lead ML having been connected to the earthed side of the mains, the trimmer T1 can be adjusted so as to obtain completely static-free reception.

Although this circuit is extremely simple, I have yet to find its equal for eliminating interference without at the same time "wiping out" weak field strength programmes.

The theory of the circuit is quite simple, and is based on the following figures. If an average 65-feet aerial is connected to a four or five-valve mains superhet tuned to Luxembourg, the resultant output signal would be about 40 per cent. programme, 60 per cent. interference.

Now imagine that same receiver operating on a mains aerial. Naturally, the output is going to be vastly different from the former signal, and an average analysis of the loudspeaker output in this case would be about seven per cent programme, 93 per cent interference.

To revert to Figure 1, however, assume that the normal aerial current flowing through coil L1 is such that the loudspeaker reproduction of the Luxembourg station is 290 milliwatts programme, 470 milliwatts interference.

Trimmer Adjustments

The trimmer T1, however, can be adjusted to pass any required amount of mains-borne H.F. energy through coil L2, which is so wound that high-frequency currents flowing through it neutralise or "cancel out" similar currents flowing through coil L1.

Now assume that the trimmer is adjusted to pass exactly the same amount of interference that is present with the normal Luxembourg signal picked up by the standard aerial. Naturally, such a procedure will completely eliminate the strong background of interference from the programme signal, but one small point must not be overlooked.

With this anti-phase mains borne "interference" signal there is about 7 per cent. of pure Luxembourg programme signal, which, of course, attenuates the Luxembourg signal flowing through coil L1.

This loss, however, is very slight, so that the loudspeaker output from the Luxembourg station, instead of being 290 milliwatts programme and 470 milliwatts interference, is now just under 270 milliwatts programme and nine or ten milliwatts interference, the latter owing to stray capacitative couplings between coils L1 and L2.

With powerful local stations, however, the noise-to-signal ratio of the output volume becomes something like 65 to 35 instead of 93 to 7 as is the case with the example given.

Circuit Modifications

By modification of the A.V.C. circuit, these figures can be improved, although, of course, if this new noise suppressor circuit is cut out by means of a switch, no loss of volume will be experienced, and, as I have mentioned earlier in the text, strong signals do not require the aid of noise-suppressing devices.

Even this disadvantage, however, does not make the circuit impracticable, for I have found it extremely advantageous when used with large commercial receivers, when their noise-to-signal ratio made foreign station listening almost impossible.

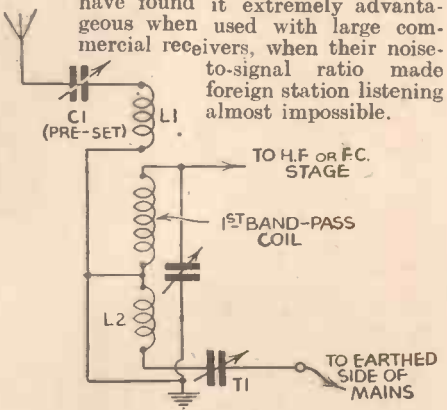


Fig. 2.—The static-suppressor applied to a band-pass circuit of a receiver. Component values as in Fig. 1.

Fig. 2 illustrates a method of applying the idea to the first band-pass circuit in a receiver, but this necessitates fairly frequent adjustments of the trimmer T1.

The circuit obviously offers a great field for experiment; couple the two coils as tightly as possible without introducing any appreciable capacitative coupling between them.

First Steps in Servicing

Important Points to be Considered when Taking Apart a Commercially Built Receiver. By PERCY RAY

This new Cossor receiver has side control knobs and therefore the notes given in this article should be carefully studied before attempting to remove the chassis.

A GOOD deal of information has been offered to the amateur constructor on the question of servicing commercially built receivers, but one of the biggest problems he often has to face is getting the chassis out of the cabinet.

Many chassis have their own peculiar way of cabinet fixing, and unless the conventional tricks are known, it may be found impossible to remove the chassis, particularly when the would-be service engineer is reluctant to use force for fear of causing breakage. The adoption of the following procedure will persuade almost any cabinet to yield up its chassis, and will also assist in re-assembly.

Commence by removing the control knobs, which is, of course, necessary to allow the spindles of the various controls to pass through the front of the cabinet. It will often be found that controls are fixed on with two grub screws, both of which, of course, must be removed. On removing the grub screw fixing, it will be found that a knob is reluctant to come off, as the keyway on the spindle is very often tapered, causing the knob to be jammed fairly securely, and requiring a reasonable amount of force to remove.

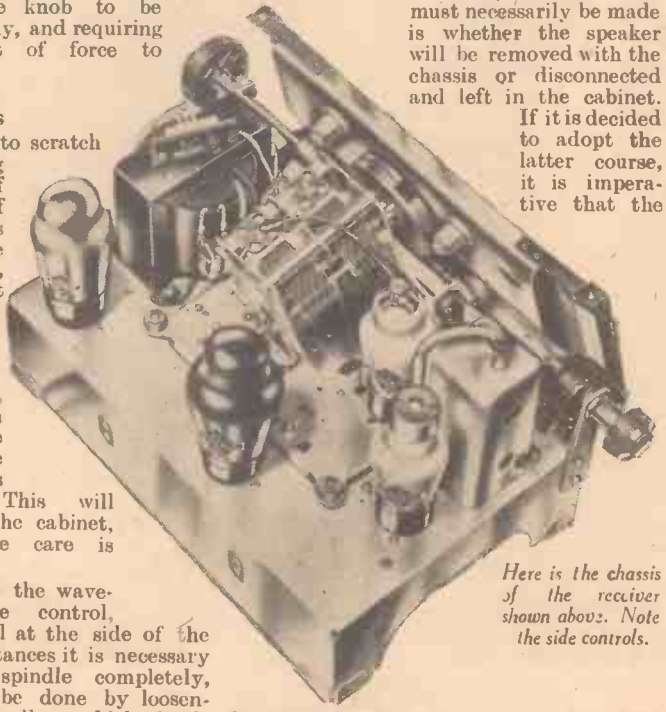
Simple Precautions

It is extremely easy to scratch the cabinet by slipping the screwdriver off the grub screw, or if gentle leverage is required to pull the knob off the keyway, and as a precaution it is well worth cutting a small round hole in the middle of a postcard, and slitting the hole to the edge, so that the card can be slipped over the spindle behind the knob before operations are commenced. This will prevent damage to the cabinet, providing reasonable care is exercised.

Certain sets have the wave-change switch, tone control, or even tune control at the side of the cabinet. In such instances it is necessary to withdraw the spindle completely, which can always be done by loosening some form of collar which holds the spindle to the appropriate component inside the cabinet. Here again a look-out should be kept for two or even three grub screws. Where the control spindle enters the actual chassis of the receiver, the spindle is usually held on by a flat collar between the side of the chassis and the side of the cabinet, and a very long-bladed screwdriver is necessary to release the spindle. At least one set on the British market has the wave-change switch on the side of the cabinet, which is actuated by a pull and push movement. In this case it will be found that the knob and a portion of the shaft are in one piece, which needs to be screwed off and withdrawn before the chassis can be released from the cabinet.

Removing the Speaker

It is becoming more and more common to place an on/off switch on the side of the cabinet with the appropriate wires leading to the chassis. It is usually possible to remove the switch from the cabinet, which is preferable to unsoldering the leads, as resoldering is obviated. After making sure that no control or switch is fouling the removal of the chassis, a decision that must necessarily be made is whether the speaker will be removed with the chassis or disconnected and left in the cabinet. If it is decided to adopt the latter course, it is imperative that the leads be marked, as even if the field terminals and leads are distinguished by a colour from the speech terminals and leads, there is a right and wrong way if a hum-bucking coil is incorporated in the speaker, also there may be a tone control in the centre of the speaker fret, the leads from which may be confused with the speaker leads. If it is more convenient to remove the speaker (such as when the soldering tags are awkwardly placed, or fixed to an insulating material of low melting point), great care should be taken that the speaker cone is not damaged. Unless several additional pairs of hands are available it is not possible to remove speaker and chassis at once, and the speaker must necessarily be laid on the chassis, where there are all sorts of flexible leads and bits and pieces capable of rendering irreparable damage to the cone.



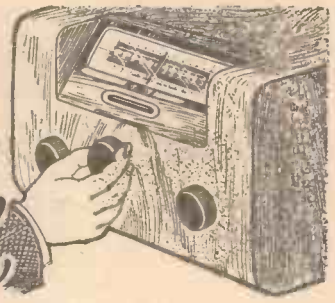
Here is the chassis of the receiver shown above. Note the side controls.

The removal of the actual chassis is a simple matter, as it is almost certain to be held in by two or more bolts passing through the bottom of the cabinet, but it will usually be found that after removing these bolts the chassis refuses to budge. This will be due either to the presence of fillets fixed inside the chassis to the bottom of the cabinet, making it necessary to raise the chassis for half an inch or so before withdrawing; or to the use of small spikes fixed to the chassis and sticking into the bottom of the cabinet. Practically the only exception to chassis fixing as described above is the alternative method of holding the chassis in position with wooden plugs fixed to the base of the cabinet, but not to the chassis, the latter being held down by wooden plugs or brackets fixed on the side of the cabinet and pressing down on the top of the chassis. The procedure to adopt in this case is obvious.

Re-assembling

On re-assembling the receiver it will be found that the hole drilled through the cabinet through which the chassis screws pass are usually oblong in shape, allowing a certain tolerance in the position of the chassis from back to front. This is to permit of the dial being placed as close as possible to the escutcheon without rubbing. It will be found that the fixing screws can be tightened so that the chassis can be moved freely without slipping unintentionally. The position of the dial can then be found, and the chassis finally fixed before replacing the various control knobs. This order of procedure is essential, as if the control knobs are fixed first of all, the knobs may rub on the cabinet causing a visible scratch which is hard to remove.

On Your Wavelength



By Thermion

Great Growth of the Club Movement

THOSE who are constantly saying that home construction is not what it was will be surprised to note from the Directory of Clubs we recently published that there are nearly 200 clubs in this country with a total membership of over 7,000. Of course, to an old-timer things are never so good as they were, the world is always in process of going to perdition, but never seems to arrive there. I hope my friends in the trade who have the defeatist and negative outlook, and conduct their business by waiting for it to come to them, will take a lesson from the efforts this journal has made, not only to foster and increase enthusiasm for the most interesting, and certainly the most scientific hobby in the world, but also to keep alive the club interest. It must be remembered that every keen clubman is an ambassador for our hobby and the industry, and this journal has been the only one consistently to encourage clubs by publishing their reports regularly each week. A wireless club properly run can be a source of education and entertainment, the members acting as coaches to those who are just taking up the hobby. There are the social evenings, the lectures, the field days, the amateur transmissions, and the camaraderie which make the club evenings a red-letter day in the week.

Most of the clubs have a well-appointed clubroom with a library. It is true that many clubs have been formed and have gone to the wall due to the selection of the wrong secretary or for lack of funds. I am a believer in paying the largest subscription which the members can afford, for you cannot run a club successfully without a reserve of cash. In those districts which are not at present served by a club I would urge any keen local enthusiast to form one at once, and to register with us. I am endeavouring to evolve some scheme such as the Wireless Clubs Association to which individual clubs can affiliate, and which will offer inducement to club members to increase their membership. Perhaps it may be possible to supply lecturers, and so on, with this journal acting in an official capacity for the dissemination of news. I cordially invite all clubmen to write and let me know what they think of this suggestion and perhaps some of their own. Readers who are members of our own Club—the B.L.D.L.C., which has the largest membership of any amateur wireless club (nearly 6,000 members), are well able to testify to the service which we render, although I had a letter the other day from a carping critic who resides at Bolton, Lancashire, asking why we do not give more space to the B.L.D.L.C. This critic seems unaware of the enormous amount of work done by the B.L.D.L.C. through the post, and we do not wish to devote too much space to notices of which members themselves are already in possession. B.L.D.L.C. notes and reports will, however, continue to appear regularly in this journal.

The Word "Televisor"

BAIRD TELEVISION LIMITED inform me that in future all their products will be marketed under the trade name of "Baird." As my readers know, the word "Televisor" is the registered trade mark of the Baird Company, but as the word has become by common acceptance so descriptive of all radio vision apparatus, particularly in America, the company feel that if they took steps to protect their rights in the use of the word, they might create an unfriendly atmosphere among listeners and the trade. Accordingly, they think it wise to use as their trade marks words which will be distinctive of their goods rather than a word which is now purely descriptive of a science. The company is, therefore, abandoning its registration of the word as a trade mark.

The Teachers to be Taught

I LIKE the new idea sponsored by the R.M.A. for a Teachers Course in Radio Service. As far as I am aware, this is the first indication that the Board of Trade is interested in the technical education of pupils in the new science. When the scholar leaves school after such a course he will be better able to qualify for some of the excellent jobs which the industry offers. The teachers will be conducted over the factories of members of the R.M.A., and the knowledge which they will accumulate as a result they will impart to their pupils. I could wish that a similar scheme was evolved for the engineering and electrical trades, particularly as the apprenticeship system broke down when the War ended, and the present shortage of skilled labour is entirely due to the short-sighted policy of parents in allowing their children to gain a temporary financial advantage by taking a job in a blind alley post because the salary was 30s. a week or so, instead of the few shillings which is paid to an apprentice. They have been forgetful of the fact that experience gained is worth far more than money, for knowledge and experience are the only two things which cannot be taken away from them.

Licence Figures

DURING June there was an increase of 29,532 in the number of paid licences, and the number of free licences granted during the same period was 230. Free licences to blind people total 3,011 making a total number of licences in force at the end of June 30th, of 8,234,250. This number cannot represent the peak, for there are 44 million people in this country, and the average family consists of only three people, making a possible licence figure of at least 14 millions. Even the present licence figures do not give a true index of the number of sets in use, for every listener is entitled to have one portable receiver as well as the usual receiver without paying an additional licence.

The Milnes Radio and Television Society

MR. F. RIDLER, the Hon. Sec. of The Milnes Radio and Television Society of Victoria Works, Church Street, Bingley, Yorks, tells me that this recently formed club desires to get into touch with firms who are willing to supply lecturers. They require a list of Companies or Institutions who have visiting lecturers, and I should be personally grateful if such Companies or Institutions would write to Mr. Ridler direct. I wish him luck in his enterprise.

Radio Fan in a Factory Drawing-room

I LEARN of one, Mr. W. Glendinning, who has one of the most extraordinary jobs in industry. He spends all his working time in a beautifully furnished drawing-room, listening to the radio.

Mr. Glendinning is the General Electric Company's "professional" listener—the man with the critical ear—and the drawing-room in which he spends his time is in the G.E.C. radio factory at Coventry. It has been constructed and furnished to correspond as closely as possible with the worst sound and interference conditions that can occur in the sort of room in a home in which the sets will eventually be heard. For instance, the ceiling is lath and plaster, the the floor is hollow, and the adjacent factory provides ample interference.

All sets are scientifically tested before they reach Mr. Glendinning—his job is to listen from the point of view of an ordinary listener. It is described as a critical cross-check of output.

There are usually five sets wired up in the room and beside Mr. Glendinning's armchair is a control panel which enables him to select whichever set he wants, or to run any number in unison. He usually does not begin work until the afternoon and very often stays on after midnight ranging the world's short-wave broadcasts. He listens to all sorts of programmes so that he can judge the sets under all conditions and his notes and comments are passed on to the engineers.

"I now know radio so well," Mr. Glendinning said, "that I can tell from where almost any performance is coming—from concert hall or studio, landline or record." Mr. Glendinning has no particular favourite items, but he prefers music to talks.

It has taken him five years to train for this job. He is now training two other people, one a high-grade engineer, and the other a young man down from the University. So far they have only had three years' experience of listening. Mr. Glendinning listened in to the first G.E.C. set in 1912—but the transmissions were then in Morse Code.

Asked what he does when he gets home, Mr. Glendinning said: "I listen. It is only when I am at home and not professionally listening that I can really enjoy the programmes."

Electrolytic Condensers

HIGH-CAPACITY electrolytic condensers are very commonly used in modern receivers. They are chosen in preference to the paper type mainly because they are smaller in size, but the wet type has another and probably greater advantage—it is self-healing. If excessive voltage is applied to this type a current will flow through the condenser without damaging it, and when the voltage is reduced to the limiting voltage figure of the condenser normal working conditions will again be obtained. The wet electrolytic, therefore, acts as a safety valve in receivers where voltage surges are experienced. When using electrolytics care must be taken to connect them the correct way round, however, the + terminal must be joined to the high potential lead and the casing or — terminal to the — lead.

In Battery Sets

IN mains receivers constructors do not seem to experience any difficulty in deciding which is the — lead in the circuit, but we find that the wrong method of connection is often made when an electrolytic is used as a by-pass across the automatic bias resistance in a battery receiver. The end of the bias resistance connected to the L.T.— lead is at a positive potential with respect to the H.T.— end, and therefore the — terminal of the condenser should be connected to the H.T.— lead in this case and not to L.T.— as is commonly assumed.

Over-heated Mains Lead

A READER complained to us the other day that the mains lead of his American midget type receiver became very hot. The receiver worked quite satisfactorily, but the heated mains lead worried him because he had found that the lead to his radio-gram (a well-known British make) remained perfectly cool even after the set had been on for hours. He was, of course, unaware of the fact that most of the midget sets are of the A.C./D.C. type and the heater dropping resistance is wound in the form of a spiral inside the flex covering of the mains supply lead. This can therefore be expected to become quite hot when the receiver is in use. Presumably this type of heater dropping resistance is used to prevent the generation of excessive heat inside the midget cabinet. If the normal type of resistance or barretter were used it would be necessary to provide effective ventilation and it would also be advisable to line the cabinet with heat-resisting material. By incorporating the heater resistance in the mains lead this danger is avoided and the space normally taken by the dropping resistance is saved.

Olympia Television

I AM now able to reveal that work in connection with the television demonstrations to be staged at this year's Radiolympia is well in hand. All the details concerning the fourteen viewing rooms, not sixteen as has been stated in so many other quarters of the Press, have been settled, and there is every promise of the shows being an unqualified success, especially in view of the close programme co-operation which is being given by the B.B.C. during this 10-day period. The actual signal distribution amplifier is to be furnished by the Marconi-E.M.I. Company and will operate on somewhat similar lines to the one now being used to feature the receiving sets at the Science Museum. The whole of the aerial and feeder distribution installation is being undertaken by Baird Television Ltd., however, and this close engineering co-operation between E.M.I.'s and Baird's should ensure a successful demonstration. Whereas last year the television section was a last-minute effort, on this occasion thorough tests prior to the opening will be undertaken and the risk of technical hitches reduced accordingly.

Radiolympia Features

MR. MOODY, the R.M.A. exhibitions organiser, tells me that he has now decided upon the principal features of this year's exhibition, and that "All-World Radio" will be the main theme. The majority of the receivers to be shown will be of the all-world type, and to make the point more prominent the main decorative feature which is usually arranged at the end of the Grand Hall will this year take the form of a hemisphere, with countries and stations picked out in lights. Thus the visitor will be able to read from this illustration just what this year's Radiolympia has to offer him. The theatre will be the same size as last year, and there will be three performances a day. The chief artists will include Eric Coates and his orchestra, Louis Levy and his Music from the Movies orchestra, Bobby Howell's orchestra, Sandy Powell and company, and Flotsam and Jetsam.

A PAGE OF PRACTICAL HINTS

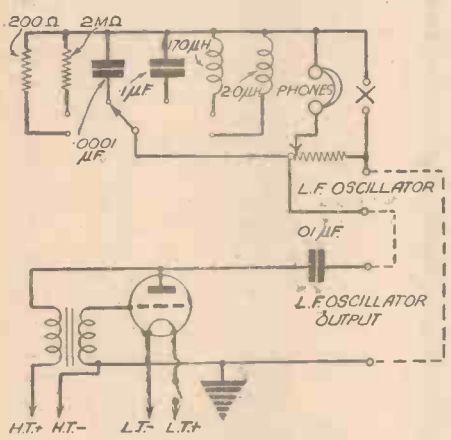
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Simple Bridge Tester

RECENTLY, while constructing a receiver using home-made coils, I realised the need for a simple piece of apparatus to determine the inductance of the coils. The arrangement shows a simple



A simple bridge tester.

bridge circuit employing a potentiometer (the value of which may be anything from 2,500 Ω to 50,000 Ω) as the two ratio arms. A suitable L.F. oscillator can either comprise a valve or a buzzer. The condensers, resistors, and inductors (this bridge can be used to measure capacitance and resistance as well) are of any usual make, the values depending wholly on the range required, as these components are merely used to balance out the unknown.

The unknown component is placed across terminals marked "X," and potentiometer adjusted to the silent point. A suitable scale can then be calibrated with known condensers, resistors, etc., across terminals "X," with the 6-point switch in the appropriate position.

I found this piece of apparatus very successful.—K. W. BEER (Catford).

Simplified Connections

I AM interested in experimental work, and find that the continued removing and replacing of battery cords leads not only to delays but sometimes to poor results due to frayed leads, etc. I, therefore, built the arrangement shown in the accompanying illustration. At the back of the work bench I fitted a raised step to which a length of ebonite fitted with sockets was attached. These are permanently joined to tapping on the H.T. supply and to the L.T., and aerial and earth. When I rig up a receiver or other apparatus I provide at the back of it a strip of ebonite to which plugs are fitted, and it will, therefore, be seen that all that is necessary is to push the apparatus to the back of the bench when the plugs will go into the sockets and the various connections will be made instantly. Rapid changes and tests may be carried out by using this device.—L. WALDE (Hendon).

THAT DODGE OF YOURS!

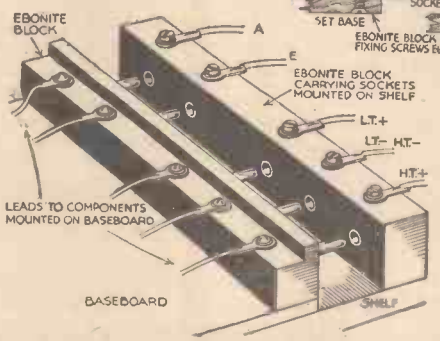
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

Automatic Guide for Coil-winding

WHEN winding coils or transformer bobbins with wire of 40 gauge and less it is difficult to prevent the wire from piling. With the idea illustrated you will have no more trouble in this direction. All that is needed are an old alarm clock movement with all the parts removed except those shown, a small grinding machine with the grinding wheel removed, and a few odds and ends.

First of all we have to make the wire guider shown separately. This is made from a piece of strip brass or metal to the shape shown.

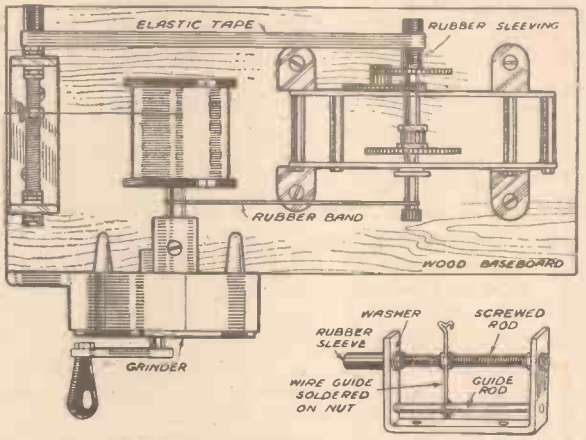
The guide rod is a piece of stiff wire soldered or riveted in place. Next the screwed rod is inserted and the locknuts adjusted until this revolves easily with as little side play as possible. After which the wire guide can be bent around the guide-



A simplified method of making connections for experimental purposes.

rod and soldered to the nut on the screwed-rod.

After screwing all the parts to the wood baseboard a thin elastic band is placed from the winder to the knob on the clock movement which is generally used to move the hands. From the other side, at the point where the minute hand has been removed, a tape elastic band goes around the screwed rod on the wire guider.



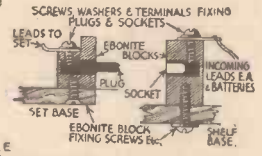
An automatic wire guide for use in coil winding.

To use this arrangement the coil to be wound is first fixed in place and then the wire guide is moved along until it is opposite one end of the coil. After one layer has been wound, the thin elastic belt is crossed, and the wire guide comes back in the opposite direction; when this layer has been wound the band is changed to its original position and so on.

By choosing the correct size of screwed rod almost any kind of fine gauge wire can be neatly wound.—G. H. HUNTER (Ashington).

S. W. Sets and Noises

MAKE certain by continuity tests that panel, chassis brackets, earthing bolts, screens, screening cans and boxes are making sound electrical and mechanical contact, and when screened components are used, such as L.F. transformers, and screened H.F. chokes, that the cases are effectively earthed. By doing so, instability and crackling will be avoided.



A comment concerning coil-holders, as used with chassis sets, may be useful. If the chassis-mounting type are preferred, these should be of low loss ceramic construction.—L. WOOD (Hendon).

INCREASING SUM

How to Compensate for Impaired Reception Devices : A Simple H.F. Amplifier: Improved

ONE of the annoying things about radio is that reception conditions vary appreciably throughout the year. Generally, conditions are best in winter during the hours of darkness, whilst it has often been found that mist, fog and general humidity tend to increase the range of reception. What we are more concerned with, however, is the fact that during the sunny and light summer months, conditions are noticeably worse than at any other period of the year.

It is because of this that about this time of the year we always receive a crop of inquiries from readers who wonder what is wrong with their sets, which appear to have become insensitive. Sometimes it is difficult to make inquirers appreciate that the set is just as efficient as it was a few weeks ago, and that the only factor which has changed is very largely outside their control.

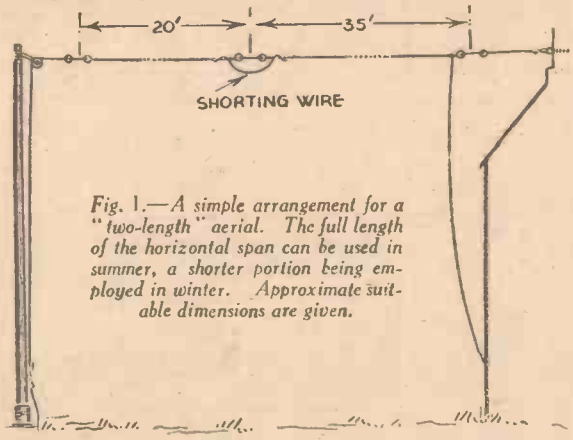


Fig. 1.—A simple arrangement for a "two-length" aerial. The full length of the horizontal span can be used in summer, a shorter portion being employed in winter. Approximate suitable dimensions are given.

Without going into the theory of the matter, I ask you to take it as perfectly true that reception conditions in summer are, comparatively, very poor. Signals which normally travel over distances of a thousand miles often reach for only a quarter of the distance. At least, it is over the much shorter distance that they exist in such form that they can be employed by any given receiver to provide entertainment. We cannot alter atmospheric conditions, and it is rarely possible fully to compensate for them, although we can do so in some measure.

Detector Input

The ability of the set to provide good loudspeaker reception depends to a large extent upon the strength of the signal voltages applied to the grid of the detector valve. Thus, if the receiver is of the Det.-L.F. type, the detector receives its grid input directly from the aerial-earth system. If the signals picked up by the aerial are weak, the output from the set must be low.

From this it will be apparent that there are two obvious methods of increasing the output from the set: one is by improving the aerial-earth system, so that it picks up a larger proportion of the available signal voltage; the other is by inserting an amplifier between the aerial system and the detector valve, to increase the signal voltage before it is passed on to the detector. These are not the only methods of obtaining the desired result. Most receivers are now designed to provide the greatest possible degree of selectivity, that selectivity generally being obtained at the expense of sensitivity. Consequently, if a temporary method can be found of reducing the sharpness of tuning, better signal strength should be obtainable.

Perhaps it will be thought that any method such as this would be futile, but it should be remembered that fewer signals are available in summer, so that "knife-edge" tuning is generally unnecessary. When considering only the simpler types of receiver, it is true to say that a fair amount of selectivity can nearly always be sacrificed in summer without introducing appreciable interference.

A "Two-length" Aerial

Having seen the principal points at which alterations can advantageously be made, we can turn our attention to the more practical aspects. Where it is possible, and convenient, to erect a better aerial than that normally employed, it will be found that the change is fully justified. An aerial which is higher and further away from surrounding objects will nearly always provide an improvement in reception equivalent to that given by an extra valve. The total length can also be increased slightly beyond the customary 65ft. or so, although it might become necessary to reduce the length again next autumn, since the longer aerial is less selective.

One simple idea which can easily be put into effect when provision is made for lowering one end of the aerial is shown in Fig. 1. It will be seen that the horizontal span is split into two parts by means of insulators, so that it is necessary only to bridge the insulators with a short length of wire to increase the effective length. The two ends which are to be joined together must be scraped quite clean, as also must the ends of the shorting strip. The latter can then be firmly twisted round the two bared parts of the aerial, the joints being covered with insulating tape to keep out moisture and prevent corrosion. In winter it will be necessary only to remove the short piece of wire to reduce aerial length. An obvious alternative method is to have two aerials of different length, or to have both an inside and an outside aerial, but this is generally less convenient.

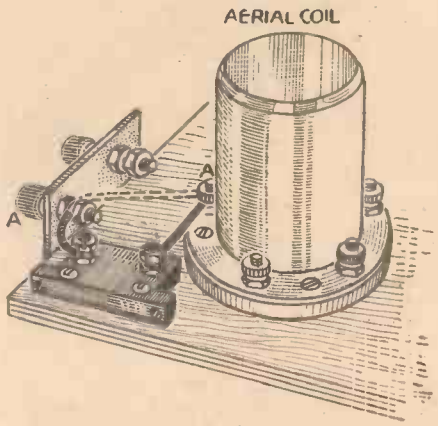


Fig. 2.—Try the effect of cutting out the aerial-series condenser by means of the wire shown as a broken line.

Remember the Earth

While considering the aerial, do not forget that it will prove worth while thoroughly to clean the insulators, and also to clean and re-solder any joints which appear corroded, as well as connections to lead-in tubes and so on.

Give the earth an equal amount of attention. If it consists of a buried plate, see that the connections to the plate are good and sound; if an earthing tube or water pipe is employed, remove, clean and replace the connection; if the earth connection is obtained through a chemical device which has been in use for a year or more it will be worth while to replace it by a new one. When using any form of buried earth it is desirable to pour a bucketful of water over the ground near to it once every week. This will ensure good contact

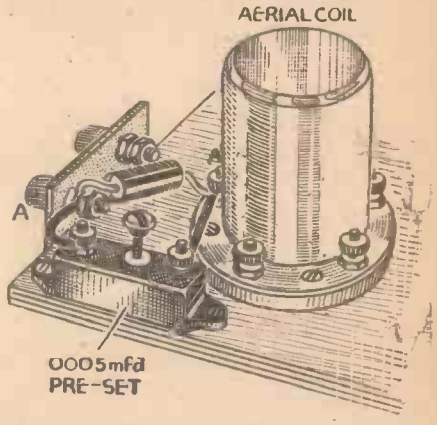


Fig. 3.—An alternative method to that shown in Fig. 2. A pre-set condenser is connected in parallel with the normal aerial-series condenser.

THE DELA

AFTER an all-mains radio set has been switched on it is necessary to wait for about two minutes before the valves have thoroughly warmed up and the receiver is working satisfactorily. In the case of television, however, a much longer delay factor must be taken into consideration. The minimum number of valves in any vision receiver so far marketed is nineteen, and to this must naturally be added the cathode-ray tube itself. It takes a much longer time for the power packs, sound, vision and time-base generator chassis to get thoroughly warmed up so as to work satisfactorily together. The set should be switched on at least ten to fifteen minutes before it is required, otherwise the results will be unsatisfactory for the initial viewing time. Many users make the mistake of switching on and as soon as there is

MER-TIME RANGE

Conditions : Better Aerial : Eliminating Selectivity Detection and Reaction. By FRANK PRESTON

between the earthing device and the surrounding ground.

Reduced Selectivity — Increased Sensitivity

Now we come to the receiver itself. It is probably provided with a condenser wired in series with the aerial lead, as shown in Fig. 2. The purpose of this is simply to increase selectivity, and so it can often be removed, and the two wires attached to it joined together. An alternative, which is often to be preferred, is to connect another condenser in parallel with it, as shown in Fig. 3. If the existing condenser is fixed, connect a .0005-mfd. pre-set one in parallel with it. When a

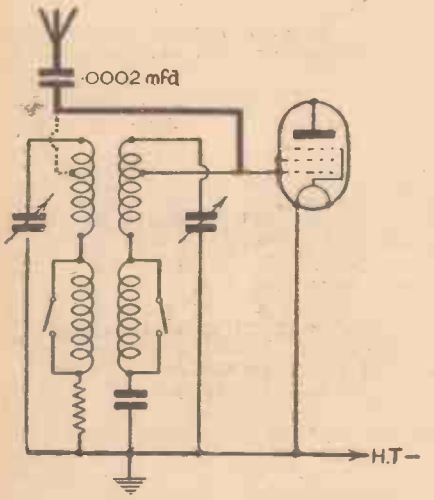


Fig. 4.—Cutting out one circuit of a band-pass filter. The original aerial lead is shown as a broken line, and the new one as a heavy line.

pre-set condenser is built into the set, a .0005-mfd. fixed condenser can be wired in parallel. In either case, the most suitable capacity can easily be found by trial.

Remember, however, that the additional condenser might alter the tuning to a certain extent. Consequently, if a gang condenser is used for tuning, the trimmers should be re-adjusted.

When a band-pass circuit is used for tuning the aerial circuit one coil can be eliminated in order to increase sensitivity and reduce selectivity. A very simple alteration is all that is generally required, and the idea is shown in Fig. 4, where it can be seen that the aerial lead is transferred from the first coil to the second—leaving the series condense'r (where fitted) in place. If a series condenser is not used, one should be added. The most suitable new connection for the aerial lead depends upon the particular coils employed, but where a tapping is provided this will generally prove most satisfactory. Otherwise, the lead can be taken to the grid terminal of the second coil.

An Untuned Amplifier

Probably one of the best methods of compensating for the poor summer-time reception conditions is by adding an H.F. amplifier to the receiver. An objection which is often levelled against this arrangement is that it brings into use an additional tuning control. This can be overcome, however, by making an untuned amplifier, with a circuit such as that shown in Fig. 5. It should at once be made clear that this is not a very efficient system, and that the amplification provided by the valve is much less than it would be if the aerial circuit were tuned. Additionally, the amplifier, contrary to the usual custom, is not used to increase selectivity, but merely to "boost-up" the signals before they are applied to the detector of a Det.-L.F. set.

A good screened H.F. choke is used in the aerial circuit, and the output, from the anode of the valve, is applied, through a fixed condenser, to the aerial terminal of the receiver. The two L.T. leads are connected to corresponding terminals on one of the valve holders in the original set and the H.T.+ lead is taken to the corresponding

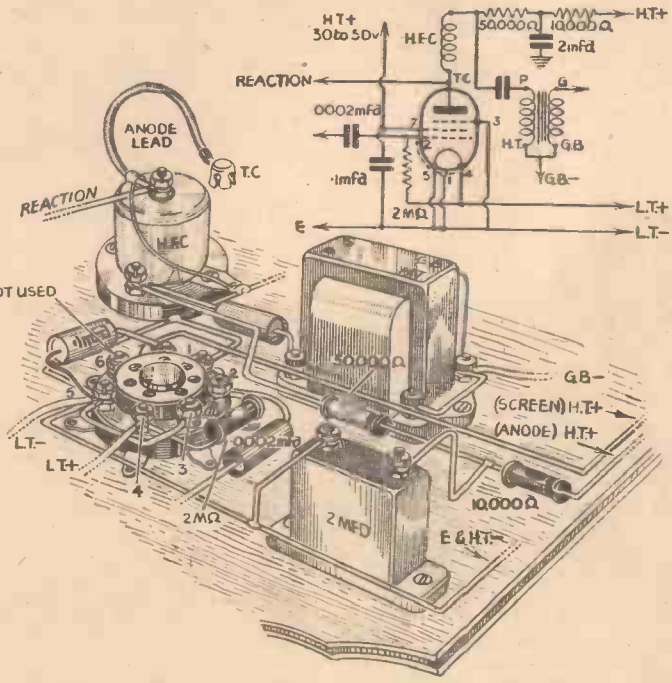


Fig. 6.—How an H.F. pentode can be used as detector to improve sensitivity and reaction control.

terminal on the receiver, or to a socket on the H.T. battery. When using the amplifier, the aerial lead is transferred to it from the set, the earth lead being left attached to the set. The original receiver is operated exactly as before. The little H.F. unit can be built on a small baseboard, or even inside the lid of the receiver, provided that this does not bring the components very close to those of the original set.

H.F. Pen. Detector

Another method of improving the efficiency of any "straight" set is by replacing the triode detector by an H.F. Pentode. This gives more H.F. amplification—through the reaction circuit—and often proves as satisfactory as an additional H.F. amplifier. Connections for the valve are shown in Fig. 6, from which it will be seen that only slight alterations are necessary. The new valve does not affect the method of operating the receiver, although it does generally give better reaction control, so that reaction adjustment is simplified.

Do not forget that none of the modifications suggested above can be fully satisfactory if the receiver itself is in need of attention, or if the valves need to be replaced. It is thus well worth while to clean the receiver thoroughly with a soft brush, to clean between condenser vanes with a pipe cleaner, and to re-solder any joints which are dirty and corroded.

Y FACTOR

some resemblance of a picture, adjustments to the controls provided are made in an attempt to get the picture steady with the correct degree of brightness, focus, contrast and gain. After a few minutes, however, another excursion has to be made to the set, for, when the valves have warmed up, the results, as judged by picture quality, are below par. Provided the controls on the set when last used were adjusted to suit individual taste, the picture on the tube after a lapse of about ten minutes will be in exactly the correct setting. The black cross, and the subsequent caption radiated by the B.B.C. prior to the start of each programme are to enable users to see that their set is working properly beforehand, and advantage should be taken of this rather than attempting to wait until the programme just commences.

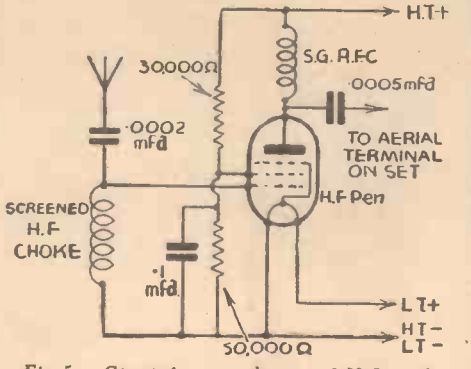


Fig. 5.—Circuit for a simple untuned H.F. amplifier for use between the aerial and aerial circuit of a Det.-L.F. receiver.

Important Broadcasts of the Week

NATIONAL

Wednesday, July 28th.—The Royal Visit to Belfast.
Thursday, July 29th.—The Romantic Young Lady, a play in three acts, from the Spanish of Martinez Sierra.
Friday, July 30th.—Dorothy, a comic opera by Alfred Cellier, adapted by Martyn C. Webster.
Saturday, July 31st.—Variety: Past, Present and Future.

REGIONAL

Wednesday, July 28th.—Variety from the Argyle Theatre, Birkenhead.
Thursday, July 29th.—Fan Worship: a feature programme.
Friday, July 30th.—The Magic Flute. Act 2.
Saturday, July 31st.—Old Swedish Dance Music, relayed from Stockholm.

MIDLAND

Wednesday, July 28th.—English song writers: Herbert Howells.
Thursday, July 29th.—Dorothy, a comic opera by Alfred Cellier, adapted by Martyn C. Webster.
Friday, July 30th.—Vocal recital.
Saturday, July 31st.—Band Concert, from The Pump Room Gardens, Leamington Spa.

NORTHERN

Wednesday, July 28th.—Variety from the Argyle Theatre, Birkenhead.
Thursday, July 29th.—An excerpt from Punch and Beauty, from Feldman's Theatre, Blackpool.
Friday, July 30th.—Chamber music melody —3: a recital of light Chamber music.
Saturday, July 31st.—A Sonata Recital.

WELSH

Wednesday, July 28th.—Concert Party Programme from the King's Hall, Aberystwyth.
Thursday, July 29th.—Choral Programme from Bethania Congregational Chapel, Dowlais.
Friday, July 30th.—Concert Party Programme, from the Coliseum, Rhyl.
Saturday, July 31st.—Orchestral Concert.

WESTERN

Wednesday, July 28th.—Too Many Cooks: a discussion.
Thursday, July 29th.—Dance Cabaret, from the Royal Bath Hotel Ballroom, Bournemouth.
Friday, July 30th.—After Eight: a Concert Party programme.
Saturday, July 31st.—Some Western Poets: The Fifteenth Century and Earlier.

SCOTTISH

Wednesday, July 28th.—Orchestral Concert.
Thursday, July 29th.—A Summer Ramble in Song, Story and Instrumental Music.
Friday, July 30th.—Organ Recital from the Capitol Cinema, Aberdeen.
Saturday, July 31st.—A running commentary on The Scottish Motor-cycle Speed Championship, from the West Sands, St. Andrews.

NORTHERN IRELAND

Wednesday, July 28th.—The Royal Visit to Belfast.
Thursday, July 29th.—The Irish Open Golf Championship, at Portrush: An eye-witness account.
Friday, July 30th.—Choral and Instrumental programme.
Saturday, July 31st.—The Temple 100 Miles Motor-cycle Race: An eye-witness account.

A FINE SHIP INSTALLATION

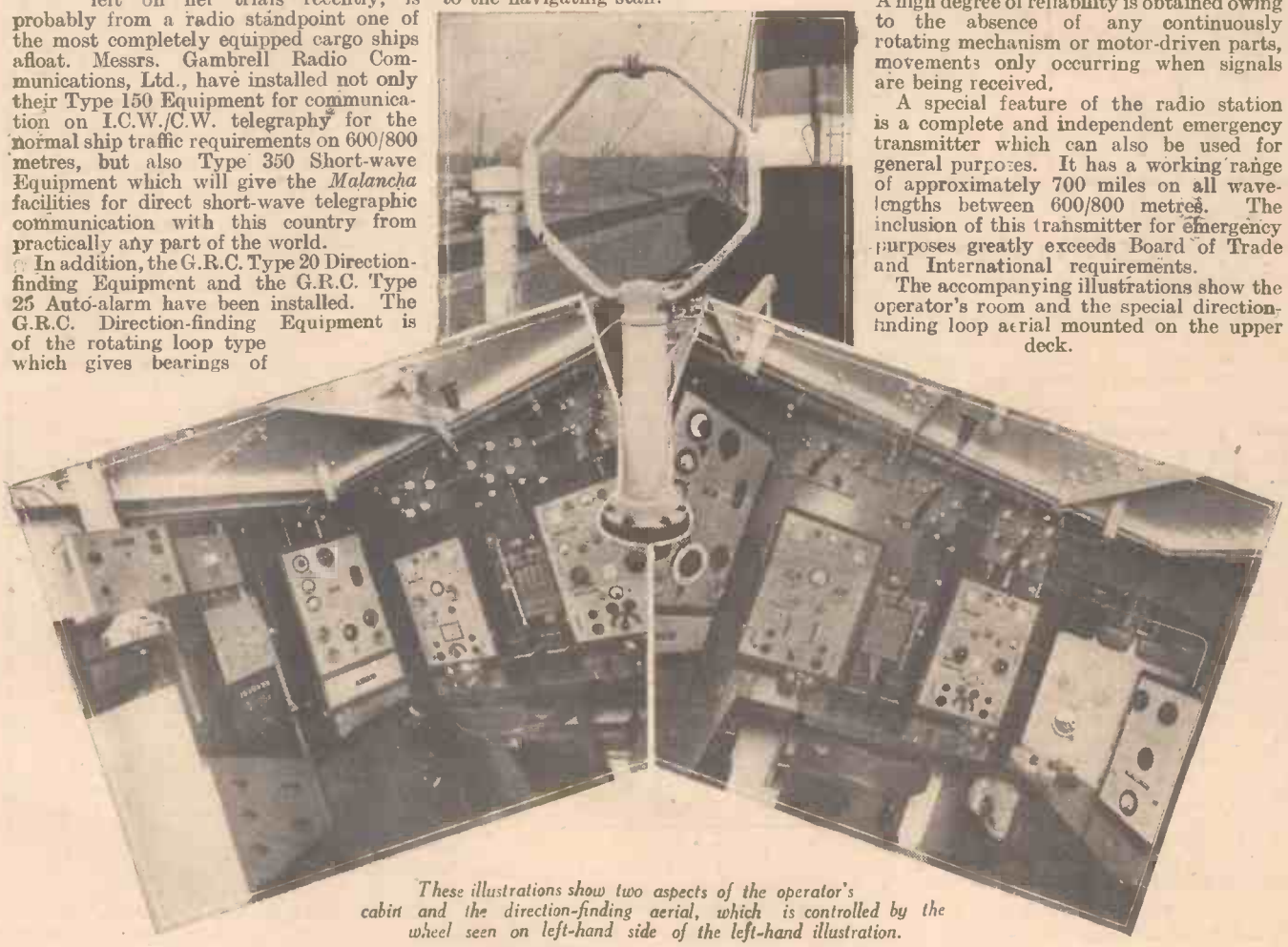
MESSRS. T. AND J. BROCKLEBANK'S new s.s. *Malancha*, which left on her trials recently, is probably from a radio standpoint one of the most completely equipped cargo ships afloat. Messrs. Gambrell Radio Communications, Ltd., have installed not only their Type 150 Equipment for communication on I.C.W./C.W. telegraphy for the normal ship traffic requirements on 600/800 metres, but also Type 350 Short-wave Equipment which will give the *Malancha* facilities for direct short-wave telegraphic communication with this country from practically any part of the world.

In addition, the G.R.C. Type 20 Direction-finding Equipment and the G.R.C. Type 25 Auto-alarm have been installed. The G.R.C. Direction-finding Equipment is of the rotating loop type which gives bearings of exceptional accuracy. Furthermore, its simplicity of operation presents no difficulty to the navigating staff.

The G.R.C. Auto-alarm for the reception of distress signals is an entirely self-contained equipment. It also embodies means for automatic transmission which will continue as long as power is available. A high degree of reliability is obtained owing to the absence of any continuously rotating mechanism or motor-driven parts, movements only occurring when signals are being received.

A special feature of the radio station is a complete and independent emergency transmitter which can also be used for general purposes. It has a working range of approximately 700 miles on all wavelengths between 600/800 metres. The inclusion of this transmitter for emergency purposes greatly exceeds Board of Trade and International requirements.

The accompanying illustrations show the operator's room and the special direction-finding loop aerial mounted on the upper deck.



These illustrations show two aspects of the operator's cabin and the direction-finding aerial, which is controlled by the wheel seen on left-hand side of the left-hand illustration.

BRIEF RADIO BIOGRAPHIES—16

By RUTH MASCHWITZ

Walford Hyden

WALFORD HYDEN is known to all listeners as the conductor and part-instigator of the radio feature, "Café Colette." A master technician, and lover of serious music, he has himself composed ballets, suites, songs and a one-act opera, all of which have been broadcast. Besides that of the Café Colette he conducts at least four other orchestras, including that of "Balalaika."

Downright and completely without

Walford Hyden

affectation, his lack of convention shows itself in many ways; chiefly in absolutely refusing to conduct an orchestra in formal evening dress.

Born in Staffordshire, he studied the piano at Manchester with such remarkable success that at twelve years old he made his first concert tour. After winning a scholarship, he studied at the London Academy of Music, where he obtained his degree. It was now that he was engaged as rehearsal pianist by Pavlova, and from this resulted a long and pleasant association with the great dancer. With her he toured many parts of the globe.

About five years before her death, Pavlova produced a season of Ballet in Paris. One day, desiring a little recreation, she strolled into a theatre and was immediately impressed by a young Russian girl who was dancing in true Russian tradition. After the performance Pavlova invited this girl to join her *corps de ballet*. The girl, Cleo Nordi, was delighted, and soon became a member of the company.

By now Walford had become leader of the orchestra, and during a subsequent world tour he and Pavlova's new recruit fell in love and were married.

Walford tells some amusing stories about his time with Pavlova. When he first joined her company during a rehearsal he developed a raging headache. Pavlova disappeared and came back with what he thought to be a glass of water. He drained it at a gulp only to discover that it was vodka! It took quite a time to get back his breath.

On another occasion during a performance at a small town in Germany, the lights both on the stage and in the orchestra pit failed, and for two minutes Walford had to whistle the music. They were the longest two minutes he had ever spent.

Walford and Cleo have a charming house in the West of London in which is a remarkable collection of musical instruments from Arabian flutes to Chinese drums and also a variety of old and foreign weapons. They are both lovers of animals and Walford spends most of his spare time—of which there is not much—exercising and playing with his two spaniels—Bruno and Pluto. The household also boasts a cat and a canary. All four creatures live in perfect harmony!

Amongst Walford's hobbies are deep-sea fishing and yachting, but at the moment he has little time to indulge these. He even had to present his car to his brother because he never found an opportunity to use it.

Peggy Cochrane

CLASSICAL pianist and violinist, dance vocalist and composer, Peggy Cochrane is one of our most versatile broadcasters. Her father was musical, and almost as soon as she could walk Peggy was taught the piano and violin. At the age of six her favourite position for practising the violin was under the table, where she informed her mother the fairies came to join her.

For six years she was a student at the Royal Academy of Music, where she won a scholarship, and at the age of fourteen she did three remarkable things. She played the Rimsky-Korsakov Pianoforte Concerto with the Brighton Municipal Orchestra, won both the open violin and piano championships on the same day at the West of England Eisteddfod, and had two compositions published. Four years later she left the Academy with flying colours and for the next few years made her mark as violin soloist.

She first broadcast quite by chance in 1924 when the Chelmsford station was opened. She happened to be on the premises at Savoy Hill at the time, and was asked to perform at a few minutes' notice. Since then she has been heard consistently over the air in Entertainment Hours, "Peggy in Three Moods," "Jack Payne's Parties," serious recitals, and her own "Tune a Minute" series.

Since her days at the Academy she had been studying the lighter side of music, and she broke fresh ground with cabaret and microphone work in "That Certain Trio" with Patrick Waddington and William Walker, when she sang in public for the first time. She then began to take up syncopation seriously, and her next job was as Gwen Farrar's partner in "Wonder Bar," when she played both the piano and the violin.

Meeting Jack Jackson at a party, he engaged her as his vocalist at the Dorchester, after which her next venture was in films.

Peggy is married to a doctor and lives in St. John's Wood. One of her hobbies is breeding golden retrievers, which she looks after entirely by herself.

Practical Television

July 31st, 1937. Vol. 3. No. 61.

Canada's Outlook

AS in this country, many of the Canadian technical schools are introducing courses on television into their curriculum so as to enable students to receive a thorough grounding in a subject which before long will prove of extreme value in technical careers. That Canada has faith in television is borne out by the discussions which took place recently in Montreal on the occasion of the Convention of the Engineering Institute of Canada. Emphasis was quite naturally given to the number of difficulties which still confront the television engineer. Both at the transmitting and receiving end the problems to be solved are of considerable magnitude, but even so, as one speaker made clear, progress, in the eyes of European experts, particularly Great Britain, was far enough advanced to justify the inauguration of a public service. This sane speaker, an official of the Canadian Broadcasting Corporation, said that although it would cost a considerable sum of money to provide equipment to cover the whole of Canada with a proper service, there was no obstacle in the way of individual cities setting up their own installations. Referring to radio, his audience were reminded that the spanning of continents was not the main criterion for the initiation of wireless services. They were first of all developed for local services, and the same thing could apply with even greater import to television. Provided the equipment used was made flexible in character so that it could be unified to any single standard that time and experience would show as essential, progress in the art would be accelerated by the accumulated knowledge derived from a whole series of local services.

Russia

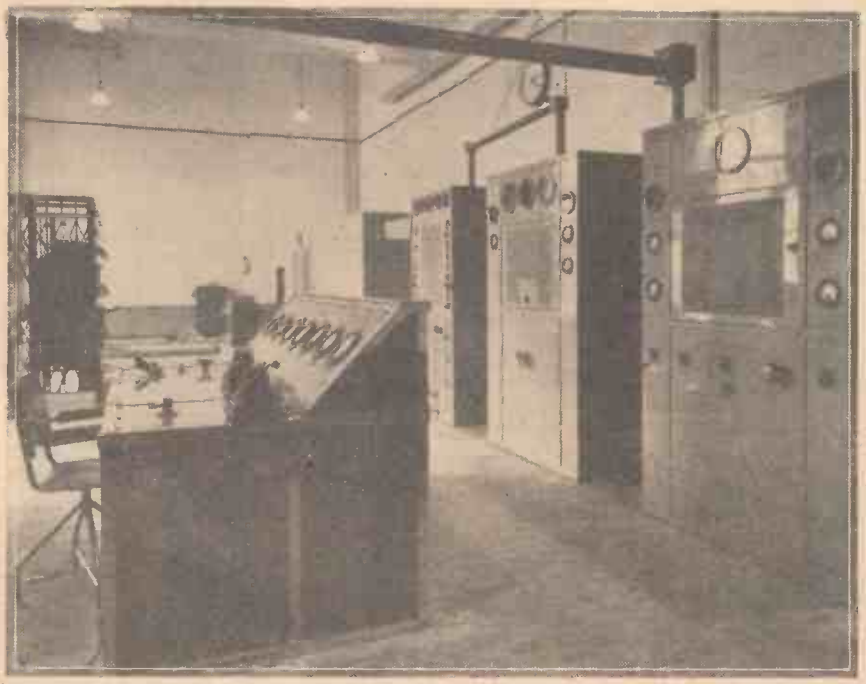
IT is now stated that Soviet Russia expect to have their first real high-definition television centre working by the end of this year, and that the transmitting equipment to be employed will be supplied by America. This is in spite of the mechanical scanners purchased recently from this country. Another curious fact is that Moscow still seems to be radiating low-definition television signals from one of their ordinary broadcast transmitters. These signals can still be received in this country and resolved into recognisable pictures by anyone in possession of the old 30-line receivers. The reason for this is hard to find, for the scientists in Russia must realise that except for a very limited public appeal high-definition pictures, which are quite flickerless, are the only ones which can encourage people to purchase receiving equipment. However, the coverage of 1,200 miles by the Moscow television transmitter has enabled a Birmingham youth to see a dancer performing in Russia, and recalls similar long-distance reception of the B.B.C. low-definition signals in Europe between the years 1932 and 1935 when the B.B.C. service was operating.

Work Value

WHEN dealing with certain of the television processes the expression "work value" is sometimes used, and readers seeing this for the first time have been puzzled by its significance. In photo-electricity the phrase is quite common and is used to express the amount of work—a measurement usually made in volts—which has to be performed on or imparted to an electron in order to remove it from a surface atom. Sometimes the work is undertaken by heating a cathode, and actually releasing the electrons in the same way as vapour rises from the surface of a pond when exposed to the sun's rays. Thermionic valve cathodes are, of course, a very familiar example of this action. On the other hand, with cold cathode devices, such as photo-electric cells, secondary emission multipliers or the two most usual types of electron cameras, the work which has to be performed on the surface electrons is undertaken by the light made incident on the cathode surface. In expressing the equation for the work done, a term is included which, in general, is looked upon as the voltage barrier which the electron itself has to overcome before it can leave the surface. It is clear, therefore, that the lower this photo-electric work function becomes the less is the energy expended to liberate the electrons. From tests which have been made it is found that one of the most satisfactory substances for this purpose is a thin film of caesium on silver oxide, the work function in this case being less than unity, namely, 0.75, and it is for this reason that photo-electric cathodes of high sensitivity are generally made in this way.

Scientific Alliances

THE rapid growth of television during the last year or two has served to emphasise more than anything else the close scientific alliance between the various branches. Electricity, optics, mechanics, electronics, and so on, all find their particular sphere in providing a television service, whether for entertainment or commercial communication purposes. This linking of what at first seemed divergent interests, but which have proved subsequently to be irrevocably inter-connected, is certainly one reason for the more rapid growth of practical applications. Present-day research is concentrating effort on the harnessing of the electron, and this has a close alliance with television. At the transmitting end we have the signal generation as a result of photo-electric phenomena, and whether electrically or mechanically scanned this electronic emission in proportion to the light and shade to which the special surface is exposed constitutes the all-important initial link in the complete chain. Either electron multipliers with their high signal-to-noise ratio or, alternatively, multi stages of thermionic valve amplification increase the strength of the initial signal through the medium of an electron flow. Electromagnetic wave propagation radiates the signal to the required receiving point where once more it serves to control electron streams in valve circuits. Finally, the picture is reproduced by electronic bombardment at enormous velocities on a cathode-ray tube screen. Optical methods find their counterpart in electronic conceptions, and not the least important of these is the directional wave between selected communicating points. The closer this scientific alliance becomes, the quicker will radio and television develop to an extent which has hitherto only existed as a flight of imagination.



Alexandra Palace Television Station B.B.C. sound transmitter. Control table—left foreground. Drive unit and low power H.F. stage—centre background. Final power amplifier—centre right. Modulator unit—right. Power switchboard—left background.

Constructional Details of "Practical Wireless" Receivers—11

F. J. Camm's A.C. £4 Superhet is the Subject of the Following Notes. Blueprint No. P.W. 59, May Be Obtained for 1s. in Respect of This Receiver

THE A.C. version of the popular £4 Superhet is designed on very similar lines to the battery model, and the theoretical circuit is given below. In the case of this receiver, no modifications have to be carried out, all of the components being still available to the constructor. The illustration shows the general arrangement of the receiver, and the list of components gives all the essential parts. Construction is carried out on a metallised wooden chassis and the mains section is included with this, so that the receiver is entirely self-contained. A metal rectifier is employed, and to ensure adequate H.T. an ordinary smoothing choke is employed rather than an energised speaker. There are certain advantages to be obtained from this mode of construction, and it enables the speaker to be built away from the receiver if desired. Single-knob tuning is employed, and the only remaining controls are the wave-change switch and the combined on/off switch and volume control.

The complete A.C. receiver removed from the chassis.

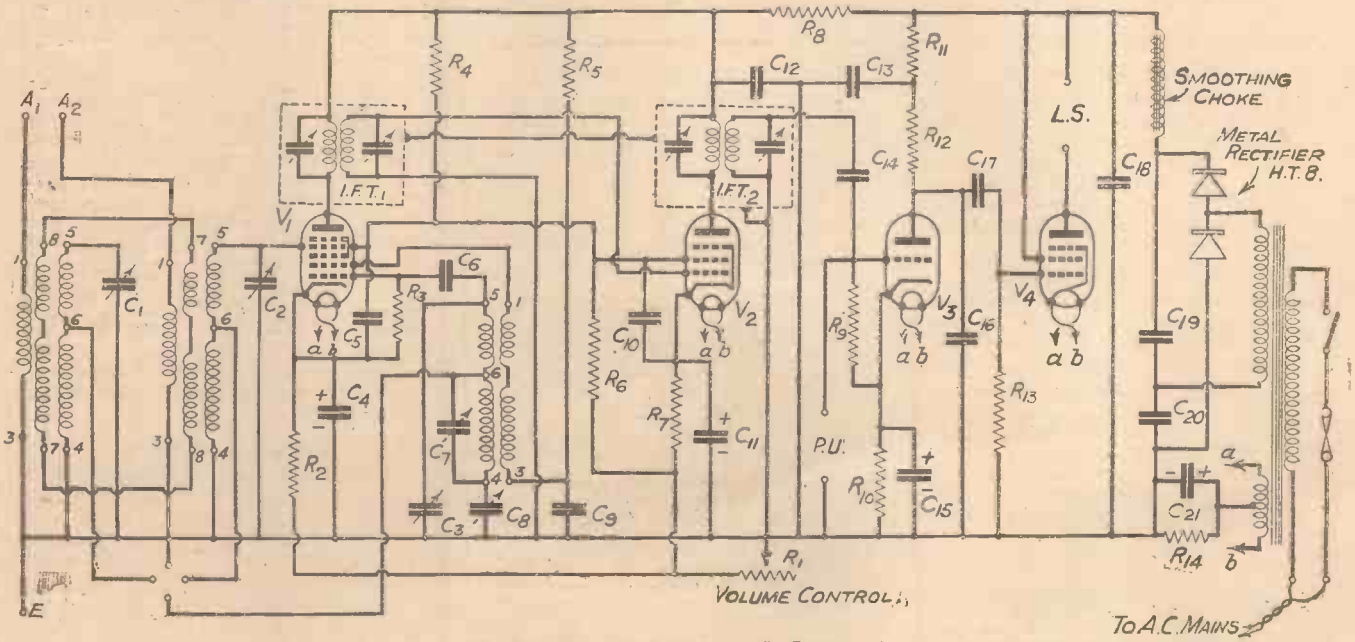
Trimming

As with any type of superhet maximum results will only be obtained when the gang condenser and the I.F. transformers are correctly adjusted, and, therefore, this is a very important part of the initial work. With the aid of the blueprint, wiring is a simple matter and should occasion no difficulty, but the trimming will have to be carried out very methodically, and unless a good oscillator is available, the ear is the only means of checking the adjustments as they are made. The trimmers for the I.F. transformers should be set to about the mid-way position, the C3 trimmer about one-eighth of a turn from the full-in position (in a clockwise direction), and the trimmers of C1 and C2 approximately one quarter of a turn from the full-in position. The setting of C1 and C2 is not quite so critical as that of C3, however, and the length of the aerial will affect the setting of C1. The adjustment of C3 and the trimmers on the I.F. transformers should be persevered with until a setting is found where readjustment of C1 and C2 will not be necessary when the tuning control is rotated from minimum to maximum. A point well worth mentioning is that the setting of the I.F. transformers should be reduced if the stations at the maximum end (550 metres) of the tuning scale come in at too high a setting on the calibrated dial.

Long Waves

The tuning scale and coils have been carefully chosen to match the gang condenser and the I.F. transformers, and, therefore, when the correct setting is obtained the stations should be tuned in at the correct marking on the scale.

(Continued at foot of page 474)



The theoretical circuit of the A.C. Superhet 4.

The Passing of Marconi

IT is with deep regret that we record the death of His Excellency the Marchese Guglielmo Marconi, G.C.V.O., LL.D., D.Sc., at the age of 63. The Marchese's first experiments in wireless were conducted in 1895, and since that time radio, as it is now more commonly called, has made tremendous strides. It was only in 1901 that radio signals were first transmitted across the Atlantic, between Poldhu, in Cornwall, and St. John's, Newfoundland, a date which is now regarded as the culminating point of Marconi's pioneer work. Other important inventions which resulted from his activities are the horizontal aerial (patented in 1905); the tuned spark system (1912), which enabled long-distance signals to be made more successfully and which resulted in the first messages being transmitted to Australia in 1918.

Of recent years his main activities have been aboard his steam-yacht, the "Elettra," and many successful short-wave experiments have been carried out and have resulted in improvements in existing apparatus, with the aid of his various expert assistants. Marconi was awarded the Nobel Prize for Physics in 1909, and the Albert Medal of the Royal Society of Arts. In 1914 he was nominated by the King of Italy to be a member of the Italian Senate, and in June, 1929, was created a hereditary marquis by the King of Italy.

The late Marchese Marconi.

PRACTICAL WIRELESS RECEIVERS—11

(Continued from previous page)

When the medium-wave setting has been located, the set should be switched to the long waves and the two padding condensers C7 and C8 should then be adjusted until maximum results are obtained. The previous adjustments should not be modified as this will upset the trimming for the medium waves.

LIST OF COMPONENTS

Three coils: BP80, BP80, BP86 (Varley).
Three-gang condenser: Midget 465 kc., with V.P. Horizontal Drive (Polar).
Two I.F. transformers: No. 674 (Eddystone).
Thirteen fixed resistances: Two 250 ohms, one 750 ohms, one 350 ohms, one 3,000 ohms, one 10,000 ohms, two 20,000 ohms, two 30,000 ohms, one 75,000 ohms, one 250,000 ohms, one 500,000 ohms (Dubilier).
One variable potentiometer: VS43, 2,000 ohms, with Q.M.B. switch (Bulgin).
Sixteen fixed condensers: Three .1 mfd. (type 4513), one .05 mfd. (type 4512), two .0001 mfd. (type 665), one .0003 mfd. (type 665), two 2 mfd. (type 9202), four 25 mfd. (type 3013), two 4 mfd. (type BE355 Block), one 8 mfd. (type 0281) (Dubilier).
Two pre-set condensers: .0001 mfd., .001 mfd. (Ward and Goldstone).
One L.F. choke, L.F.14 (Bulgin).
One H.T.8 rectifier (Westinghouse).
One W31 mains transformer (Heayberd).
Four valve-holders: one 7-pin, three 5-pin (Clix).
Two component brackets (Peto-Scott).
One four-point switch, S116 (Bulgin).
One fuse-holder with 500 m.a. fuse (Microfuse).
One Metaplex chassis (Peto-Scott).
Two-ft. screened lead (Ward and Goldstone).
Three terminal strips: A.E., P.U., L.S. (Clix).
Four valves: 41MPG, MVS-Pen., 41MHL, PT41 (Cossor).
One Speaker, Stentorian Senior (W.B.).

NEW VARLEY COMPONENTS

MESSRS VARLEY announce a number of new Nicore coil units, I.F. transformers and push-pull output transformers, to be added to the already-popular range of components available to the home constructor. The full details of these new lines are given below.

Coils and Coil Units

B.P.115. 3-GANG NICORE SUPERHET COIL UNIT (465 kc/s. I.F.)
An addition to the well-known range of Nicore ganged units. Comprises band-pass and oscillator coils, suitable for an I.F. of 465 kc/s. Can be used with superhet condenser or with straight .0005 condenser with additional padding condenser. Suits J.B. station-named dial.

B.P.120. 2-GANG 3-BAND SUPERHET COIL UNIT (465 kc/s. I.F.)
Covers 17–50 metres S.W., 200–550 metres M.W., 800–2,000 metres L.W. Comprises aerial and oscillator coils, complete with trimming and padding condensers. For use with straight 2-gang condenser.

B.P.121. I.F. FILTER 465 kc/s.
When using superhet with an I.F. of 465 kc/s especially in coastal districts, interference from Morse stations is often troublesome. This filter removes interference due to this cause. Comprises coil and trimming condenser in screening can.

B.P.99. I.F. TRANSFORMER 110 kc/s.
A fixed coupled I.F. transformer, complete in screening can, on bakelite base complete with terminals.

Skeleton Type I.F. Transformers, fitted with fixing bolts for chassis mounting and loose leads.

B.P.122. I.F. Transformer 465 kc/s.

B.P.123. I.F. Transformer 465 kc/s. Grid lead at top of can, for use with top grid valves.

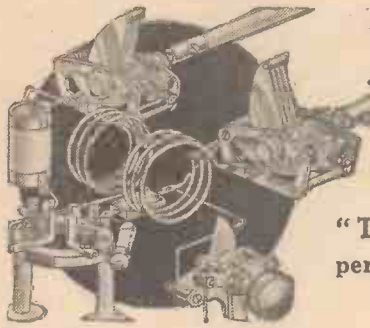
B.P.124. I.F. Transformer 465 kc/s.
"Band expansion" or variable coupling type. Has auxiliary coupling winding—allowing single peak curve for selectivity or double-peaked curve for quality to be obtained by means of single-pole double-throw switch. High Q windings. Used between F.C. and I.F. Grid lead at top of can, for use with top grid valves.

B.P.125. I.F. Transformer 110 kc/s.

B.P.126. I.F. Transformer 110 kc/s.
Grid lead at top of can, for use with top grid valves.

Push-pull Output Transformers
A new group of push-pull output transformers with improved frequency response. Secondary is in two halves which may be connected in series or parallel, giving two ratios without any unused turns.

D.P.46 Ratios 20 : 1 and 40 : 1
D.P.47 ,, 25 : 1 and 50 : 1
D.P.48 ,, 34 : 1 and 68 : 1



Short Wave Section

"The Experimenters" Describe Some Experiments Carried Out With an Inexpensive Single-valve Short-wave Receiver.

LAST week we found ourselves trespassing on the preserves of the "Short-wave Section," so this week we were given instructions either to write an article suitable for inclusion in this section or else to "keep off the grass." As a matter of fact, we have recently carried out a good deal of experimentation on short waves, so we accept the challenge. It seems that there are two fairly distinct schools of thought on the short-wave-receiver question: one insists on a pukka superhet with pre-H.F. amplifier, amplified and delayed A.V.C. and the like, while the other is perfectly content with a good single-valver "hotted up" to the highest degree.

Make It Simple

Our own experiments lead us to sympathise with the latter, for we have always been more successful with the simpler type of set on the short waves. Some of our

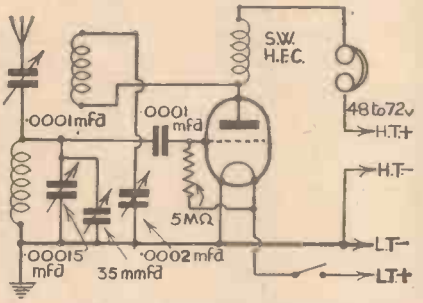


Fig. 1.—The original circuit of the single-valve set which was used for the experiments.

critics might reply to this by pointing out that a more elaborate receiver calls for greater skill in design and operation. That is partly true, but we can with all modesty claim that we are perfectly competent to produce a set which will defy competition, and also that we can make any receiver give of its best. Frankly, we have never been impressed with the superhet for the higher frequencies, and we consider that even a simple H.F. stage is unnecessary in the majority of instances.

In view of past experiences we decided that we would build a couple of one-valve sets designed around the basic circuit shown in Fig. 1, and see what improvements could be made without departing from simplicity of design. In both cases, a start was made by using a standard type of four-pin plug-in coil for tuning and reaction, the aerial being connected to the "top" end of the coil through a .0001-mfd. variable condenser.

Earth—Or No Earth?

Both sets were tried out separately using different aerial-earth systems, when it was found that in one case results were better when the earth connection was omitted. In the other case, the disconnecting of the earth simply made the set unstable and difficult to tune. From this it was obvious that there was room for experiment in this direction; we leave you to make the test for yourself. A point which became rather noticeable was that the set used without the earth appeared to be rather more sensitive, and this led us to suppose that the reduced damping was

by The Experimenters

an advantage. Incidentally, the aerials used with both sets were of similar pattern, consisting of a total length of approximately 50ft. of wire of which about 30ft. formed the lead-in.

Loose-coupled Aerial

In order to reduce damping with the set requiring the earth connection it was decided to observe the effect of employing a loosely-coupled aerial winding. Thus, five turns of 24-gauge d.c.c. wire were wound on a short length of cardboard tube which was stood on top of the plug-in coil, as shown in Fig. 2. The aerial and earth leads were connected to the ends of this, as shown in the inset diagram in Fig. 2. Reception was certainly improved, so we decided to try the effect of varying the position in respect of the tuning coil. Admittedly, the method adopted was rather crude (see Fig. 3), but it served our purpose. The extra coil was attached to a strip of plywood made to pivot on an upright about a wood-screw. This idea worked very well, and it was soon found that there was an optimum position of the moving coil for each tuning range.

By carefully adjusting the variable series aerial condenser as the aerial coil was moved we found that reception could be improved very appreciably, and that reaction control was smoothed out to a

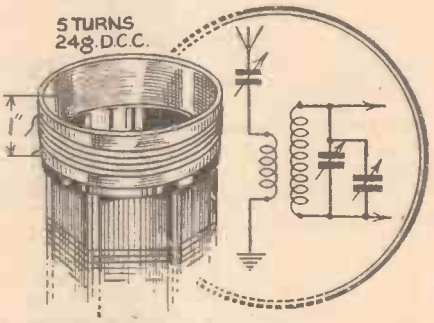


Fig. 2.—A loose coupled aerial coil to stand on top of the standard four-pin plug-in coil.

remarkable extent. In fact, this old-fashioned and rough arrangement was so good that we decided to make it a permanency on this experimental receiver. It will be of interest that the best setting was obtained when the reaction condenser had to be set to just about half its maximum capacity to obtain oscillation in the middle of the waveband.

A Doublet Aerial

While using this coupling arrangemen

(Continued overleaf)

These illustrations are made from the "snaps" sent by G6KR, and show his very neat two-valve short-waver, with which he has logged all continents.

SHORT-WAVE SECTION

(Continued from previous page)

it was decided to try using a doublet aerial consisting of two 60ft. lengths of rubber-covered wire arranged as shown in Fig. 4; the length was chosen to suit the two amateur bands (20 and 40 metres) in particular, but it is suitable for all wavelengths between about 10 and 50 metres. The two twisted down-leads were simply joined to the ends of the loose-coupled winding, either with or without the variable condenser in series with one of them. In this

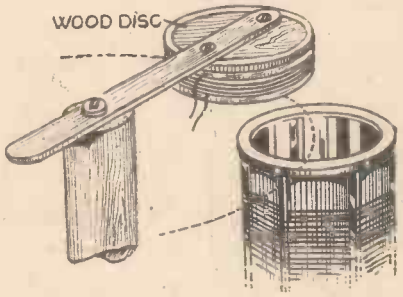


Fig. 3.—A "swinging" aerial coupling coil, which was used with success. Leads from the moving coil should be kept as short as possible.

case, it seemed that the earth lead had little effect, although stability was increased if it was joined to the L.T.— line. We also found it interesting to experiment with different numbers of turns for the coupling winding, although the original number was a good compromise for all the short wave-bands.

Throttle-control Reaction

Another interesting experiment was in connection with reaction control—which is extremely important in any simple set. We tried throttle-control reaction, by connecting the reaction winding of the four-pin coil in series with the anode of the detector valve and the 'phones, the reaction condenser being wired between the anode and earth, as in Fig. 5. Opinions differed as to which was the better system, but throttle control was certainly quite satisfactory, provided that the moving vanes of the reaction condenser were earthed, and that the condenser was controlled through a 3in. extension rod. One peculiarity about this system, which is rather confusing at first, is that the reaction condenser works "wrong way round." In other words, instead of the coupling being increased as capacity increases, oscillation is caused by reducing the reaction capacity.

During the course of our tests we tried a variety of alternative component values, but those chosen originally, and shown in Fig. 1, were as good as any. We therefore came to the conclusion that there was little point in suggesting that you should spend much time in experimenting in this direction.

Results

Readers are always interested in results, so we had better give a brief indication of the kind of reception obtained with the single-valver. We are not going to say that we logged every country in the world, but we see no reason why this should not be done in the course of time, if best use were made of good reception-condition cycles. Several American amateurs were picked up, and on Sunday mornings the dial was literally crowded with transmissions from most of the European countries. We also brought in a number of American broadcasting stations on the 19-, 31- and 49-metre bands; fair 'phone signals could be received at almost any time of day on one of the bands. During the day and early evenings 19 metres was most fruitful but late at night the other two bands provided plenty of signals. It must here be admitted that we used really good 'phones, actually a fairly old pair of Brown "A"-type wound to 8,000 ohms.

A Neat Amateur Set

You will remember that last week we published a circuit for a two-valve short-wave set which was sent in by reader G6KR, of Shrewsbury. When our last article went to press our friend had not sent the snaps which he promised, but they have since come along. They are reproduced on page 475, and you can see that the set is a very creditable piece of work, neat and workmanlike. Our correspondent apologised for the smallness of the snaps, but they reproduce quite well.

When he sent them there was an accompanying letter, in which were given the values of the components which he used in the circuit reproduced last week. We need not list them here because they agree almost completely with those which we added to the diagram. Actually, the only differences are that G6KR uses a .000015-mfd. trimming condenser, in place of the .000035-mfd. which we suggested; an 800-ohm bias resistance instead of 500 ohms; and a 1-mfd. bias by-pass condenser. The values given by G6KR are just as satisfactory as those we advised, although we think that an electrolytic by-pass condenser for the bias resistance is worth while, especially when the H.T. battery begins to run down. Incidentally, will you please note that, due to a draughtsman's error, the connections

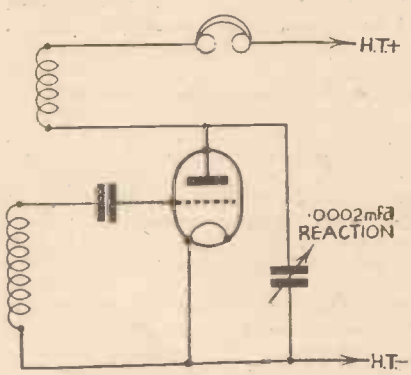


Fig. 5.—Connections for throttle-control reaction.

to the condenser in the circuit published last week were reversed; the negative terminal should, of course, be joined to H.T.—, not to earth.

Letters, Please

Now, you other readers of these notes, why not let us have a few particulars of your "pet" circuits? We shall be interested in them, as will all our other friends. Every one of us is ready to learn—and there is still much to be learned in this radio business. There is no need to make elaborate drawings; PRACTICAL AND AMATEUR WIRELESS draughtsmen will reproduce any rough pencil sketches that may be suitable for publication. Let us hear from you!

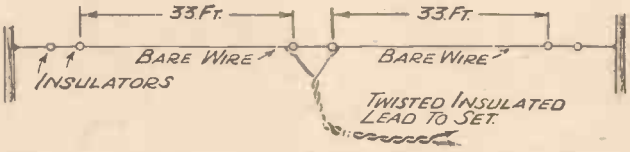


Fig. 4.—Arrangement of the doublet aerial, which gave most satisfactory results.

Radio Internacional, Lima

OAX4Z, the Lima 2-kilowatt station recently reported as broadcasting on 49.24 m. (6.092 mc/s), has slightly raised its wavelength, and may now be found nightly on 49.33 m. (6.082 mc/s) from G.M.T. 23.00. During the day transmissions are carried out on 31.37 m. (9.562 mc/s), or on practically the frequency allotted to DJA, Zeesen, the separation being only 2 kc/s.

And a Newcomer to Your List

YV5RI, Caracas (Venezuela), is said to be a new station found on 48 m. (6.25 mc/s). The call includes the slogan: *La Vos de la Esfera*. Announcements are made in both Spanish and English.

Listen to Sofia

It is not always an easy matter to capture the Bulgarian broadcasts on the medium wavelength, but the best of these radio entertainments can be tuned in without difficulty through the LZA, Radio Garata, short-wave relay working on 20.04 m. (14.97 mc/s). The regular schedule is now as follows: G.M.T. 10.00-12.00 (Mon., Wed., Fri., and Sat.), 18.00-20.00 (Tues., Thur.); 05.30-13.00 and 15.00-21.30 (Sundays). The call and information respecting programmes are given out by a woman announcer.

LEAVES FROM A SHORT-WAVE LOG

Those Spanish Transmissions

Another channel is being monopolised nightly from G.M.T. 22.30 by a Nationalist station, EA9AH, situated at Tetouan (Spanish Morocco). These war news bulletins may be found on 21.36 m. (14.05 mc/s). Broadcasts from the main Nationalist (Insurgent) studio at Salamanca are now relayed on two short-wave channels, namely 46.8 m. (6.41 mc/s) and on 23.4 m. (12.82 mc/s). Since the capture of Bilbao by this political party the call EAJ28, previously used by San Sebastian, has been adopted by the former station (Radio Requete de Bilbao) on 41 m. (7.32 mc/s) and invariably creeps into the amateur transmitter band, causing considerable interference. New calls from Spain are being logged nightly, the latest being Radio Puigcerda, working for the Catalan Anarchists on 45.65 m. (6.573 mc/s); it has been heard towards G.M.T. 17.30.

Manchukuo Calling

MTCY, Hsinking (Shinkyo), Manchukuo, a regular broadcaster on medium waves, has been relaying its transmission to Germany through JM04, Shinkyo, on 18.86 m. (15.905 mc/s). The signals were clearly heard in the British Isles. Are these tests a forerunner to a regular daily programme?

Letters from Readers

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

W2XGB: "The Bandspread S.W. Three"

SIR,—With reference to S. H. Ware's letter in a recent issue of PRACTICAL AND AMATEUR WIRELESS concerning W2XGB. This station, according to announcements, is on the air testing on 17,310 kc/s every evening from 16.00 to 18.00 G.M.T., except Saturdays and Sundays. He is received here at Q5A4, but I find that fading is very pronounced. My receiver is the "Bandspread Short-wave Three," and I really must thank PRACTICAL AND AMATEUR WIRELESS for such a fine receiver.—F. G. BLACKMAN (Littlehampton).

Signal Surges

SIR,—With reference to the two letters published in your "Letters from Readers" page in the July 17th issue, by R. S. Pace (Penrith) and S. C. Blackshaw (Wolverhampton), I should like to say that the signal surges in my set are not due to the same reason as theirs, because the volume control and switch only cuts off the L.T.+. My set is a well-known commercial portable of the suitcase type, H.F. (var.-mu) det., L.F., Pen. Grid-bias is automatic and the volume control controls the bias on the H.F. valve, so that to turn off the set the control is turned to minimum, i.e., more G.B. to the H.F. valve, and continuing turning, the set switches off. The G.B. circuit is still complete.—R. G. TAIT (Mundesley).

A 20-metre Log from Yorkshire: Correspondent Wanted

SIR,—As I have not seen a 20-metre log from any amateur in this district, I enclose mine. My receivers are an 0-v-2 (R.C. and trans.), and an 0-v-1 (trans.) which tunes from 13 metres to 170 metres. Aerial used is 10ft. long and 20ft. in height—earth 6ft. All stations were heard on 'phones, and listening hours were 23.00 to 24.30.

W1BW, W1EH, W1KJ, W1IAB, W1AKY, W1FNL, W1BQQ, W2IKV, W2ETF, W2EKU, W2FOA, W3DLL, W4IF, W4DLH, W4BYY, W4EJA, W5FDI, W8CXT, W8JOA, W9FTZ, W9SWQ, (U.S.A.). Canadian amateurs: YE1GC, VE1AR, VE1DC and VE2GA. Portuguese amateurs: CT1AY, CT1BY, CT1PA, CT1PX and CT1CV. South Americans: LU9KA, PY2EJ, PY5OT, CO2LY, CO2JG, LU4BL, YV5ABE and CT5TZ. Also SU1SG, SU1CH (Egypt), SV1CA, SV1NK (Athens, Greece), I1FAT, F3MN, VO1I, SM5YS, K4SA, ZB1H, and K4SA (R8) in QSO with W2EKU (R7).

I shall be glad if any other S.W.L. in my district would get in touch with me at the address given below.—G. W. HORTON, 149, St. Ann's Road Rotherham. Yorkshire.

An Amateur's Activities

SIR,—Being a member of the B.L.D.L.C. since June 8th, 1936, and up to now not having written to you of my activities, I feel that this letter will be of interest to you. To date I have logged 1,160 different S.W. amateurs on the 20 and 40-metre amateur bands. I have obtained verifications from fifty-six countries, including all continents, all on 20-metre 'phone. I have received all W districts except W7, but have logged W10XDA; the expedition ship *Morrissey*; all Canadian districts, including the experimental VE9AL. Recent QSLs which I have received are VU2CQ, W8NYP, W6CQI, W6EJC, VE3YY, SP1CC, OA4AB. I have found conditions on the 20 and 40-metre bands very indifferent this last month. But I have logged a few 20m. phone stations, including: I1KN, I1RK, I1SR, I1TKM, VE3GK, VE3EO, VE5ET, VE5BF, PY5AQ, PY4AX, PY3BX, PY2BA, W8OAR, W6GCT, W6LR, W6AH, W6NNR, W6BGH, W4OC, W6BIT, W9EF, W2IWT, T12KT, LU4AW, U3BC, U3BX, SP1HH, LY1HB, and YI2BA. Incidentally, YI2BA is not listed in my call book. I should very much like to have his address. I might state that I have been a reader of PRACTICAL AND AMATEUR WIRELESS since it first came out, and I should like to see the S.W. section enlarged.

The receiver I use here is a home-made S.W. superhet, A.C. mains operated, and all listening is done on a mains-energised speaker. I hope shortly to be applying for my A.A. licence. I might state that when I send out reports to amateurs I always enclose a reply coupon, and I invariably get a reply. In fact, the majority of QSL cards I have state on them: Thanks for the very F.B. report.—C. HILL (S.E.13).

CUT THIS OUT EACH WEEK.

Do you know

—THAT repairs to a speaker cone or speech coil should be made with a heat-resisting adhesive.
—THAT an iron core cannot satisfactorily be added to an existing air-core coil as the wavelength range will then be considerably modified.
—THAT wire-wound resistances should not be used for anode coupling or decoupling purposes.
—THAT wherever possible mica dielectric condensers should be used between an anode and the grid of the following valve.
—THAT multi-contact plugs and sockets are now available in several ranges for television and similar apparatus.
—THAT reaction may be applied to an I.F. transformer to increase sensitivity and selectivity.

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

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

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.

Newbury and District Short-wave Club

WE are very pleased to report that we spent a very enjoyable evening recently when one of our members (2CIO) came along with a transmitter and gave us an informal lecture on "What happens between the 'Mike' and the Receiver." As our membership is now increasing we had quite a party at our "Shack" and we all enjoyed 2CIO's talk and demonstration on an Artificial Aerial. — L. HARDEN, Hon. Sec., 12, Highfield Avenue, Newbury, Berks.

REPLIES IN BRIEF

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

R. F. A. W. (Doncaster). All of the aerials are joined together and to the primary of the transformer. The resonant frequency determines which aerial comes into play due to the harmonic principle.

J. H. F. (Chaddesden). The I.W.3 is an indirectly-heated full-wave rectifying valve. The heater is 4 volts at 2.4 amps and the output 350 volts at 120 mA. VMS4 is a variable-mu S.G. valve, MH4 is a triode and MPT4 an output pentode. These valves are all of the indirectly-heated type with 4 volt 1 amp. heaters.

E. J. W. (New Barnet). We regret that the receiver is now obsolescent and accordingly the blueprint has been withdrawn. Modern arrangements are greatly superior, and many of the essential components are now difficult to obtain. There are no issues of the magazine in print containing the details.

J. E. H. (Faversham). The glass increases losses as it has a lower efficiency than air as a dielectric and thus increases the capacity between coil and screen. Your screens were obviously too small and a larger diameter component should be used.

E. G. C. (Wembley). Many speaker fields do run quite hot, and if the speaker was fitted into the receiver by the makers we feel sure they would have used an ample field resistance. Of course, short-circuited turns would result in overheating, but then excessive voltage would be measured at the anodes of the valves.

G. N. (Liverpool, 22). If your coil is well made there should not be an appreciable improvement by using a commercial coil. Of course, there would be the added advantage that a plug-in coil could be used and the coil changing would be facilitated and greater wave-ranges could be covered. Eddystone, B.T.S., or Raymart coils could be used.

C. D. (Donaghadee). We regret that your queries are not clear. Can you set them out in more detail?

—— (Yardley Wood, Birmingham). H.F. is apparently leaking through to the L.F. amplifier and therefore more adequate H.F. filtering must be employed. Use a better-class choke and make certain that the anode by-pass condenser is not open-circuited. Very elaborate smoothing would be needed to use the H.T. unit and batteries are desirable for short-wave headphone work. We cannot give short-wave coil data in the form of a reply, but our Short-wave section last week should be of use to you.

F. W. F. (S.W.19). Interaction between the first two stages could account for the trouble. They should be separated by a metal screen connected to earth, and great care will be required to obtain the correct working voltages for the H.F. stage. The screening round the lead to the anode should be joined to earth also.

L. C. L. (Bethnal Green). You could not connect the set to an all-wave superhet, and there would be no advantage if you could. The only way of amplifying the signals from the short-wave set would be to add L.F. amplification and a 1 to 1 L.F. transformer could be added between the output from the 1-valver and the pick-up terminals on the all-waver.

K. L. W. (Ayr). We are unable to publish your query but suggest that you insert a small advertisement for the purpose.

Practical and Amateur Wireless
BLUEPRINT SERVICE

These blueprints are drawn full size.

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

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

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

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

PRACTICAL WIRELESS	Date of issue.	No. of Blueprint.
CRYSTAL SETS		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW55
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D,LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, H.F Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW53
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valver)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve: Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW33A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspread S.W. Three (HF Pen, D (Pen). Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans. Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF, Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM398
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C.4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadraphne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, O, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-Valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen)	*July* '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D. Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	*Jan.* 19 '35	AW463
The Carrier Short-waver (SG,D,P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-Wave World-Beater (HF, Pen, D, R.C., Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New-Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Microphone Connections

"I have a microphone consisting of what is apparently a telephone mouthpiece on a base with four terminals. I am not sure how to connect these and wonder if you can help me. I wish to use it with a battery amplifier which has only two input terminals."—S. F. U. (Darlaston).

THERE are several instruments of this type now on the market, and presumably you refer to a component similar to the accompanying illustration. This type of

A useful microphone such as is referred to in the above query.

microphone has a transformer mounted inside the base and two of the terminals are for connection to grid and G.B. terminals on the amplifier, whilst the other two are for the connection of an energising battery for the microphone. Usually a voltage of about 4.5 is required, and in some cases it is necessary to observe a certain polarity. In this case the terminals should be marked positive and negative. If the terminals have no markings of any kind it will be necessary to experiment and find the input and the biasing terminals.

Telsen Coil Connections

"I have a Telsen Variable Selectivity Aerial coil on which are 8 terminals numbered from 1 to 8. Could you give me the connections for this coil as I wish to include it in a simple three-valve set, Det. L.F. Power?"—E. T. W. (Lower Willingden).

WE have already published these details on several occasions, the last being May 15th this year. However, as you may be a new reader and have not got the back number we give again the necessary details. A small condenser is mounted in the top of the coil and is joined between terminals numbers 1 and 2. Therefore the aerial may be joined to either of these terminals, the connection to number 1 including the condenser in the aerial lead and connection to number 2 excluding the condenser. Terminal 8 is joined to the grid condenser and fixed vanes of the tuning condenser and terminals 6 and 7 are joined to the earth line. Terminal 5 is joined to the moving vanes of the reaction condenser, the other side of which is, of course, connected to the detector anode and H.F. choke. A three-point wavechange switch is required and this should be joined to terminals 3 and 4 and also to earth.

Building a Receiver

"I possess several old wireless components, including valves, Class B transformer, etc. I constructed a two-valve set using a circuit based on the 'Simple Two Valver' but would now like you to recommend a blueprint for a larger set using as far as possible the components mentioned. Later on, could I attach a short-wave converter?"—W. S. R. (Helensburgh).

RULES

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

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

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

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

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

WE cannot recommend a blueprint unless you use the parts which we specify and thus you might not be able to use any of the parts which you now possess. However, as you are now using a two-valver with apparent satisfaction, we think the best plan would be to build a Class B amplifier to attach after the present L.F. stage, and an H.F. unit for inclusion in front of the receiver. Details of units of this type have been given on several occasions and a blueprint for the Class B section (No. AW445A) may be obtained for 6d. A suitable H.F. unit will be found in our issue dated February 1st, 1936.

Defective Field Winding

"I have a commercial receiver which has developed a peculiar fault. This takes the form of a very loud humming and after trying to locate the trouble (with the aid of a very simple meter which I possess), I am at a loss to discover the actual cause. Perhaps the following details will enable you to help me to trace it. The speaker is energised and used to run rather warm. It now appears quite cool, although I notice that the tape wrapped round it is cockled. The output valve is terribly hot to the touch and, in fact, it is almost too hot to bear the hand. The other valves are comparatively cool. No crackles or other noises are heard and volume seems about usual. Can you diagnose anything from these details?"—G. F. T. (Eastbourne).

WE think the most likely cause of the trouble is a defective field winding to the loudspeaker. This not only smooths the H.T. supply, but also acts as a limiting resistance. Consequently, if it is partially short-circuited less smoothing will take place and an excessive voltage will be applied to the valves. As the output valve was already, no doubt, receiving the maximum H.T., it is now being over-run, resulting in the excessive heating. If an electrolytic or smoothing condenser were defective, this could cause hum but would limit the H.T. on the valves, and the output valve would therefore run cooler than normal. The damage to the tape round the field tends to confirm our decision that the speaker will be found at the root of the trouble. Have it tested at a good service agent or return it to the makers for test.

L.F. Transformer Fault

"My Detector two L.F. receiver has broken down and the following fact arises. Two transformers are employed, and I can get good headphone signals in the anode circuit of the first L.F. stage, but no signals at the usual output terminals. I suspected the valve, but changing round the two valves does not improve matters. I then connected a resistance across the primary of the transformer and obtained signals not loud, but clear. Does this show that the transformer is faulty?"—F. E. (Liverpool).

THERE should be no coupling between the resistance and the secondary of the transformer and therefore the inclusion of the resistance across a broken primary should not give you any improvement. It would, however, tend to indicate that there was a faulty H.T. connection to the transformer, or that there is some leakage between primary and secondary, the combination thus acting as a resistance-capacity coupling. It is more likely that the former suggestion is most probable, the H.T. not getting to the valve due to a bad connection which is overcome when you attach the resistance, due to the method of tightening the terminal or connecting the wire. Perhaps you could check this point.

Making a Mixer

"I have a pick-up with built-in volume control and a microphone for home broadcasting. I bought a 300,000 ohms volume control for the mike to fade out speech. What is the best method of combining these so that I can tone the two together for some programmes, announce with the music from gram. playing in the background, etc.?"—D. H. (Cirencester).

THE two volume controls should be joined in series. That is, the pick-up leads and microphone leads (with volume control in parallel) should be joined in series, and the two connected across the grid circuit. This arrangement is very simple but works effectively, and a diagram is given on page 250 of our issue dated May 29th last, Fig. 2. There are, of course, more comprehensive systems utilising centre-tapped volume controls, but with your present arrangement the scheme mentioned will be most effective.

The coupon on page 480 must be attached to every query.

Miscellaneous Advertisements

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

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIOMART

SHORT-WAVE MANUAL

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