UNCOMMON AERIAL SYSTEMS

Practical Wireless

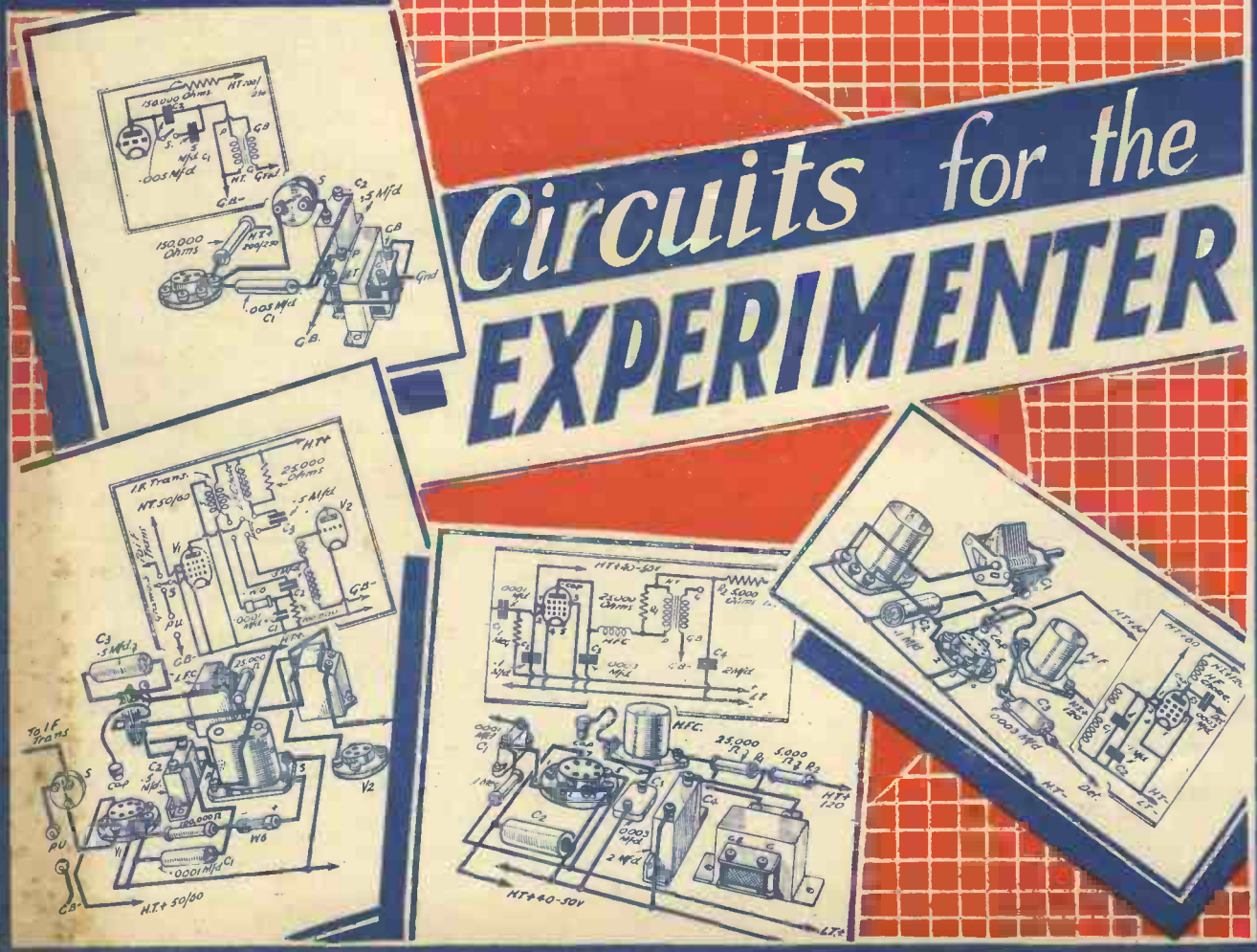
3D.

AND AMATEUR TELEVISION

EDITED BY F. J. CAMM.

Published every Wednesday by
GEORGE NEWNES LTD.
Vol. 5.——No. 108.
October 13th, 1934.
Registered at the G.P.O. as a Newspaper.

Circuits for the EXPERIMENTER



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The Cathode Ray I.F. Visual Ganging Apparatus is one of the hundreds of testing fixtures used in the "His Master's Voice" factories at Hayes. This apparatus gives a visual indication of the shape of the response curve, and ensures the correct adjustment of the intermediate frequency stages in each superheterodyne radio chassis. An unmodulated oscillator varying by approximately plus and minus 15 K.C. from 117 K.C. is fed into the receiver and the output from the second detector is viewed on the oscillograph. Any variation or inaccuracy in the response curve is clearly visible, and is corrected, if necessary, so that a uniform response is obtained throughout the audible range, in addition to the highest possible degree of selectivity.

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IS THE FRAME AERIAL DEAD?

SEE PAGE 138

ROUND *the* WORLD *of* WIRELESS

Cardiff Symphony Orchestra

THIS popular orchestra, which is composed chiefly of musicians who are not in regular employment, will be heard by West Regional listeners on October 14th. Garforth Mortimer, the conductor, evolved a scheme by which unemployed musicians in the Cardiff area could meet for weekly rehearsals, and as a result the Cardiff Symphony Orchestra came into being. The rehearsals, were held regularly from October, 1933, until May, 1934; they were then suspended as many of the members found summer engagements, but in the beginning of September they were resumed. The artist in the concert will be Clifford Deri (baritone), who won the Gold Medal at the Royal Academy of Music in July of this year; he has been appointed Sub-Professor of Singing at the Academy.

Popular Organ Recitals

REGINALD FOORT, the well-known cinema organist, will be playing at the Regal Cinema, Ferensway, Hull, throughout the first part of the winter; and one of his recitals will be broadcast to North Regional listeners on October 17th. This constitutes his first Northern broadcast.

Another well-known cinema organist, Herbert Maxwell, makes his North Regional début on October 20th, when he will broadcast for the first time from the Regal Cinema, Durham.

Variety from Liverpool

ON October 17th, a variety entertainment from the Pavilion Theatre, Liverpool, will be broadcast from the North Regional. The programme will include the following artists: Billy Merrin and his Commanders, David Poole (ventriloquist), Jim Jessiman (comedian), Lewis and Lann (acrobatic dancers), Henri Hilton (vocalist), Con and Syd Creole (dancers), and Hilder Baker (comedienne).

"All for t'love of a Lady"

THIS is the title of a Yorkshire comedy, written specially for the radio by George Beaumont, which will be broadcast from Leeds on October 16th. Produced by Robin Whitworth, it is being presented by James R. Gregson's Yorkshire Radio Players—including James R. Gregson, Florence Gregson, and George Beaumont himself.

When the Lights Failed

MANY singers nowadays declare that they seldom get a kick out of their performances; everything goes according to plan, and naught emerges save the critics' comments in next day's papers. Frank Titterton, however, still manages to provide a measure of excitement for himself and his audiences. At an August "Prom," when he was the soloist in the recitative and aria, "Sound an Alarm," an enthusiastic but misguided member of the audience expressed his views on the music presentation; and a day or two ago the elements themselves conspired to restrain Titterton's vocal efforts. He was singing at Buxton when a terrific storm broke over the Winter Gardens. In the middle of his solo, "Lend Me Your Aid," all the lights went out, following a terrific crash of thunder. Without a pause Titterton continued singing, and thus prevented what might have developed into a serious panic among the audience of 2,000 people.

The B.B.C. Midland Orchestra

THIS new orchestra, consisting of thirty-five players, will give a programme which includes Grieg's "Peer Gynt Suite No. 1," on October 19th, Leslie Heward conducting. The orchestra will be employed all the year round by the B.B.C. It also forms the nucleus of the City of Birmingham Orchestra, whose concerts will be relayed as usual. There are two, for instance, in the Town Hall on October 20th—a Children's Concert in the afternoon, when Harold Gray will conduct, and a Beethoven Concert in the evening, when Leslie Heward conducts, and Tom Bromley (pianoforte) and the Orchestra play the Concerto in C Minor.

Welsh Orchestral Concert

THE monthly String Orchestral Concert in the Reardon Smith Lecture Theatre of the National Museum of Wales will be given on October 17th, and an hour's relay will be taken for West Regional listeners. The strings of the Western Studio Orchestra (augmented) will be conducted by Reginald Redman, and the Cardiff Ensemble will be heard in Frank Bridge's arrangements of "Sally in our Alley" and "Cherry Ripe." An interesting item will be Introduction and Folk Tune by Reginald Redman, which was given a first performance in London a short time ago.

"The Northern Concert Hall"

UNDER this general heading, ten concerts by the Hallé Orchestra, eight by the Liverpool Philharmonic, and four by the Leeds Symphony Orchestras will be broadcast to the North Region this season. Georg Szell, the young German conductor, is to direct the Hallé orchestra in their opening concert at the Free Trade Hall, Manchester, on October 18th. The programme includes Beethoven's "Egmont" overture, Richard Strauss's symphonic poem, "Tod und Verklarung" ("Death and Transfiguration") and the Symphony No. 1 in C by Brahms. Georg Szell is only twenty-seven years old.

ROUND the WORLD of WIRELESS (Continued)

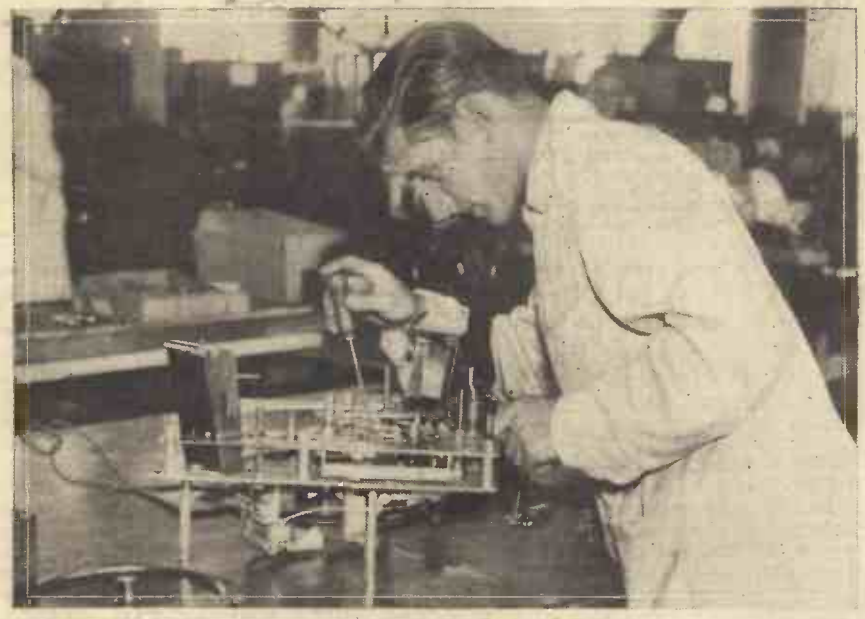
A Talk from Chipping Campden

IN the broadcast of one of the "Microphone at Large" series, which is to be given on October 17th, London Regional listeners are to share with Midland Regional listeners in the diversion of a microphone visit to the lovely old market town of Chipping Campden, in the Cotswolds.

INTERESTING and TOPICAL PARAGRAPHS

to see small groups of fishermen on the quay or in the shelters of this little Cornish village with their heads close together, bending over a line of music from a new work.

ADJUSTING AUTOMATIC RADIO-GRAM MECHANISM.



Automatic mechanisms are now an integral part of medium- and higher-priced H.M.V. radio-gramophones. An engineer is seen here making a final adjustment before the automatic chassis is installed in a radio-gramophone at the H.M.V. factories at Hayes, Middlesex.

Mr. F. L. Griggs, R.A., R.E., the well-known artist, who is a local resident, will co-operate with Owen Reed, organizer of Midland Regional features. Others taking part are George Groves, an old waller expert on Cotswold stone, and Harry Keeley, who will talk of thatching, and of the times when he led an ox team for ploughing for a wage of threepence a day. It is also hoped that Polly Wayne, who is aged ninety-four, will give her reminiscences of the Dover Hill Games, an old Cotswold custom.

Out and About

ON October 17th, C. Henry Warren will give the first of his fortnightly talks in the Midland Regional programme, which are to be called "Out and About." These will include personal impressions of Midland character and of the countryside—something on the lines of Priestley's "English Journey." Mr. Warren read some of his own poems at the microphone in the Birmingham studio recently.

Looe Fishermen's Choir

THIS well-known choir will broadcast in the London and West Regional programmes on October 24th; its recital will also be included in the Empire programme. The Choir is believed to be the only one of its kind in Great Britain, being composed entirely of men connected with the fishing industry. As its members spend most of their time at sea, it is only on rare occasions that the whole Choir can be got together for practice, though it is no unusual sight

Lord Snell at the Microphone

ON October 17th, a speech of welcome by Lord Snell, Chairman of the L.C.C., to the delegates to the third international conference of the Youth Hostel Association will be relayed from the County Hall to London Regional listeners.

"Young Men in Industry"

THE first talk in this series will be given on October 15th from the Midland Regional by J. E. Irvine.

"Europe and its Peoples"

THE talk about Belgium in the Scottish School Series bearing the above title will be given on October 19th by Emeritus Professor C. Sarolea, who is a notable linguist and was a friend of the late King of the Belgians, whom he accompanied on an expedition to South America.

B.B.C. Northern Orchestra

THE North Region's new orchestra of thirty-five players will not, as previously announced, be called the North Regional Orchestra, but the B.B.C. Northern Orchestra. Conducted by T. H. Morrison and "led" by Alfred Barker, it will broadcast a concert on October 14th, featuring Louis Godowsky, the celebrated Leeds-born violinist. Another well-known Leeds artist, Zerubbabel Leikin, pianist, will broadcast on October 16th.

"During the Interval"

THE interval between the first and second parts of the opening Hallé concert on October 18th and of other Northern Symphony concerts this season is to be filled by a new feature. It is called "During the Interval," and will take the form of a conversation between two members of the Free Trade Hall audience—not necessarily authorities on music—and will actually be relayed from the Free Trade Hall. They will, of course, discuss the concert, but not in specialized terms. Not only will the music claim their attention, but also the audience, and if any distinguished persons happen to be present these may, if convenient, be called up to the microphone to broadcast a message to listeners.

White Sails

THIS is the title of a musical play about two parties of holiday-makers on the Norfolk Broads, which will be produced by Martyn Webster on October 16th in the Midland Regional programme. The action includes the chase of a motor cruiser by a sailing yacht. Charles Hatton is the author of the book and lyrics, and Jack Hill is the composer. Hatton wrote the radio revue "Midland Masquerade" and the short play "Suicide Party" (relayed from the Birmingham Repertory Theatre), while Jack Hill is the young Birmingham pianist of "Two Jacks" and "The Three Knaves" fame.

Choral Recital from Tenbury Wells

ON October 18th there will be a choral recital from St. Michael's College, Tenbury Wells, which is a famous training centre for church musicians, and is also noted for its fine library of early scores. The programme, which is for Midland Regional listeners, will be introduced by the Warden, the Rev. E. H. Swann. The organist is Laurence Crosthwaite, B.Mus.

SOLVE THIS!

PROBLEM No. 108.

Smith worked in a boiler house attached to a large factory, and to pass away odd moments built up a small three-valve set which he installed in his workroom. In order to avoid charging difficulties he purchased a good car battery and connected the three cells in parallel so as to enable the accumulator to last some months without charging. He installed his set, fitted a good indoor aerial and obtained good results. After a few weeks signal strength fell off, and within a short time he could obtain no signals. Thinking that the battery had run down rather quicker than he expected, he made up a charger for his D.C. supply and connected the battery. After a suitable length of time he removed the accumulator, connected up the receiver again, but still could obtain no signals. Why? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 108, and must be posted to reach here not later than the first post Monday, October 15th, 1934.

Solution to Problem No. 107.

Although when Bradbury tested his coupling condenser he could get no current through it, this was not a complete test, as it only proved that there was no short circuit. Actually, one of the terminals had become disconnected, and the condenser was therefore open-circuited. This was the cause of his trouble.

Books have been forwarded to the following readers in connection with Problem No. 106:—

R. North, 14, Trinity Crescent, Sunningdale. J. C. Rennie, Cardonna, Campbell Street, Wishaw, Lanarkshire.

CIRCUITS FOR THE EXPERIMENTER

Details of Some Interesting and Efficient Circuit Arrangements Are Given in this Informative Article.

OF the many multi-electrode valves that have been introduced during the past few months, the H.F. pentode is probably the most widely used, this being mainly due to the variety of duties which this valve is capable of performing; it can be satisfactorily employed as an H.F. amplifier, an I.F. amplifier, a detector, and even as an L.F. amplifier if it is followed by a suitable coupling.

Advantages of the H.F. Pentode

In receivers employing two H.F. stages, with ordinary S.G. valves, overloading of the second valve often occurs. The advantage of the H.F. pentode over the ordinary S.G. valve is that a high voltage input can be handled without distortion, and therefore this type of valve is very suitable for use in the second H.F. stage. It can also be used to advantage in the first stage, of course, but unless the input voltage from the aerial is very high, the improvement obtained would not justify the substitution of a pentode for a relatively new S.G. valve.

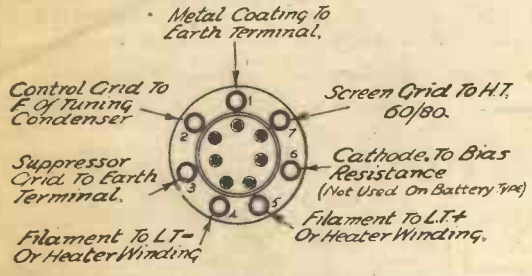


Fig. 1.—The valve holder terminal wiring of a 7-pin H.F. pentode.

There are four-pin battery H.F. pentodes available that can be substituted for an S.G. valve without the necessity for wiring alterations. When a seven-pin type is used, however, a seven-pin holder must be fitted in place of the four-pin type. Fig. 1 indicates the holder connections, and Fig. 2 shows a typical H.F. stage using a seven-pin pentode, and the valve electrode numbers shown in Fig. 2 correspond with the holder numbers shown in Fig. 1. The top cap of the valve cannot be shown, of course, but this is connected to the anode. When a mains pentode is fitted in place of an S.G. valve, a slight alteration of the screen-grid resistance values is necessary in most cases.

As a Detector

The H.F. pentode can generally be satisfactorily used in place of a triode detector, and this substitution should result in a marked increase of volume; Fig. 3 shows a suitable circuit arrangement for a battery pentode. When a mains type is used, it is advisable to parallel-feed the transformer, using a 100,000 ohms anode resistance, a 500,000 ohms resistance between the screening grid, and H.T. of 200 to 250 volts, and a bias resistance of approximately 1,500 ohms. These values are subject to slight alteration to suit different valve types, however.

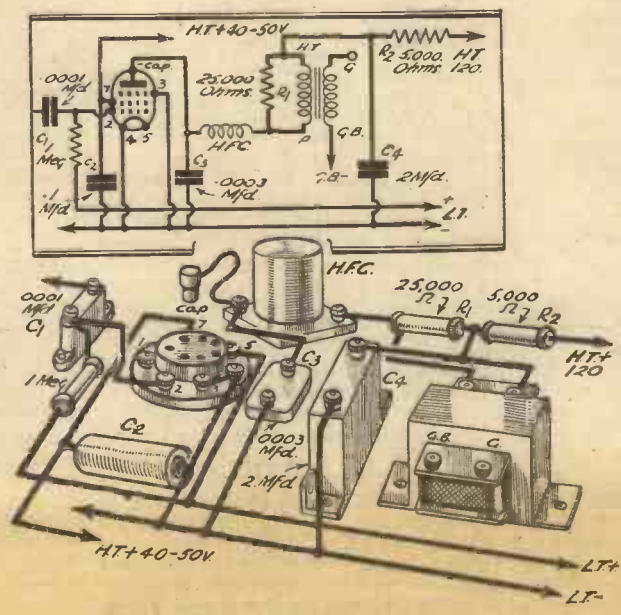


Fig. 3.—An H.F. pentode used as a detector.

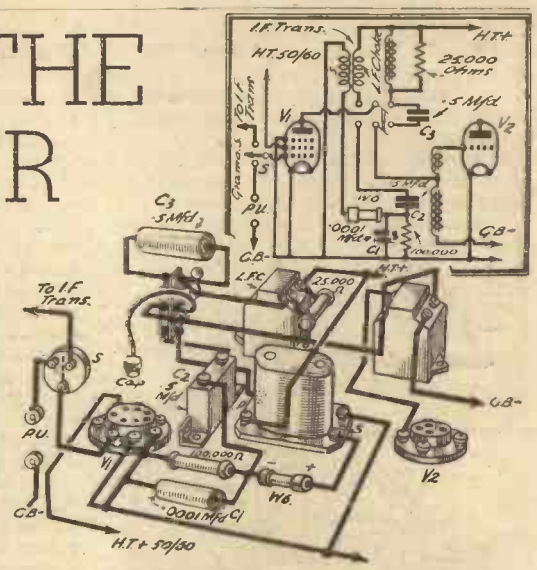


Fig. 4.—H.F. pentode used as L.F. amplifier.

As an I.F. and L.F. Amplifier

Some of the modern superhets employ a Westector as second detector, followed by a pentode output valve, and it is often taken for granted that satisfactory gramophone reproduction cannot be obtained with such a receiver. If an H.F. pentode is used in the I.F. stage preceding the Westector, however, this valve may be used as an L.F. amplifier if the switching arrangement shown in Fig. 4 is used. It will be noted that when the switch is on "gram," the pentode is choke-transformer coupled to the output valve, and therefore adequate L.F. amplification is obtained.

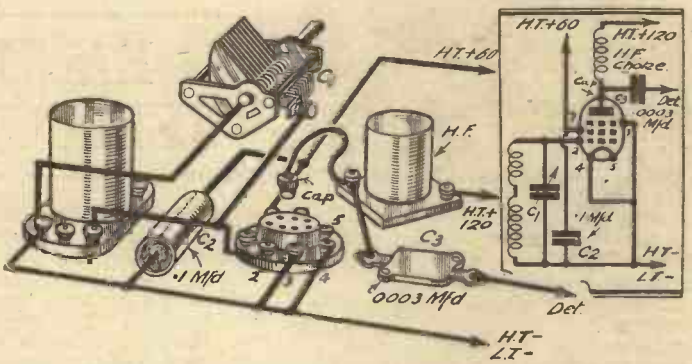


Fig. 2.—Circuit showing a typical H.F. stage using a 7-pin H.F. pentode.

Bass Boosting Circuit

Some gramophone records are deficient in the bass register, and therefore, in an amplifier used for gramophone amplification, an L.F. coupling that can be adjusted to provide accentuation of frequencies below 100 cycles is desirable. This bass boosting effect may be obtained by means of the circuit shown in Fig. 5. When bass accentuation is desired, switch S should be opened; the transformer winding and the condenser C1 will then produce a resonance in the lower register. A good class transformer should be used, and the value of C1 should be carefully chosen—a capacity of approximately .005 will be found suitable. If a battery valve is used, the anode resistance shown in the diagram should be replaced by a high inductance choke, in order to avoid loss of voltage.

Push-pull Output

It is generally agreed that a well-designed push-pull output

(Continued overleaf)

(Continued from previous page)

stage provides practically distortionless amplification, this being mainly due to the absence of the harmonic distortion which is prevalent in an output stage employing a single valve—more especially if this is a pentode.

If best results are to be obtained from a push-pull stage, however, the electrical characteristics of the valves should be alike, and uniform current must flow through the output transformer primary. The presence of D.C. in a transformer winding tends to lower the effective inductance; a push-pull output transformer primary winding is centre tapped, however, and the current is passed through the two halves in opposite directions, and, therefore, provided the current in each half is of the same value, the net effect of the direct current on the core will be zero. In order to obtain this desired effect, however, the anode current consumption of the two valves must be exactly alike. In a battery operated receiver this can be easily effected by using an input transformer having a separate secondary winding section for each valve, and adjusting the battery bias voltage until both valves pass the same current. When mains valves with automatic bias are used, the necessary adjustment is not so easily effected.

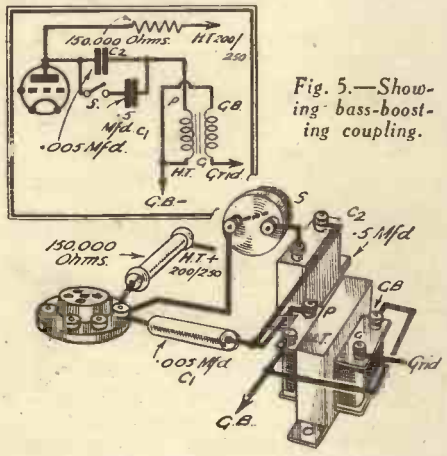


Fig. 5.—Showing bass-boosting coupling.

It is the general practice to fit a common bias resistance for the two valves, having a value of half that specified for one valve, but adjustment of this resistance varies the consumption of both valves simultaneously, and therefore it is suggested that a separate heater winding, and a separate bias resistance, be used for each valve if best results are desired. The circuit arrangement of a push-pull stage of this type is shown in Fig. 6.

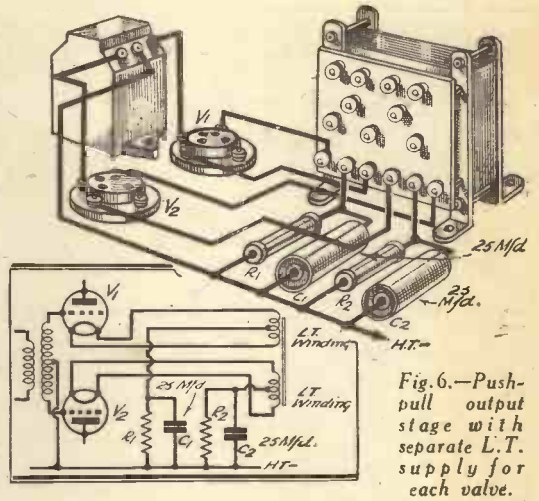


Fig. 6.—Push-pull output stage with separate L.T. supply for each valve.

Variety Applause

THE question of applause at the Vaudeville Entertainments put on the ether *viâ* the studios at Broadcasting House is still making some of the officials "hot and bothered." I believe that what listeners most complain of is the senseless giggling and laughter at the actions of the artist rather than the spoken humour, which more often than not drowns the joke the listener is straining to hear. Personally, I do not think the fault can be placed at the door of either the artist, audience, or the sensitivity of the wireless receiver. Where the trouble actually originates is in the placing of the microphone in relation to the audience and the artist. Whenever present at one of these performances I have particularly noticed this point, and, more often than not, the audience has been much too near the mike. During the periods an outside broadcast has been relayed from one of the theatres the occasions have been very rare when a similar trouble has occurred. The reason is very plain, for the artist is facing the pick-up and the audience behind it, whereas in the studio in most cases both are facing it. If this point received the attention it deserves there would not be many complaints of interference with the transmission, and the very necessary background for realistic reproduction of this kind of entertainment would be subdued to its proper relationship.

A Phantom Lead-in

VISITING a friend who was living on one of the new estates which are springing up in all parts of the country, I was rather interested to notice on the window-pane of his dining-room a piece of tinfoil which was connected to the lead-in of his wireless receiver. On enquiry he informed me that the landlord refused to allow holes to be drilled in the window frame in order to accommodate the usual lead-in tube from the aerial to the set. In order to combat the difficulty he had attached the aerial to a piece of tinfoil fastened to the outside of the window with adhesive, and another directly opposite on the inside connected to the wire of the aerial terminal of the set. The size of the foil was 9ins. square, and of course the glass window-pane was acting as a dielectric and the two pieces of foil as plates of a condenser, causing the current to flow from one plate to the other through the medium of capacity coupling. The selectivity of his receiver was quite astonishing, and it is a simple method to adopt where such difficulties occur, or even in the case of the present general system of iron frames.

RANDOM REFLECTIONS

Losing the Set!

I CAME across a very interesting case the other day which apparently settles a much discussed question. A problem was set for a magistrate in a North Country town with reference to a radio pirate. In short, he had been operating a receiving set without the usual Post Office licence, and, in giving judgment a fine was inflicted and the set ordered to be confiscated. Quite a number of people have been under the impression that this was an extremely harsh decision, and that the fine would meet the case. It is, however, clearly set out in Clause 3, Section I, of the Wireless Telegraphy Act, 1904, that the penalty could be justified, as the clause in question reads as follows: "If any person establishes a wireless telegraph station without a licence, or installs, or works, any apparatus for wireless telegraphy without a licence, he shall be guilty of a misdemeanour, and be liable, on conviction under the Summary Jurisdiction Acts, to a fine not exceeding One hundred pounds, or to imprisonment, with or without hard labour, for a term not exceeding twelve months, and in either case be liable to forfeit any apparatus for wireless telegraphy installed, or worked, without a licence, but no proceedings shall be taken against any person under this Act except by order of the Postmaster-General, the Admiralty, the Army Council, or Board of Trade." This makes the position quite clear and should be carefully noted, not only by those who use a receiving set, but the many, who, at the present time, are experimenting with transmitting circuits without first having obtained the necessary permit to do so from the Postmaster-General.

Crystal Palace Acoustics

IN the past many great musical festivals and other functions of international importance have taken place at the Crystal Palace which would have been worthy of the attention of the outside broadcast engineers of the B.B.C. I used to wonder why a move had not been taken to broadcast some of these great entertainments until I made enquiries of a B.B.C. official, and was then told the acoustic properties of the great hall did not lend themselves towards making for a satisfactory transmission. You can imagine my surprise when I was informed the other day by an engineer of the H.M.V. Gramophone Company that the trouble with the acoustics had been defeated. He mentioned, when the competing bandsmen at the recent National Band Festival were playing their test pieces in the Crystal Palace, they believed they were only playing to the thousands of people present in the building, whereas records were being made of the performances. It was feared, owing to the volume of the massed bands and the extraordinary acoustics of the building, that it might be impossible to obtain satisfactory records, and therefore the utmost secrecy was preserved. A mobile recording laboratory was hidden away in the grounds, while two microphones were built into the stage fittings. The resulting records are a revelation of perfect pick-up and reproduction.

C. D. K.

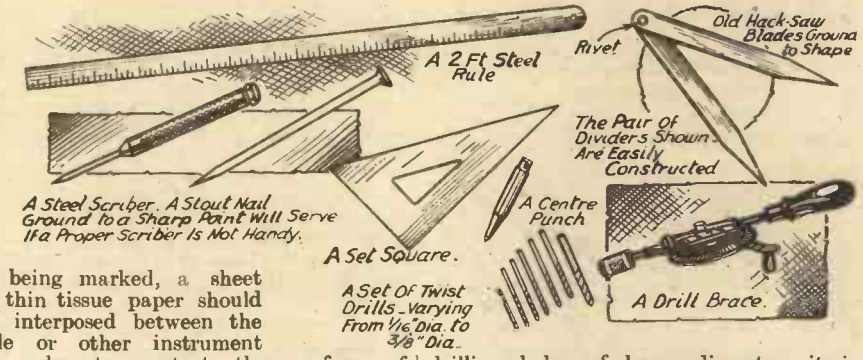
ARE YOU NEW TO THE HOBBY?

Some Practical Advice on the Choice and Use of Tools for Home Construction

ALTHOUGH a wireless receiver may easily be constructed in the living-room, perhaps on the kitchen table, there is a great deal to be said for the correct method of proceeding with the task of marking out the necessary panel or baseboard and using good tools and instruments for the necessary cutting and fixing which has to be done. It must not be inferred from this that wireless receiver construction is a complicated procedure, and although many constructors do carry out the work with the aid of only a screwdriver and a bradawl, it is possible greatly to simplify the work by using good tools in the correct manner. The result of so doing will be reflected not only in the appearance of the finished work, but also in the performance.

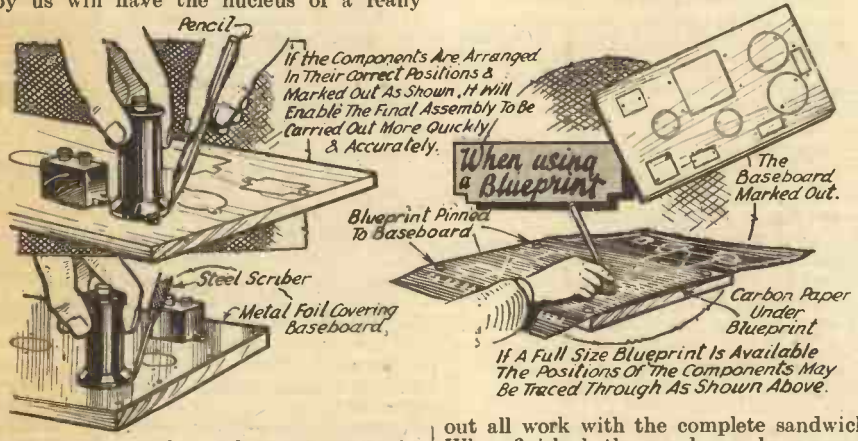
The "Practical Wireless" Tool Kit

Those readers who availed themselves of the tool kit which was recently presented by us will have the nucleus of a really good constructor's outfit, and with the aid of these tools most normal constructional work may be carried out. If it is desired to supplement this kit, a 2ft. steel rule will be found one of the first additions. Such a rule is required when marking out the cabinet front, or squaring up a large baseboard, and it is not an expensive item. The scribe has already been given, but for those who are not fortunate enough to own the kit a nail may be used in an emergency for marking various surfaces. The small inset at the top of this page shows some of the items mentioned, together with other valuable accessories.



Using a Blueprint

Construction is greatly simplified when a blueprint is obtained, and although this is always to scale, it is not necessary to go to the extent of transferring all measurements from the paper to the baseboard. By placing the print upon the baseboard the various fixing centres may be pierced without seriously damaging the print and the components may then be mounted in the indicated positions. An alternative method is to use a sheet of carbon tracing paper. When a polished ebonite panel is being marked, a sheet of thin tissue paper should be interposed between the rule or other instrument in order to protect the surface of the ebonite, and a very good plan where the perfect surface of the ebonite is required on the finished article is to sandwich the panel between two thin boards (after placing thin tissue on each side of the panel) and then to carry out all work with the complete sandwich. When finished, the wood may be removed and the panel found undamaged. Ebonite may prove very troublesome if it is worked in the wrong manner, and although we have recently published an article on this subject, it would be as well to repeat one or two points again for the benefit of the new reader. When drilling holes of large diameter, it is often desirable to cut a number of small holes round the edge of the required piece, afterwards cleaning up the projections left when the centre-piece is removed. If a large twist drill is being employed the work should be carried out in two stages, drilling first from one side and then from the other. Slow cutting is advisable with ebonite in order to prevent the cutting instrument from binding, and also to prevent damage to the ebonite due to the heat which is generated.



Tools Which Are Valuable

Among the many tools which the keen constructor will find invaluable for his work may be mentioned the soldering iron and the brace. The actual type of iron will depend upon the means which are available for heating it, and thus the choice will be made between gas-heated, electric-heated or ordinary fire-heated types. The latter may, of course, be used in conjunction with a gas jet, although the special gas-iron will be found more convenient if a suitable gas tap is available. On this page are illustrated a number of parts with various notes relating to their use and with certain small points emphasized. To store the tools a neat rack can quickly be constructed, or a large box may be adapted as a tool box. Racks round the side of the box, or in the lid will serve to

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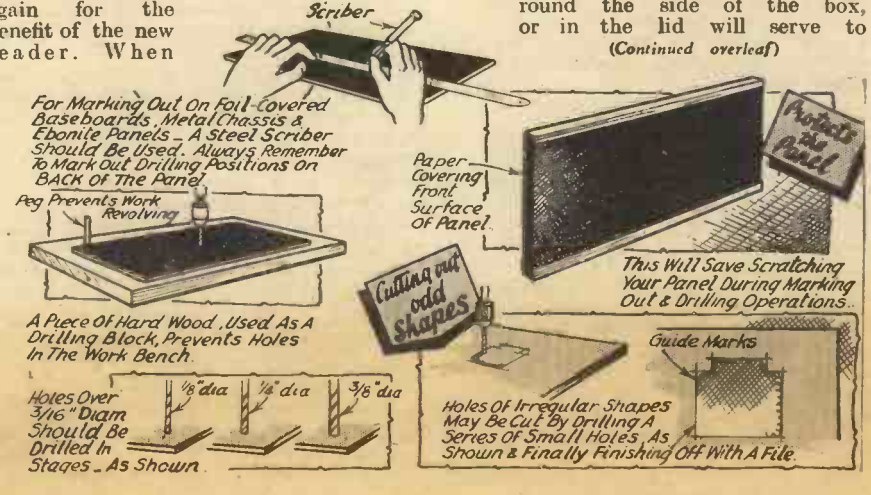

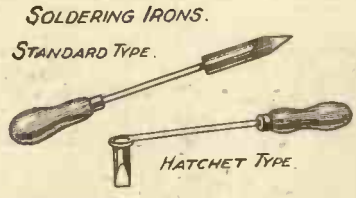

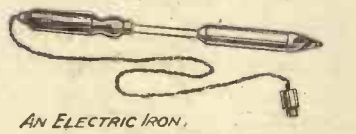

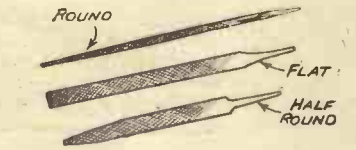

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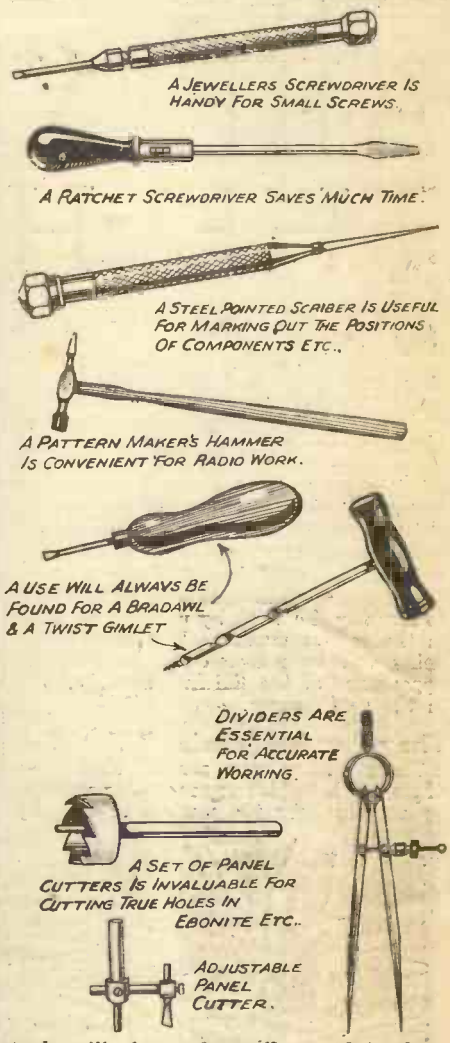
accommodate the smaller tools and prevent them from becoming mislaid. By cutting slots in the rack which only just take the various tools there will be no danger of misplacing them with loss of time when next a special item is required and does not appear in its usual place.

A useful point which is worth noting, especially by those who do not do a great deal of work, is the inclusion of an oily rag in the tool chest. By wiping steel tools with this rag after use they are protected from rust, and to avoid soiling the work a clean rag may also be kept handy with which to wipe the tool when it is required for use.

A great deal of the information here given may seem obvious to many of our readers, but it will be found that a saving of time and temper always results in better work, and when it is desired to try out some circuit arrangement which might be described in our pages, more enjoyment will be added to the actual testing and trying of the finished work if the construction may be carried out expeditiously and without the necessity of waiting until a certain tool can be borrowed or purchased, or just lashing up the arrangement with the aid of improvised tools. Money spent on good tools is never wasted, and the handyman will no doubt find many uses in the home for the tools which are described here, in addition to their use in the pursuit of his hobby.

Beware of Cheap Tools

It should be borne in mind that certain tools rely for their efficiency upon the quality of the steel or material from which they are made, and therefore the constructor should guard against purchasing cheap tools (generally of foreign make), which will prove useless after a short time in use. For instance, some very cheap screw-drivers with a ratchet action handle are at present on the market. It will probably be found, however, that if a really tightly fixed screw is attacked with one of these instruments, the handle will twist and the blade of the driver will be distorted, or the ratchet mechanism will be destroyed. Similarly, cheap pliers can be obtained from market stalls and in popular bazaars. These are cast, and if very great force is employed in turning an obstinate nut, the handle will break off, and this may lead to a nasty cut or damage to some apparatus, owing to the sudden jolt as the pressure is removed. These are not imaginary cases, but are actual cases which have been brought to our notice, and a few extra shillings spent upon good



tools will always be well repaid by long years of trouble-free service. An oil stone should, of course, find its place in the workshop or tool-case in order that those tools which require it may be kept provided with a sharp edge. A rub at frequent intervals will enable chisels, screwdrivers, and other similar tools to be kept in perfect condition.

USEFUL HINTS

The Variable Grid Leak

THERE are many wireless enthusiasts, even to-day, who look upon the grid leak as being a very mysterious thing both in construction and operation. It is true that it effects a very delicate operation, allowing the negative charge which accumulates on the grid to leak off at the proper rate. It has often been pointed out in the pages of PRACTICAL WIRELESS that if this charge that accumulates on the grid were allowed to reach too high a point, the efficient operation of the valve would be greatly interfered with. So it is of importance that the resistance of the leak be perfectly suited not only to the peculiar characteristics of the valve, but to the circuit in which the valve is used. Too many people overlook the importance of this device. Many receivers are unable to operate at their maximum efficiency simply because the grid leak is not of the proper resistance value. The resistance of grid leaks is measured in megohms, and a megohm is 1,000,000 ohms. Grid leaks are used having a resistance of from 25,000 to 5,000,000 ohms. When trying out a new receiver, or valve in a detector circuit, it is always wise to try out several different values of grid leak in order to find the value which suits the valve used. A variable type of grid leak is undoubtedly ideal if it is possible to get a reliable one. Those old-fashioned carbon types of the past were never satisfactory, and resulted in more noises and poor reproduction than any other component which went to make up the finished receiver. It is a great pity some manufacturer does not make a speciality of a really reliable variable grid leak. For laboratory use, a simple but efficient variable leak can be made by drawing a thick line with Indian ink on a small piece of Bristol board, and using a sliding contact strip of phosphor bronze. This gives a variation over any desired limits according to size. Unfortunately a similar type could hardly be used in a general set because it would be too susceptible to changes in atmosphere when used in that way.

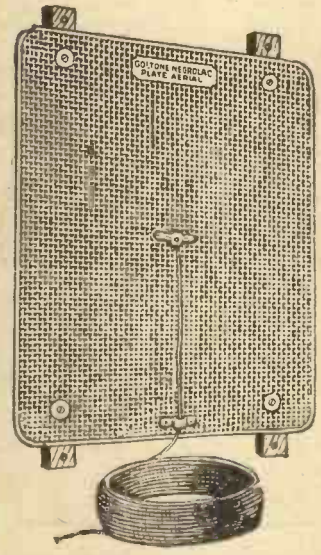
Plate Voltages

THE radio experimenter who ignores the customary rules by trying out some wrinkle of his own without knowing exactly what is happening may find that his experiment proves to be a costly one. For instance, an amateur recently was experimenting with higher plate voltages than those specified by the makers. In the case in point the valve was designed for 150 volts maximum but he was running it with 350 volts, and could not understand why he got such a pretty blue glow in the valve. Of course when a valve shows the gassy blue glow of ionization it is useless for any kind of experiment. The user should be very cautious when increasing voltages above 150 on the ordinary radio valve, and particularly so in the case of the high-frequency stage. Too great a flow of current in the input circuit of a detector is not to be desired, since a great deal of distortion which is blamed on the low-frequency circuit originates in the grid circuit of the detector.

UNCOMMON AERIALS

A Single Length of Stranded Wire is Not Essential as an Aerial, and Some Interesting Variations of this Valuable Part of the Wireless Equipment are Here Described.

UNDER the Wireless Telegraphy Acts, 1904-1926, the P.M.G. permits the listener to erect an aerial the length of which shall not exceed 100 feet. In the early days of broadcasting the amateur endeavoured always to utilize the full length of 100 feet of stranded copper wire, although, as has been shown in these pages on several occasions, some variations in the horizontal length of wire are possible and also efficient. For instance, two wires arranged parallel to each other, and both supported parallel with the ground, is an efficient arrangement where space is limited. An umbrella design, in which wires radiate from the top of a single mast towards the ground, has also been found to furnish good signal pick-up properties. There are, however, many other methods of "tapping" the wireless waves, in which either no wire at all, or at least very small quantities of wire, are utilized, and these will no doubt be of interest to the newcomer to wireless as well as to those who have previously considered it essential to use a length of stranded wire.



Two novel aerials; on the left a brush-type aerial (the No-mast), and on the right the Negrolac aerial.

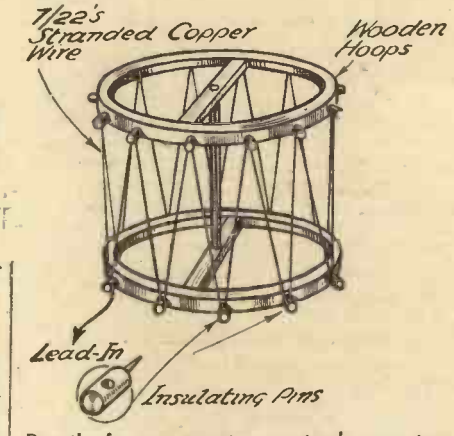
One of the latest commercial aerials, the Globe, produced by the New London Electron Works. The globe is of copper, and the lead-in is taken from the bottom of the globe.

Properties of the Aerial

First of all, let us analyze the aerial system, which may be regarded as one plate of a condenser, the other plate of which is the ground, to which an earth wire runs from the wireless apparatus. The dielectric of this condenser is the air between these two plates. Bearing this fact in mind, it is not difficult to conceive many methods in which a condenser may be constructed to preserve a similar capacity to that obtained by a normal aerial and earth. Taking it as a fact that the earth must be retained, and considering the walls of the house as "earth" (owing to the fact that they are in direct contact with the ground) it is only necessary to furnish the second plate of the condenser, and obviously, this could be carried out by wrapping the 100 feet of stranded wire round a flat board and supporting it near the earth; by using a plate of metal having an equivalent surface area; or by using the wire wound round some spacing medium. Various manufacturers have, from time to time, manufactured aerials on these principles, and no doubt they will be familiar to many readers.

The "Cage" Aerial

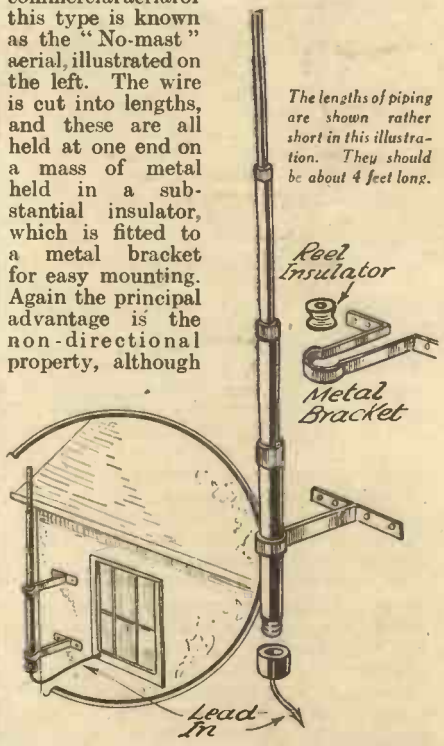
In the simplest form, the method of arranging the 100 feet of wire in a compact manner is to be found in what is known as a cage aerial. As its name implies, a cage is formed with the wire and two end pieces. For the latter, two small wooden hoops of the type used by children are fitted with a strip of wood across the centre. These cross members are then fitted to the ends of a strip of wood (a broom-handle, for instance) so that they are about two feet apart and parallel to each other. One end of the wire is then anchored to one of the hoops, after which the wire is taken across to the opposite hoop, back again, and so on, until the total quantity of wire is used up. From one end a lead is taken to the aerial terminal of the receiver, and the cage is then erected on top of a mast clamped to the wall of the house; suspended from a horizontal pole projecting from the upper window of a house, or hung in an attic or under the roof. In view of the risk of the hoops becoming distorted due to dampness or rain, it is preferable to fit the device inside the roof under cover. The results obtained with this arrangement are quite good and some latitude is possible in the size of the hoops, spacing between them, and the quantity of wire which is used. The principal advantage of this type of aerial is its non-directional property.



Details for constructing a simple cage-type aerial.

A "Brush" Aerial

An alternative method of using the wire is seen in the building of a brush, and a commercial aerial of this type is known as the "No-mast" aerial, illustrated on the left. The wire is cut into lengths, and these are all held at one end on a mass of metal held in a substantial insulator, which is fitted to a metal bracket for easy mounting. Again the principal advantage is the non-directional property, although compactness also has a prominent place in its list of attributes.



Details of construction of a vertical aerial built up from lengths of gas piping.

A Plate Aerial

Instead of wire, actual metal plates may take the place of the pick-up apparatus already mentioned. That is to say, in the cage arrangement a sheet of copper may be nailed to the edges of the hoops with a leading-in wire soldered to the plate, whilst a narrow cone, or funnel, may be used to provide a modification of this scheme. Very little difference in performance will be noticed with the two types

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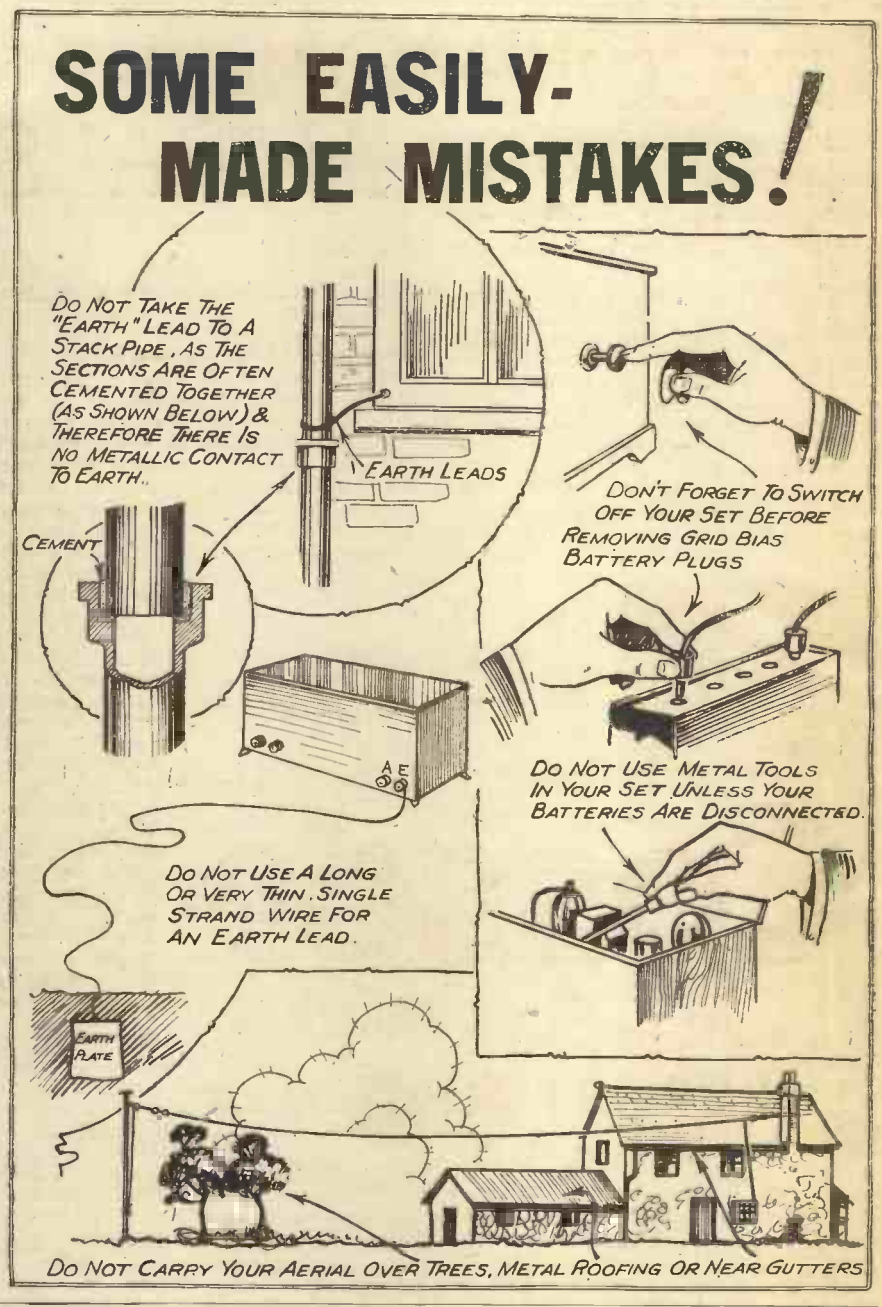
of aerial, that is, plate or wire. As a variation, however, the metal may take the form of a flat plate, stretched across a wooden frame, with the latter nailed to the wall or chimney stack. A sheet, 2ft. by 18in., will be found to provide good results, and perforated zinc forms a suitable material for construction, being obtainable at the popular stores in a suitable handy roll. For the experimenter who prefers to purchase a ready-made aerial of this type, we may recommend the Negrolac Aerial manufactured by Messrs. Ward and Goldstone. This is well-made and provided with all fixing screws, etc. It costs £1 1s. 0d.

A "Ball" Aerial

Still another variation of the metal aerial is to be seen in the device which appeared for the first time at Radiolympia, and which is a product of the London Electric Wire Company. This takes the form of a ball or sphere of copper, with a suitable mounting bracket. It has all the attributes of the previous types of aerial, namely, compactness, non-directional effect, and good pick-up properties.

A Pipe Aerial

Short-wave experimenters have for years found that the vertical type of aerial proves more effective than a horizontal wire, and a very efficient and simply-erected aerial may be constructed from some lengths of gas-piping. Five 4ft. lengths of piping, varying in diameter from 1½in., and with reducing sockets for connecting each successive length, may be built up and held about eighteen inches from the wall by means of metal brackets. Insulation must be provided, either between the pipe and the bracket, or between the bracket and the wall. By fitting the brackets at suitable positions on the piping, ordinary reel insulators may be used to hold the pipe in position, a cross pin preventing the pipe from dropping through. This type of aerial should, of course, be arranged so that it projects some distance above the roof, and the leading-in wire should be anchored in a gas plug which may afterwards be screwed into the end of the lower section. A gas fitter will supply the piping and carry out the necessary tapping quite cheaply, and this aerial will be found highly effective. Many other variations of these schemes will no doubt suggest themselves to readers.



RADIO AND THE WEATHER

MARK TWAIN once said that while everybody talked about the weather nobody did anything about it. The reason I mention this is I have just opened three consecutive letters, each of which complain that broadcasting brings rain, wind and storm, and suggesting that something ought to be done to curtail the energy now being dissipated into the ether.

A Petition

I remember a few years ago the inhabitants of a well-known Derbyshire Spa signing a petition asking for the same curtailment, and while this was going on the West Country Press was full of letters from farmers. In the former case the excessive local rainfall was the cause, and in the latter the lack of it. Persons blame radio for everything—weather, illness, accidents, lawlessness, political topsy-turvydom, and, I suppose, insanity. One of the correspondents tells me that while radio has been developed and perfected, so have our varied weather phenomena increased in violence. Another that the seasons are changed, and neither the winters nor summers are what they used to be. It is unfortunate for radio that people should advance radical theories that much of our unusual weather is due to radio activities in the ether, for such rumours spread rapidly into belief among credulous people. It seems to me the weather furnishes a topic about which many who are very ignorant believe they are very wise, and their greatest sport is to blame climatic changes on radio.

Radio Not to Blame

Weather variations have been with us from all time, and long before radio was dreamed of any unusual weather created consternation and excitement. Records which have been kept by meteorologists of the changes in temperature, pressure, air movements, humidity, etc., near the most powerful radio stations, using the most accurate instruments for the purpose, show that no blame can be put on radio for unusual weather changes. The combined power of all the radio transmitting stations of the world which is put in the ether would hardly be enough to operate a respectable electric motor, much less affect the weather conditions. Artificial excitation is not such a simple point, and I well remember the experiments which were carried out in this connection in London during a drought some years ago, when rockets and gun-fire were employed in order to try and make the clouds discharge their much-needed moisture. The experiments did not produce any marked effects, and that the idea is futile is substantiated by the fact that no further experiments have been carried out in recent years when rain has been urgently needed by the country.

HOW MUCH HIGH TENSION?

Some Interesting Sidelights on the Use of a Generous H.T. Supply

IN spite of all that has been written concerning the desirability of providing a receiver with an ample supply of high-tension energy, cases are constantly arising in which poor reproduction results from either misdirected high-tension economy or from sheer lack of knowledge on this important subject.

The value of a liberal allowance of high-tension voltage can be grasped very easily by a study of the various stages in a multi-valve-operated receiver. Consider first of all the high-frequency amplifying stages. Like all amplifying valves, radio-frequency types, whether of the screen-grid or the high-frequency pentode variety, depend for distortionless reproduction on being worked over the straight portion of their grid-volt anode-current characteristic. If, in an endeavour to economize in high-tension current, the anode voltage is reduced considerably, the effective grid bias is correspondingly shortened, and the valve will therefore fail to handle strong signals without distortion.

Affecting Over-all Performance

This point is illustrated in the diagram reproduced in Fig. 1. Here is shown a "family" of static characteristic curves for a typical screen-grid valve of the fixed-mu type, and the way in which the maximum permissible signal is limited by the value of the anode voltage can be readily appreciated. First of all, over-all performance is affected in several ways. For example, it is clear that at a reduced anode voltage there is a considerable risk of overloading the valve on strong signals, and the only alternative is to reduce the input, which in its turn will reduce the amount of power available at the output stage to operate the loud-speaker. In this connection, it must not be forgotten that

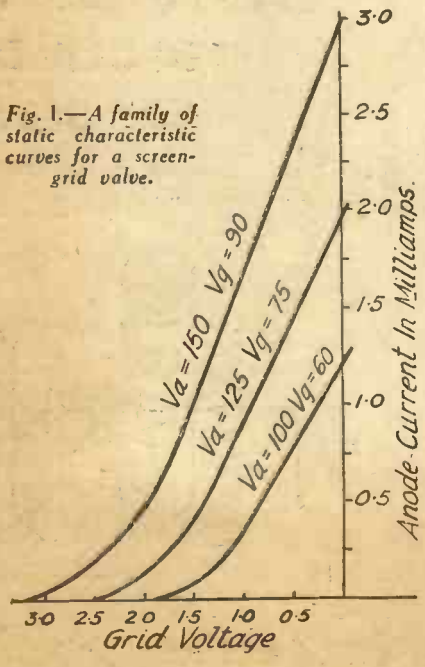


Fig. 1.—A family of static characteristic curves for a screen-grid valve.

many modern speakers lack considerably in quality when operated at low power. Then, the characteristic curves themselves show that the mutual conductance of the valve, as represented by the slope of the curve, is considerably greater at high anode voltages than at low.

In the case of the detector stage, the value of liberality in the matter of high-tension voltage is equally marked. In the old days, when the leaky grid triode detector valve with magnetic or capacity reaction was used almost universally, the guiding precept in designing the detector stage was to use the minimum high-tension voltage which gave adequate output combined with effective and smooth reaction. These

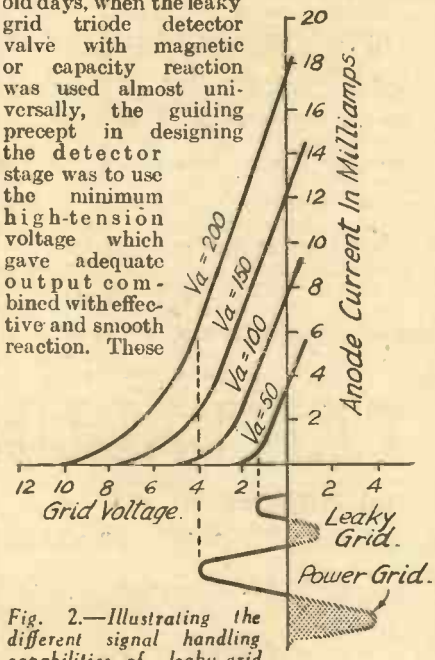


Fig. 2.—Illustrating the different signal handling capabilities of leaky-grid and power-grid detection.

were the days when two or more stages of low-frequency amplification followed the detector, and when, moreover, the efficiency of high-frequency amplification was far below what it is to-day, with the result that only comparatively small grid inputs were applied to the detector valve.

To-day, however, thanks to the screen-grid valve, and to the more recent high-frequency pentode, large stage gains are possible on the high-frequency side, and very seldom is it necessary to interpose a low-frequency amplifying stage between the detector and the output valve. This means that the detector must be able to handle comparatively large input signals and must, in addition, add its full quota of amplification in order to load the output valve.

Best Detector Conditions

With a triode-detector valve this can be achieved only by operating the valve under what is known as "power-grid" conditions. In this arrangement, the anode voltage is increased, if possible, to the maximum value for which the detector valve is rated, and as a result the anode current is correspondingly increased.

Operated under these conditions the valve will rectify quite powerful signals without distortion, and its amplifying powers are also exploited to the full. But since power-grid detection necessitates a somewhat heavier anode current, its benefit cannot be enjoyed unless the listener is prepared to accept this additional drain upon his high-tension supply.

Fig. 2 illustrates the effect of power-grid detection when compared with the ordinary leaky-grid system, the difference in signal-handling capabilities and in anode-current consumption being illustrated very clearly.

It is, however, in connection with the output stage that the ill effects of parsimony in high-tension supply are perhaps most noticeable. It should be borne in mind that in the output stage is generated the actual power required for driving the loud-speaker. In all other stages the only effect required is to produce in the anode circuit of the valve as large an alternating voltage as possible; the power question does not enter into the matter, and the consumption of anode current is merely incidental and perhaps unfortunate. But the output valve must provide a considerable amount of alternating *power*, as represented by the product of the alternating voltage developed across the "load" in the anode circuit (speaker or output transformer) and the alternating portion of the anode current.

Insensitive Large Speakers

Many speakers which are noted for the fidelity of their reproduction are comparatively insensitive, that is to say, they require a larger power input to produce a certain volume of sound than some of the more sensitive but somewhat less faithful reproducers.

Most listeners know that with the normal or class "A" output valve the A.C. component of the anode current consists of variations of current strength above or

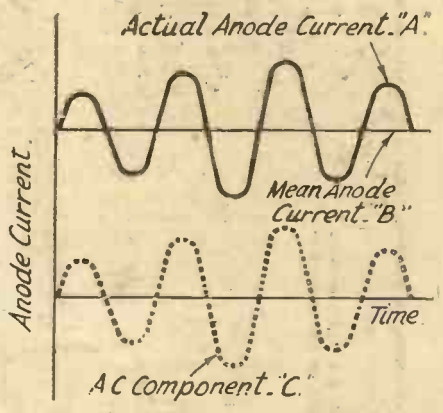


Fig. 3.—The steady or mean output current with the alternating component superimposed.

below a steady or "mean" value, which latter represents the normal anode current as measured by an ordinary milliammeter. This is shown in the familiar diagram reproduced in Fig. 3, where the top horizontal line represents the "rest" value of the anode current, while the curved line represents the actual anode current when signals are being received, and the dotted

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curved line shows the equivalent A.C. component. It is not difficult to understand that the actual anode current marked "A" is equivalent to a combination of the steady value "B" and the A.C. component "C." It is also clear that the amplitude of the alternating component will be limited by the value of the steady current, since the full "modulation" value is given by this mean current.

If, therefore, a really large output is required from a class "A" valve it must be of a type having a fairly large anode current in order to accommodate large variations. It is for this reason that the general quality of reproduction in mains receivers is usually so very much better than in battery sets. With mains power at a few pence per unit only, the listener can afford to be generous with his high tension. With battery operation, however, the total H.T. consumption must be limited at least to the economic maximum discharge ratio of the high-tension battery employed.

Questions of Cost

This brings to the front another aspect of the question of providing generous high tension supply. The difference in cost between expending 20 milliamps. and, say, 50 milliamps. in the high-tension circuits of a mains receiver is a mere detail—a matter of a few pence per week only.

In considering the case of the listener who has no alternative but the dry H.T. battery, it can at once be said that he will be wise to allow as heavy a consumption as he feels to be justifiable, bearing in mind the two facts that liberal H.T. makes possible improved performance all round, but at the same time adds to the cost of listening.

Most high-tension batteries, even the "standard" types of quite low capacity, will give quite a big current for a limited time, but only the battery designed for heavy discharge currents will stand up to such service for a reasonable time.

Battery Types

The "standard" type of battery should not be called upon to give more than 6 or 8 milliamps., and under this duty their life is quite satisfactory. "Power" types or so-called double-capacity batteries are usually rated for drains of the order of 12 to 15 milliamps., while the heavy-duty, triple-capacity type may be used where currents up to some 20 milliamps. are required. Each type of battery will give a reasonable life provided its recommended duty is not exceeded. The costs of the various types are in proportion to their capacities, but even so it definitely pays to use a battery at least one size larger than that indicated by the total anode current required by the set. The reason is that the useful life of a battery is not strictly inversely proportional to the drain, so that with a loading of, say, 10 milliamps., a double-capacity battery will give more than twice the life of a single capacity battery.

All dry batteries suffer a considerable drop in voltage towards the end of their useful life, with consequent deterioration of both volume and quality of reproduction. With a large battery this deterioration is postponed, and this is another reason why it pays to be generous with your H.T. supply whenever such a course is economically possible.

Wireless at British Airports

THE Air Ministry now controls in Great Britain a comprehensive system of ground-and-air, inter-aerodrome, and meteorological communications for civil aircraft, with transmitting and receiving stations at Croydon, Heston, Lympne, Pulham, and Manchester, as well as the three new stations mentioned recently. The latter are designed particularly to cater for the growth of internal air routes.

"Wonder Bar"

THIS musical play by André Charlot, which proved very successful on the stage both in Berlin and London, and also as a cinema screen show, has been adapted for broadcasting by C. Denis Freeman, and will be heard in the National programme on October 15th and in the London Regional programme on October 17th.

MAKING A TANTALUM CHARGER

Details of a Reader's Successful Effort to Overcome Some of the Difficulties Encountered in Building a Charger

SEVERAL readers appear to have encountered difficulties in constructing the tantalum charger described in PRACTICAL WIRELESS for January 21st, 1933, and to such readers the following description of my own method may be of assistance.

A worn-out accumulator was obtained for a few pence, and the plates were removed by chipping away the pitch. The container was cleaned out thoroughly, and the lead plate was melted down in a ladle. A mould was then made from clay to the shape shown in Fig. 1. The end of the tantalum strip was bent to a V-shape, and temporarily fixed with wax in a hole in a piece of plywood supported on the top of the container. The mould was placed on the piece of plywood so that the strip projected into the circular hole in the mould. A terminal was held in the centre of the hole with pliers and molten lead from the ladle poured in, as in Fig. 2. When the lead had set the clay was broken away, and a hole was bored in each of the lead flanges for fixing.

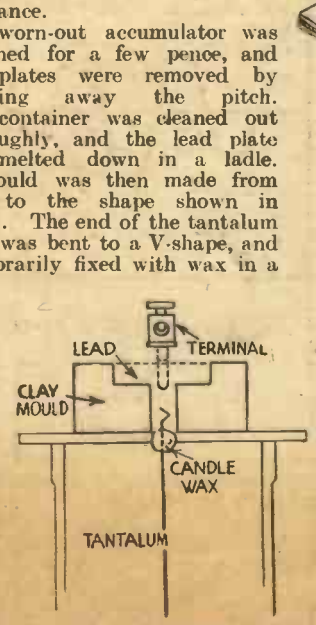

Fig. 1.—How the mould is built up from clay.

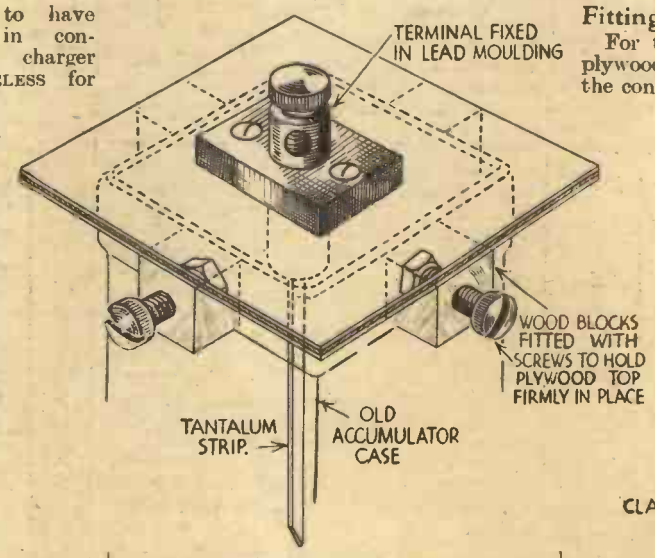

Fig. 3.—Full details of the terminal assembly.

Fitting the Top

For the top of the rectifier a piece of plywood was sawn so that it overlapped the container by an inch all round. Small wooden blocks were screwed in the centre of each side, and bolts and nuts fitted into two of them to fix the top firmly, as shown in Fig. 3.

A slit was sawn in the top for the lead plate and a hole drilled for the tantalum plate. The lead plate was fixed as shown in the previously mentioned article, except that the terminal was passed right through the top, thus firmly fixing the plate. The tantalum was fixed by two screws in the holes provided.

E. C. SWINSON.

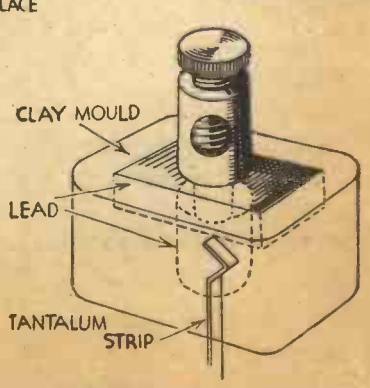

Fig. 2.—Further details of the method of fitting the terminal.

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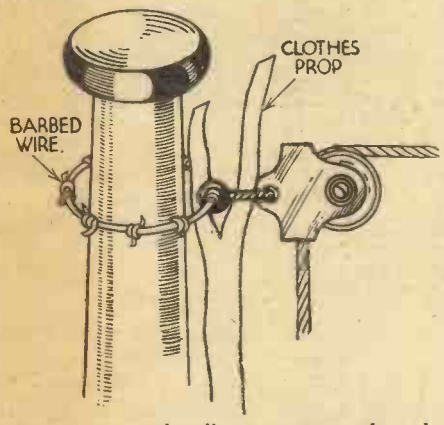
READERS' WRINKLES

THE HALF-GUINEA PAGE

Fixing an Aerial Pulley

IT often happens, especially during the winter months, that the aerial halyard breaks and it appears necessary to lower the mast for repairs to be made. A simpler and much less troublesome method is as follows:—

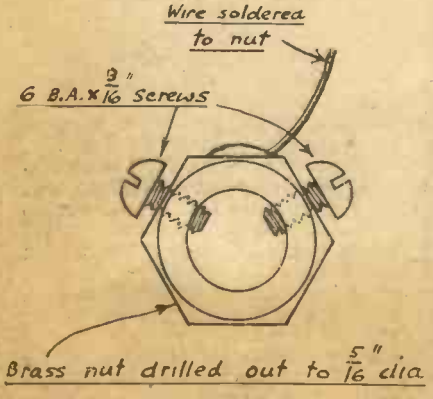


Fixing an aerial pulley to a mast after the halyard has broken

Obtain a length of barbed wire just long enough to form a loose loop round the bottom of the mast, and to the loop attach a pulley. Thread the halyard through the pulley and then with the aid of two or three clothes-props fastened together, push the loop into position at the top of the mast, as shown in the sketch. Now pull the aerial taut by means of the halyard and withdraw the clothes-props. The "barbs" of the wire loop will bite into the mast and a secure repair is the result.—F. E. MORRIS (Kilburn).

Tapping Resistors

IT is sometimes required to tap a carbon resistor to form a potentiometer, or when an exact value is required, as, for instance, a dropping resistance for a multi-range voltmeter. The following method will enable this to be done, for either a temporary or permanent adjustment. Drill



Tapping resistors by means of a nut and screws.

THAT DODGE OF YOURS!

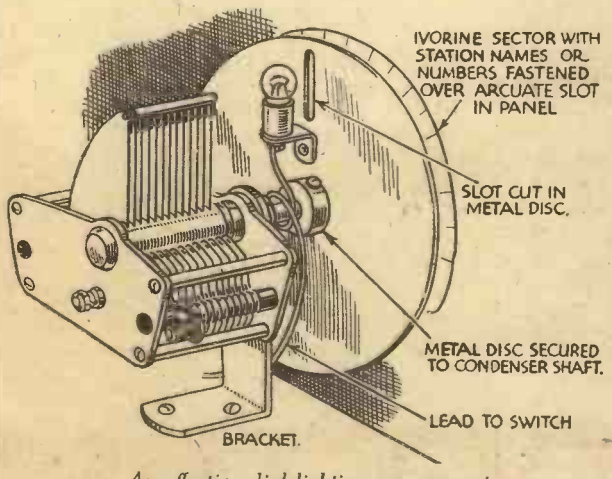
Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-1-0 for the best wrinkle submitted, and for every other item published on this page will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

out a ¼in. brass nut to 5-16in. diameter. then drill and tap two faces for No. 6 B.A. screws, as shown on the sketch. The nut is threaded over the resistor, and connection made by soldering a wire to one of the other faces. The paint on the resistor should be removed where the screws make contact, and the ends of the screws should be flat, not pointed. It is also essential to see the resistor is not of the type having a porcelain or other insulated surface.—L. W. HARVEY (Brondesbury Park).

Novel Dial-lighting Arrangement

HERE is a novel dial-lighting arrangement—the cost of which is very small.

It consists of a metal disc, an ivorine full-vision scale, a small lampholder, and



An effective dial-lighting arrangement.

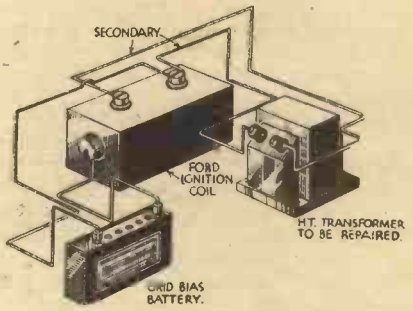
a L.C. screw-type bulb. A hole is drilled in the centre of the disc to suit the condenser, this hole being made to fit the spindle tightly, or a small collar can be soldered to the disc and a grub-screw fitted to grip the condenser spindle.

A slot is cut in the disc to suit the scale, large enough to show the name of the station on the scale. If numbers are used, the slot can be smaller. The lamp is fixed to the back of the disc just behind the slot, and is wired with one wire only from the L.T. switch, the return being made viâ the condenser spindle. This wire is fixed to the spindle with a rubber band or tape and to the baseboard, leaving a little slack for condenser movement.

In some cases the condenser may have to be set back from the panel, but this only requires a small extension to the spindle, the condenser being fixed to a bracket on the baseboard.—THOMAS JOHNSON (Newcastle-on-Tyne).

Repairing Transformers, Speakers, etc.

SHOULD you have the misfortune to have a transformer with one of the



Method of repairing a transformer.

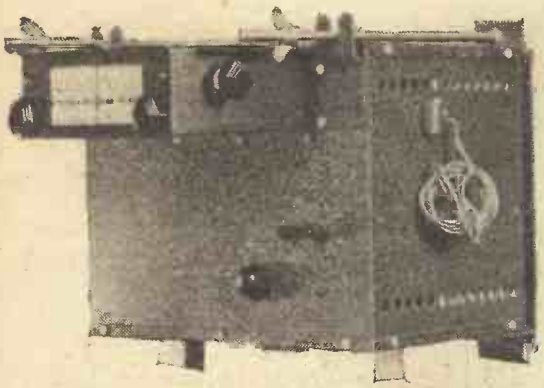
windings broken down, *don't* take it to pieces, leave it just as it is, then carry out the following scheme: Obtain a good Ford coil, and a grid bias battery (a good 9-volt one), alternatively, if you are on A.C. current, get a bell transformer with secondary of 8 volts, and use that; then connect as shown in the accompanying sketch.

Take care to connect the secondary first, otherwise a violent shock will be felt. When the secondary is connected, join the primary to the grid battery or bell transformer, and see that the trembler at the top of the coil is working correctly. Leave on for one minute, then disconnect and test the transformer. If not repaired, connect again, and again if necessary, and you will find, if the necessary care is taken to see that trembler is working properly, that the transformer winding is usually welded at the break at the first or second attempt. The spark gap can be regulated by the nut at end of trembler.

Do exactly the same when repairing speakers, remembering that the main thing is not to take them to pieces. This method consists actually of spot-welding, the arc which takes place at the broken point producing sufficient heat to weld the fine wire.—J. R. BURNS (Cork).

FERRANTI CAR RADIO

Details of an Interesting Receiver Designed for Use with a Motor-car Lighting Battery.



This photograph shows the neat arrangement of the complete Ferranti "Motorset."

THE latest apparatus designed for use entirely as a car-radio receiver is the Ferranti "Motorset," a powerful 5-valve superheterodyne which operates entirely from a normal lighting battery as found on the car of to-day. The valves are of the Universal type, and, although only five in number, they include a heptode and a double-diode-triode, so that the circuit arrangement is very similar to a normal 8-valve superhet., the heptode combining the functions of first detector and oscillator, and the double-diode-triode combining the functions of second detector, A.V.C., and first L.F. valve. The necessary high-tension supply is obtained by means of a special double-vibrator mechanical rectifier which performs the double function of converting the current from the lighting battery into A.C. and then stepping it up to the required voltage, after which it is again rectified for the H.T. supply. In view of the utility of the new Droitwich transmitter, special attention has been paid to the long-wave performance of this Ferranti receiver.

The entire apparatus is contained in a neat steel cabinet finished in black enamel and designed for fitting below the dash-board. If desired, the entire apparatus may be removed in less than half a minute, yet the mounting is perfectly secure and shock-proof. All the valuable features found in a modern home receiver are included in this particular model, and these include an illuminated dial giving station names as well as wavelength calibrations; single knob tuning; combined manual volume control and on-off switch; tone control; moving-coil loud-speaker delivering an output of 2½ watts when fully loaded. The dimensions of the case are 9⅛ in. high by 12½in. wide by 15in. deep, and the price is 18 guineas complete.

It can be seen from this photograph that the speaker grille is situated on the underside of the black steel cabinet.

THE NEW H.M.V. BATTERY SUPERHET

A NEW battery receiver is announced in the H.M.V. superhet, which follows modern design in every way, employing four valves with delayed A.V.C., double pentode output, new reflecto-light dial and novel "on-off" indicator housed in a handsome walnut cabinet. The new high-power station at Droitwich has been kept well in mind when designing this model.

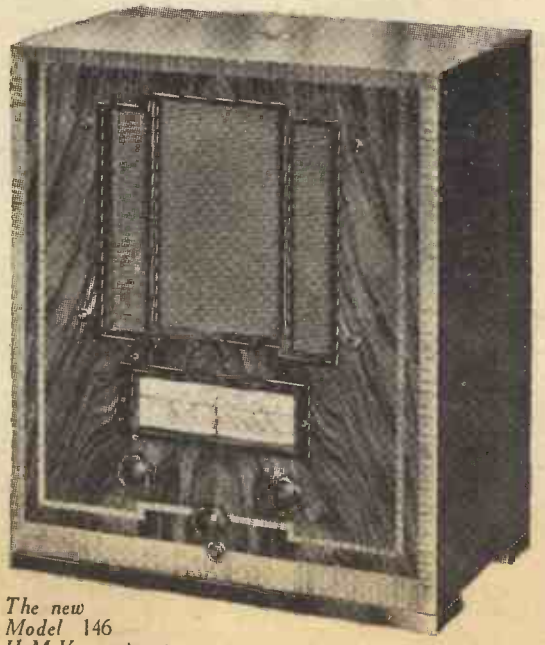
A New Scale Light

In order to save current, the scale is not illuminated, but is made of special material, which makes the station names and wave-length calibrations stand out clearly from the background, and gives the illusion that the scale is illuminated from behind. As the main switch is turned to "medium wave," "long wave," or "gramophone" a small transparent scale bearing the word "on" comes into view at the top and in front of the main station scale.

All the main controls are mounted on the front of the cabinet. On the left is the volume control, and on the right the master switch. This switch has four positions, MW, LW, Gram. and Off. The actual tuning control is below the scale, and beneath the tuning control is the sensitivity switch, which has a novel "push-pull" action. A pre-set reaction control, to enable the maximum sensitivity to be obtained, is mounted at the back of the cabinet.

Latest Valves

The first valve, a heptode, acts as a mixer, and is fed from a super-selective tuned circuit. The output from this valve is fed into a Litz wound I.F. transformer. The intermediate frequency is 456 kc/s; the use of this frequency practically eliminates direct second-channel interference. The secondary winding of the transformer is connected to the I.F. amplifier valve—a VS24. The primary of second I.F. transformer is joined to the anode of this valve. Both the primary and secondary of this transformer are tapped. The primary tap is connected to the AVC diode of a double-diode-triode valve (HD21). Both the previous valves are controlled by delayed AVC. The split secondary of the transformer feeds the diode rectifier of the same valve, the rectified output being fed into the triode portion, which serves as an L.F. amplifier. The coupling between the L.F. portion of the third valve and the output valve is by means of a parallel-fed transformer, the secondary feeding the grids of the double pentode QP21. Reaction is supplied by means of I.F. feed-back from the second I.F. secondary to the anode of the first valve.



The new Model 146 H.M.V. receiver, which has a new type of lampless illuminated dial.

This form of regeneration in a superheterodyne receiver is not, of course, new, but it has not previously been found to be productive of good stable results over long periods. The first valve is acting act one frequency, whilst the I.F. valve is operating on a different frequency, and the coupling of the anodes of these two valves might result in all sorts of weird effects, unless certain precautions are taken. The Marconiphone engineers have carried out a great deal of experiment in this connection, and the method which has finally been adopted in this circuit may be said to be productive of good reaction effects without ill-effects.

Provision is made for the attachment of a gramophone pick-up, and the volume control acts on both radio and gramophone. This method of volume-control is to be recommended as it removes the necessity of a further control which is only brought into use at infrequent periods. It is, of course, possible to gang two controls to carry out the combined operation, but a single control acting on the L.F. side enables volume to be controlled on both radio and gramophone. The price is 11 gns.

NOISE SUPPRESSION

Quiet A.V.C. or Noise Suppression is Coming Into Increasing Popularity, and a Knowledge of the Underlying Principles is Desirable

By FRANK PRESTON

NOISE suppression figures as an important feature of a number of modern receivers, but the meaning of the term does not appear to be generally understood. In many instances it is thought to be the same as interference suppression, whilst in other cases it is merely taken to imply that some kind of L.F. volume control is provided. In point of fact, however, noise suppression is something quite different from these, and becomes necessary only when automatic volume control is fitted. It is well known that the chief disadvantage of A.V.C. is that it renders the receiver most sensitive when it is not tuned to the wavelength of any particular transmission, the sensitivity decreasing proportional to the signal intensity when a station is tuned in. The result of this is that an efficient receiver provided with A.V.C. is very "noisy" when off tune, so that the various forms of inter-station "mush" and so-called background noises come into undesirable prominence. Because of this one hears a succession of "hisses" and the like when rotating the tuning dial whilst tuning in.

The Simplest Arrangement

When only the more powerful transmissions are required, it is possible to eliminate the inter-station noises by turning down the manual H.F. volume control, but this method does not apply when more distant stations are wanted, because the set is rendered comparatively insensitive. If the tuning condenser is fitted with a station-calibrated dial, or if the wavelength positions of a number of stations on the dial are known, the inter-station noise difficulty can perhaps best be overcome by fitting some form of visual-tuning indicator and an L.F. volume control, or even a switch to short the grid circuit of one of the L.F valves. The complete arrangement of this system is shown in Fig. 1, which is a portion of the circuit of a mains superhet in which A.V.C. is applied to the intermediate-frequency amplifying valves. It will be seen that if the contacts of the switch connected in parallel with the secondary winding of the L.F. transformer are closed, the L.F. valve will become inoperative, and therefore the loud-speaker cannot respond to any signals tuned in. When using this arrangement, therefore, the "suppressor" switch should be set to the "on" (contacts closed) position, after which tuning can be carried out, using the visual indicator only. As soon as this shows that the station has been correctly tuned, the switch contacts are opened.

Automatic Suppression

This is not really a legitimate system of noise suppression, but it can be employed, and it serves as an indication of the principles involved. A proper system of noise suppression must be entirely automatic so that as soon as the receiver is de-tuned the L.F. amplifier becomes inoperative. This is often referred to as Quiet Automatic-Volume Control, due to the fact that the speaker is silent during the intervals between the wavelength positions of various stations when the tuning condenser is being operated.

The principle of Q.A.V.C. is not new, and there are various methods of applying it, but it has not generally been used by the amateur. There are several reasons for this, one of which is that an H.T. voltage of high value is required (so that the system is practically limited to mains receivers), and another is that it involves the use of either an additional valve or of a multiple valve, such as a double-diode triode, double-diode pentode, triple diode, etc. The general circuit for the second detector of a superheterodyne, which comprises a double-diode triode used for A.V.C. and noise suppression (or Q.A.V.C.), is given in Fig. 2. At first glance this circuit appears to be very complicated, but if the various parts are considered separately it will be seen that the arrangement is not difficult to understand.

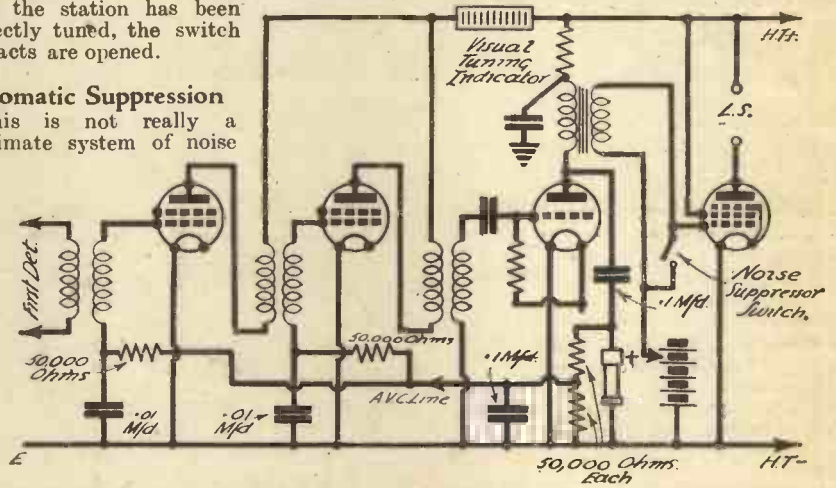


Fig. 1.—Skeleton circuit showing how a switch can be provided for noise suppression with a receiver fitted with a visual-tuning indicator. In this case A.V.C. is provided by means of a Westector. Component values are average ones.

A Matter of Bias

First of all it will be appreciated that the two resistances R1 and R2, which are connected in series between the centre tapping on the secondary of the I.F. transformer, provide the A.V.C. bias for the preceding intermediate frequency amplifier. The end of R1, which is connected to the I.F. transformer, becomes increasingly more negative as the signal strength increases, so that the bias voltage applied to the previous valve increases with signal strength. The grid of the triode portion of the double-diode triode is connected to a tapping on R2 and, therefore receives a varying negative voltage at the same time as does the grid of the I.F. valve. On all signals of more than some pre-determined minimum intensity this latter bias must be just sufficient to prevent the triode section from passing any appreciable amount of anode current. When this is so the resistance R3 does not introduce a voltage drop, with a result that the bias voltage applied to the third (output pentode) is that developed across R4 only, this resistance being chosen to provide the normal working bias voltage required by the pentode.

It will be seen that, as soon as the receiver is off tune the A.V.C. voltage is reduced to a minimum, and therefore the triode portion of the multi-electrode detector passes a certain amount of anode current. This current is drawn through R3, and thus a voltage-drop is set up across that resistance, the actual voltage being dependent upon the current passing. And it will be seen that R3 is in series with the bias resistance R4: consequently the bias then

(Continued on page 142)

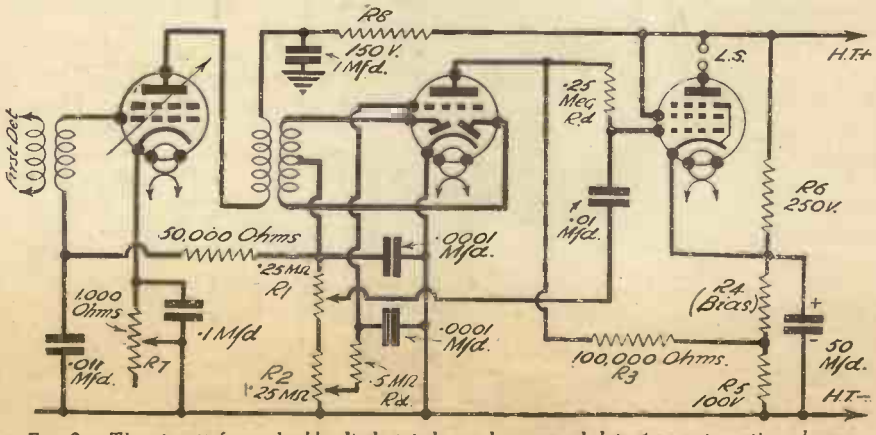
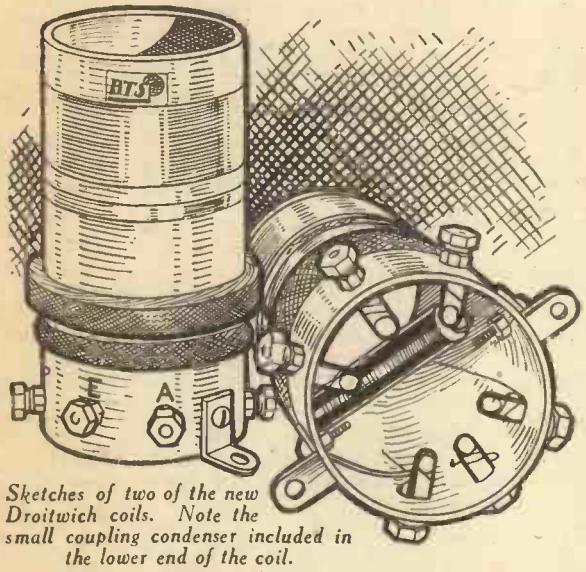


Fig. 2.—The circuit for a double-diode triode used as second detector, automatic-volume control and noise suppressor.

Droitwich Coils

Details of a New and Cheap Type of Coil which is Being Introduced to the Home Constructor



Sketches of two of the new Droitwich coils. Note the small coupling condenser included in the lower end of the coil.

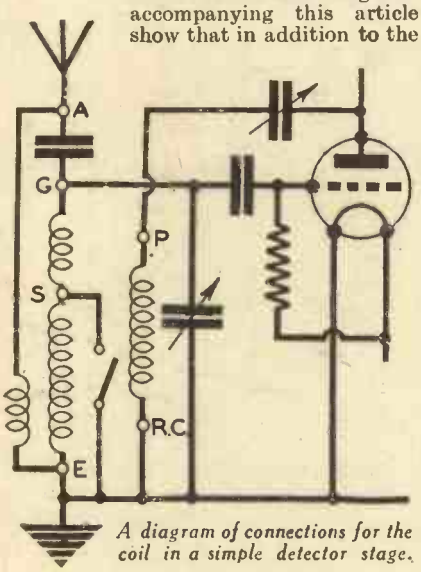
SINCE the introduction of the iron-core coil there have been many attempts to repopularise the air-core or simple type of tuning coil, and to this end some interesting types of coil have been introduced. Obviously, in addition to low price the efficiency of the coil has also had to be of such a nature as to warrant the use of the coil in place of the iron-core type, and we have already reviewed several different types of coil in these pages.

With the advent of the Droitwich transmitter, however, some rather more care is required in the design of the coil if it is to prove of utility in all parts of the country. Hitherto, the long-wave band has been regarded as rather simple, and coils have been designed to have their maximum efficiency on the medium waves, with a long-wave performance which was satisfactory only so long as the transmissions on that band were well received. Selectivity on this portion of the tuning scale has generally been a compromise, although there are, of course, many types of coil which do give a very high standard of performance on the long waves.

In America, of course, the long waves are not employed, and the design of receivers in that country has been rendered much more simple owing to the fact that one band of frequencies only has had to be tunable, although in some cases the short-wave band has also been introduced. When, however, a receiver has to be designed to cover also the long waves there are certain difficulties in the way of giving a really high standard of efficiency of both bands.

The High-power Transmitter

In the past this has not been of great consequence owing to the power which has been employed by the long-wave stations. With the increase which is, however, being employed at Droitwich there will be serious overlapping of stations in many parts of the country. Radio-Paris, for instance, will be found to be swamped by Droitwich over a very large area in the Midlands, unless special precautions are taken. Similarly, where a powerful receiver is in use, and the coils have not been designed for selectivity on the long waves, serious difficulty may be encountered in confining the Droitwich transmitter to a narrow band on the tuning scale. British Television Supplies have tackled this question, and have developed a new tuning coil of the air-core type, which possesses some novel features, and which, whilst employing a standard arrangement for the medium waves, has been designed on rather unorthodox lines so far as long waves are concerned. The small theoretical diagrams accompanying this article show that in addition to the provision of a small series condenser, a separate aerial coupling coil is employed on the long waves. No switching is required to bring this coil into use, as it is permanently joined to the aerial terminal. The value of the series aerial condenser is .00003 mfd., which value renders it practically of no account on the long waves, but the aerial is joined also to the small primary winding. The actual arrangement of the windings, the value of the coupling condenser, and the number of turns in the primary coil have all been carefully worked out so that, on medium waves, the coil gives a performance fully up to the requirements of a modern wireless receiver, namely, good signal strength and good selectivity. On the long waves, however, the effect of the coupling coil is found to be such that the Droitwich transmitter may be confined to a narrow band without any loss of signal strength. The coil has been tested in comparison with ordinary types of coil, and has been found to give greatly improved results in its long-wave performance. It has been designed for a specific purpose, and it does what is intended.



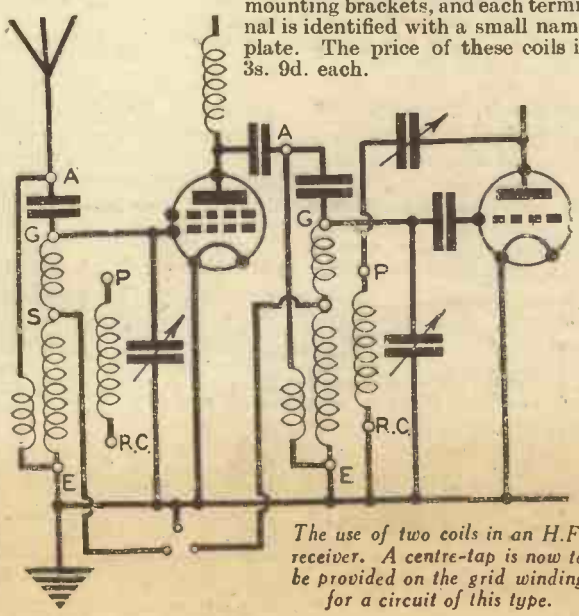
A diagram of connections for the coil in a simple detector stage.

It must not be inferred from this that its performance on the medium waves is in any way lacking. The combination of condenser and coupling coil results in a very satisfactory performance both as regards signal strength and selectivity on this band, and the coil is comparable with any standard air-core coil. As a matter of fact, at the time of going to press, the manufacturers inform us that an additional refinement in the form of a centre-tap to the grid winding is to be provided so that the coil may be employed in more efficient H.F. receivers in which one or more H.F. stages are employed. This will provide yet a further aid to selectivity, and give the coil greater scope.

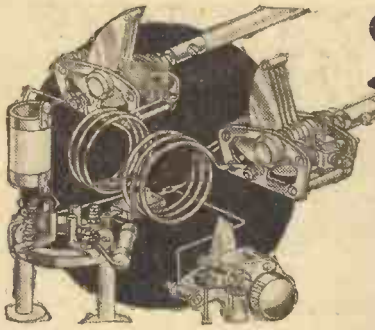
Coil Details

The former upon which the coil is wound is 1½in. in diameter, and the medium-wave grid coil is wound at the upper end, in solenoid fashion with enamel-covered wire. A short distance from this is the reaction winding, which is disposed to operate on both wave-bands. A short distance from this coil is the long-wave grid winding, and this is wave-wound with silk-covered wire, and a similar type of winding is arranged at the lower end of the former for the long-wave aerial-coupling coil.

Six terminals are arranged round the lower edge of the coil, together with two mounting brackets, and each terminal is identified with a small name plate. The price of these coils is 3s. 9d. each.



The use of two coils in an H.F. receiver. A centre-tap is now to be provided on the grid winding for a circuit of this type.



Short Wave Section

ELIMINATING NOISES IN SHORT-WAVE RECEIVERS

By A. W. MANN

THE cause of hissing is often a faulty S.G.-H.F. valve. The only remedy is to fit a new valve in place of the faulty one. If used later as an S.G. detector for S.W. reception, a valve of the hissing variety is likely to be noisy in operation, and, in addition, may cause a hum to build when carrier-wave is tuned in. Of course, a dry earth or faulty earth connection will produce a similar effect.

Always check wiring against a theoretical circuit. Remember it is current practice in the interests of efficiency, short-wiring, and compactness, to enclose a number of fixed condensers in one metal container or screening box, the latter being used as a common lead to earth viâ the chassis. L.F. chokes, shown as separate components in diagram, are sometimes centre-tapped chokes fitted into the same screening box.

Should it be necessary to check A.C. or D.C. voltages, use meters suitable for the purpose, and not any old meter to hand. It is better to be safe than sorry.

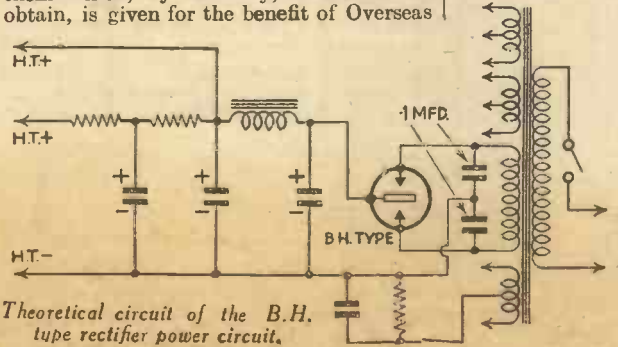
To ignore the above advice may result in serious damage to the receiver, personal injury, and considerable expense. Be quite sure about what you are going to do, and the correct methods to adopt, otherwise it is better to place the task in the hands of an experienced person. High voltages are no respectors of persons, and will not be played about with in a haphazard manner.

Valve Rectifiers

Droning, or purring noises, heard in the speaker, superimposed on signals, may be due to a faulty rectifier valve. Place an ear to the valve envelope, and if noises are internal to rectifier, same is faulty. Fading signals will probably be experienced. Replace with new rectifier valve of same type.

Gaseous Valve Rectifiers

As the writer has had considerable experience of this type, which is a standard fitment in certain high-class American short-wave A.C. operated receivers and power packs (eliminators), information concerning them which, by the way, is difficult to obtain, is given for the benefit of Overseas and other readers using apparatus in which the gaseous type rectifier is fitted. There are two makes in the 125 M A class, the B. H. Ratheon, and C.R.A.—125 B.H., which are interchangeable and have much to recommend them: long life, silent operation, robustness. Faults, however, are difficult to trace should they develop, unless one has had previous experience.



Theoretical circuit of the B.H. tupe rectifier power circuit.

Purring Noises in Speaker

Purring noises in speaker, also internals of rectifier, together with flash-over between the twin tube elements and underside of cap, and with fading and distorted signals, until only purring noise (like a form of motor-boating is heard), denotes complete burn out. If dial-light flickers and rectifier bulb is very hot, the cause is either a burnt-out rectifier, or due to excessive voltage to plates. Check high voltage and secondary of power transformer, chokes, by-pass condonsers, etc.

Should the dial-light flicker violently a few seconds after switching on, and a click be heard in power transformer, a shorted secondary winding is more than likely. This will cause excessive residual voltages to build up, and break-down the gas element of rectifier. Remove transformer, test all tappings and windings. Erratic needle movement will denote trouble when testing off load with power line connected to transformer primary.

It is possible that this effect will be noted on all windings, if secondary high voltage winding is shorted. A re-wind of secondary is, of course, necessary.

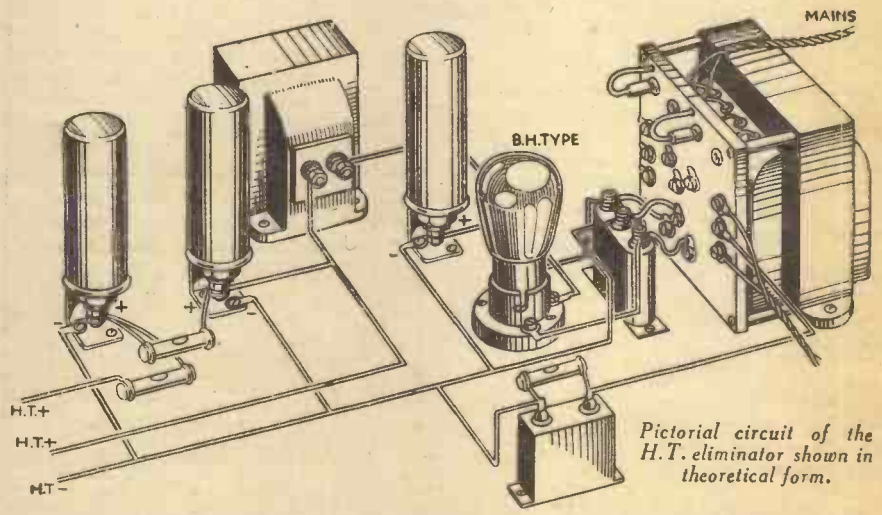
Checking Power Transformer Voltages

Unless you have mains checking experience, do not attempt to check power transformer voltages, as 250, or even 275, volts each side of centre tap is quite common.

The maximum plate voltage allowable with B.H. and C.R.A. 125 rectifier, is 300 volts per plate. As these rectifiers are filamentless, continuity test on filament is impossible. The gas element replaces the filament, and to avoid a complete burn out no type of rectifier valve should be used as a replacement, other than B.H., or C.R.A. 125 types.

Detecting Interference

If you are subject to some kind of interference, the quickest way to find out whether it is outside or in the set is to detach the aerial and earth and interconnect the aerial and earth terminals by means of a short piece of wire. If the interference becomes inaudible, or considerably reduced, it can generally be taken for granted the interference is not in the set, but outside. It is always advisable, where sets are operated from the mains, to interchange for test both on the aerial and earth terminals to find out whether the interference enters viâ the mains. If, after the aerial has been detached the noises are still heard in the same way the set should be searched for the cause. Outside interference may be caused by any kind of electrical apparatus, and many cases have been traced to electric lamps, stoves, and inefficient switches in the house. When the search for this sort of trouble commences it is always wise to switch off everything connected to the mains, except the set, and switch each in separately. Inquire of your neighbours whether they are subject to the same type of interference.



Pictorial circuit of the H.T. eliminator shown in theoretical form.

THE BRAIN AND RADIO

Can Wireless Signals be Heard Without the Use of a Wireless Receiver?

HAVE you met one of those peculiar people who imagine they can receive wireless messages without the aid of some kind of electrical apparatus? I met one the other day for the first time, though for years I have received letters telling of the most peculiar experiences which, on being looked into, proved to be the result of a disordered brain. However, the lady who called upon me, asking for advice, was quite a rational type of individual, and I listened patiently to her story. She was a a typist in a City office, and travelled home each evening by one of the underground tubes. With all the noises which are consistent with such form of travel they did not prevent her from hearing both broadcast speech and music from the London station. She went on to say that this kind of thing did not stop with the travelling, but when she retired for the night rest was unobtainable because she was kept awake by continuous messages from relations and friends who persisted in telling of blood-curdling experiences which awaited her.

Hallucination!

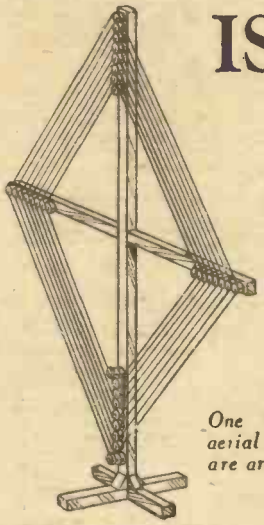
I say, without doubt, that cases such as this are nothing more than a hallucination. I was, however, unable to get rid of her so easily, and in desperation I picked up a small buzzer which was lying on my table telling her to keep it in her bedroom and sound it three times before getting into bed. She went away quite satisfied and apparently relieved from a considerable amount of anxiety. What would have been the use of my explaining to her the whole theory of radio, when she was perfectly convinced in her mind that she was receiving radio messages? Like all these irrational people, she would have considered me the irrational. Radio can only be broadcast by one means, namely, electro-magnetic waves. In order to send out these waves into the ether it is necessary to use a transmitting station. These waves are of such a high frequency that it is impossible for the human ear to detect them without the aid of some detecting apparatus. When located even as close as a mile or so from the transmitting station the energy received on an elaborate aerial is so infinitesimal that it would amount to about .00001 fly-power. In order to detect such a message very delicate apparatus must be used which is capable of magnifying this weak signal enormously. A wireless receiver may be compared to a powerful microscope. To expect the brain to receive such a message without the aid of a receiving instrument is like expecting the deaf to hear sounds, or the blind to see, or you to feel something without touching it.

An Impossibility

Sound waves are of a low order of vibration, and rate from 10 to 20,000 oscillations per second, after which we can no longer hear them. Radio waves vibrate at a rate of 30,000 to millions of cycles per second, while light waves vibrate at the average rate of 600,000,000,000,000. This will show that radio waves have a vibration too high to be heard by the human ear, while they are not fast enough to be seen by the eye. Feeling any sensations for which we cannot account, sounds, mysterious sights, etc., which are not shared by others, calls for a consultation with a capable physician!

IS THE FRAME AERIAL DEAD?

An Interesting Discussion on the Merits of the Frame Aerial and Its Use with Modern Radio Receivers

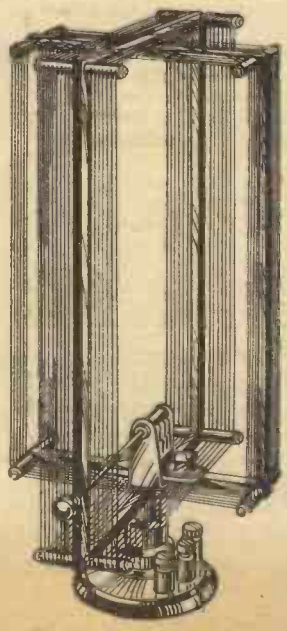


One form of frame aerial in which the wires are arranged in "flat" formation.

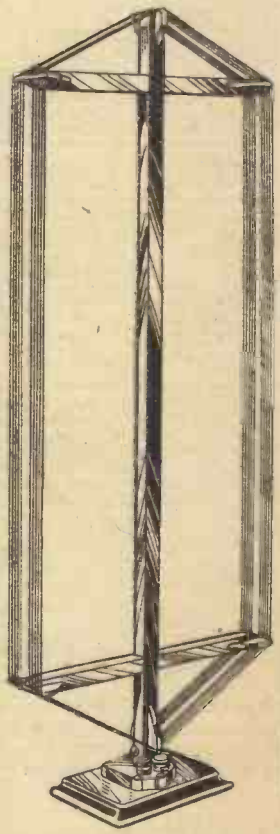
THE frame aerial does not seem to be having a very great measure of popularity at the present time, and a visit to the majority of radio stores reveals a sad lack of display of this type of wireless accessory. Why is this? Is there anything in the device which renders it useless with modern receivers, or is it just that the present-day listener has lost sight of the various advantages which its use confers? As no doubt the majority of our readers are aware, the frame aerial possesses a very valuable feature which enables it to overcome the lack of selectivity which may be inherent in a radio receiver, and it is this important feature which enables a ship at sea to ascertain its position, or the position of a radio beacon.

How the Frame Works

The windings which are used in a frame aerial take the place of a tuned circuit, and a variable condenser is joined across the ends of this winding, which is then included in the grid-cathode circuit of a valve. Therefore, the wave-range which is covered by a frame aerial will depend upon the amount of wire which is included in its windings, and so to cover both medium and long waves, it will be necessary to use a tapped winding, with a change-over switch, in the same manner as a modern dual-range coil. This is probably one of the reasons why the frame aerial is not so popular to-day. A separate tuning condenser will be necessary for the frame, and in addition to the switching incorporated in the receiver, the wave-change switch on the frame will also have to be operated, so that two movements will be necessary to transfer from medium to long waves. This is in addition to the difficulty of tuning separate condensers for each station. Furthermore, the frame aerial will only be responsive to signals which arrive from a certain direction, and when the frame is positioned to be at right-angles to the incoming radio wave no signal will be heard. (This does not take into account the reception of a very powerful station situated at a short distance, which might be heard even when the frame is at right-angles.) As the frame is turned so that its windings come more and more into the plane of the incoming radio wave, so the signal strength will grow, and will be at a maximum when the frame is in the same plane. This type of aerial is, therefore, very valuable to those listeners who experience difficulties in cutting out a station which seriously interferes with the reception of certain stations not situated in the same direction. Naturally, when it is desired to hear a station situated, say, 500 miles away, and this station is badly interfered with by a station situated only fifty miles away in the same direction, the frame will not be of any use in reducing the interference.



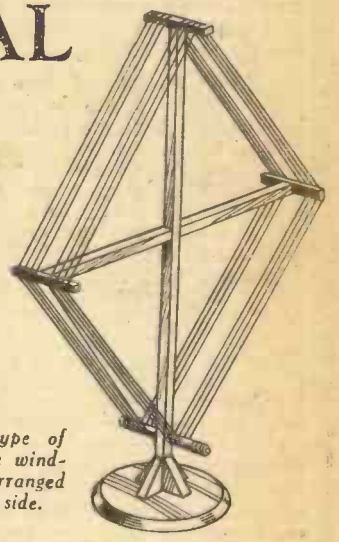
A novel commercial aerial having separate windings for medium and long waves. The change-over is effected by means of a multi-pole switch.



There is no necessity for the windings to be arranged in square form as is shown by this type of aerial.

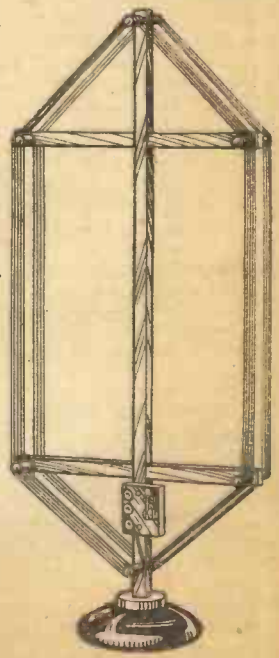
The Superhet and the Frame

The greatest use of the superhet in the past has been in the super-heterodyne circuit, where the frame was centre-tapped, and was used in a special manner. The modern design of this type of circuit has rendered its use obsolete for this purpose,



In this type of frame the windings are arranged side by side.

but it still retains its selective property, and many listeners will probably find it of great value for receiving certain stations which are badly spoiled by interference with their present apparatus. A frame aerial may be wound in any form, as may be seen by examining the sketches of the various commercial aerials shown on this page. For the medium wave-band from 70ft. to 75ft. of wire are required, and these may be wound in any desired form. Special thin flex is highly suitable for the aerial, and it should be passed across ebonite spacing strips at the ends of the frame-arms. Generally speaking, the length of the "sides" of the frame should not be less than 2ft., although for very small portable use a smaller size may be turned to account. Its efficiency is not so high, however, and it pays to use some dimension greater than 2ft. To make the aerial less cumbersome, the apparatus may be designed to fold up, when the ends of the frame should be firmly attached to the ebonite insulators. For a long-wave winding about 230ft. to 250ft. should be employed, and thus for a frame aerial to cover both bands, a total of 250ft. should be employed, with a shorting switch across approximately 175ft. of the wire. It is possible to arrange a small winding in between the two sections just mentioned, in order to provide reaction effects, but the amount of wire and its disposition in relation to the long and medium windings is rather a matter for experiment and no exact details can be given.



Another dual-range frame, in which a small switch changes from one band to another.

THE EASY ROAD TO RADIO.

THE BEGINNER'S SUPPLEMENT

H.F. AND L.F. COUPLING

A Simple Explanation of the Principles of Coupling Together Various Parts of the Receiver, with Some Practical Notes on Obtaining Maximum Efficiency.

THE process and method of coupling together the circuits and stages of a receiver are important points which are too often overlooked or insufficiently understood. Most experimenters and constructors realize that, if optimum results are to be secured, the coupling between the detector and L.F. stages, and also between the output valve and the speaker, must be properly matched, but they overlook the fact that the matching of high-frequency sections of the set is of even greater importance.

The question of coupling is bound up principally with such technical points as impedance (more correctly, relative impedances) and transformer ratios. It is not proposed to deal specifically with technicalities in this article, however, but to explain in simple language the main points which are involved. In the first place, it should be explained that the equivalent impedance (resistance to alternating current) of any output circuit should be similar to the impedance of the input circuit which it feeds. In other words, the impedance of the anode-coupling component used with one valve should be made to be equivalent to the impedance of the grid-filament circuit of the valve which follows it. It should also be explained that the grid-filament circuit of any valve is extremely high by comparison with the impedance of the anode-filament circuit, and also by comparison with the impedance of the aerial-earth circuit.

Matching Impedances

A transformer—of either the H.F. or L.F. type—provides the simplest means of matching impedances or securing the best coupling, because the ratio of the impedance of the secondary winding to that of the primary winding is proportional to the ratio of the secondary to the primary turns. The impedance ratio is not a simple proportion of the turns ratio, but is actually proportional to the square of the turns ratio. Thus, the impedance of the secondary winding of a transformer is equal to the square of the turns ratio multiplied by the primary impedance. For example, if the impedance of the primary winding of a so-called 1 : 5 transformer were 10,000 ohms the secondary impedance would be 10,000 multipled by 5 squared, or 250,000 ohms; if the ratio of the same transformer were reduced to 2 : 1, the secondary impedance would become 40,000 ohms.

Impedance More Important than Ratio

It would appear from this that optimum results would be obtained when the ratio of an L.F. transformer were made as high as possible, since then the secondary impedance would be greatest. In practice, however, this is not always the case, because increasing the ratio introduces

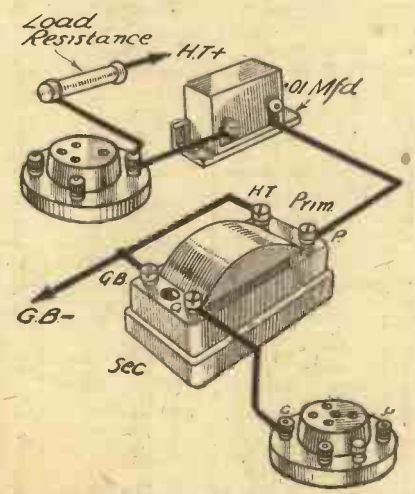


Fig. 1.—Showing the usual connections for parallel-fed transformer coupling.

other factors, not least of which is that of voltage step-up. A transformer increases the A.C. voltage flowing through the primary and decreases the accompanying

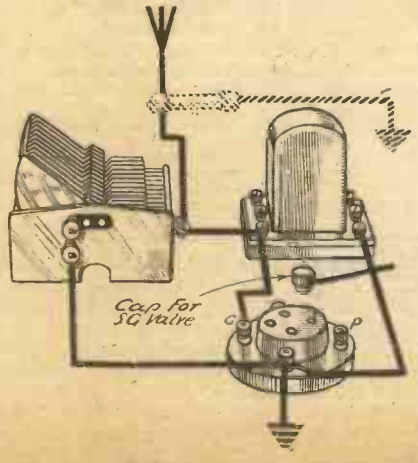


Fig. 2.—When the aerial is connected directly to the "grid" end of the first tuned coil, its low impedance acts as a parallel resistance across the grid-filament circuit of the valve, as shown in broken lines.

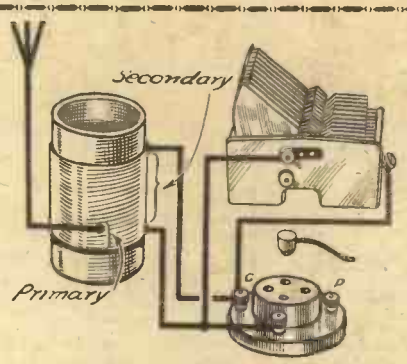


Fig. 3.—When a separate aerial winding is employed, this acts as the primary winding of a step-up transformer and assists in securing correct H.F. matching as explained in text.

current, but if the voltage is increased beyond certain limits the valve fed by the secondary circuit is in danger of being overloaded. Another difficulty introduced by the use of a high ratio is that of self-capacity which develops between the many turns of the secondary winding. In practice it is therefore generally better to use a transformer with a high primary inductance (which is the principal factor governing the impedance) and to have a moderate step-up ratio.

But the constants of the transformer are not governed only by the secondary impedance, but also by the primary impedance. The latter must be chosen to match the valve in whose anode circuit it is connected, and the value of the impedance in ohms should be equal to twice the A.C. anode-filament impedance of that valve. Thus, if the rated impedance of a detector valve is 15,000 ohms, the primary winding of the transformer connected in its anode circuit should be 30,000 ohms (at a frequency of about 1,000 cycles).

The above explanation shows why better results and greater amplification are often secured by replacing a high-ratio L.F. transformer by one of lower ratio. It also serves to explain the reason for the increased popularity of resistance-capacity transformer coupling with which the circuit is as shown in Fig. 1. In this case the primary winding of the transformer is not connected in the anode circuit of the valve, its place being taken by a fixed resistance. Because of this it is possible to employ a transformer with fewer turns, but with an equally-high step-up ratio without introducing the difficulty of self-capacity.

Finding the Best Ratio

The very same idea of coupling, or matching, applies when feeding the loud-speaker, because the impedance of its speech coil is usually between 2 and 10 ohms, whilst the impedance required in the anode circuit of the last valve is generally something like 10,000 ohms. In this case a step-down transformer is required, and the correct ratio can readily be determined by making use of the information given above. It can be seen that the correct ratio can be found by dividing the impedance required in the anode circuit by the impedance of the speech coil, and taking the square root of the answer. For example, if the impedance required (called the optimum load) were

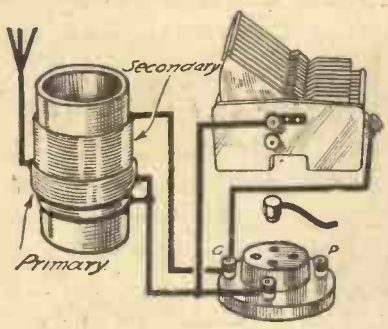


Fig. 4.—The use of a tapping for the aerial gives the same effect as that shown in Fig. 3. The virtual "primary" and "secondary" windings are shown in this drawing.

10,000 ohms and the impedance of the speech coil were 10 ohms, the ratio required would be the square root of 1,000, or approximately 32 to 1; actually a ratio of 30 : 1 would be chosen as being the nearest available.

Efficient Aerial Coupling

Turning now to the coupling of the aerial to the first valve, it can be seen that the same principles apply. The minimum grid-filament impedance of the valve might be considered to be 500,000 ohms, whilst the aerial-earth impedance is generally in the nature of a few hundred ohms. If the aerial were connected directly to the "grid" end of the first coil, as shown in Fig. 2, the result would be the same as if a low resistance were connected across the ends of the coil, and this would have the effect of "damping" the tuned circuit, making selectivity very poor and considerably reducing the signal output from the valve. On the other hand, if the aerial were connected to the end of a second small coil placed near to the grid coil, as shown in Fig. 3, conditions would be entirely changed. Supposing, for instance, that the grid coil consisted of 100 turns and the aerial coil of 10 turns, a step-up ratio of 1:10 would result, and the "impedance effect" of the aerial circuit on the grid circuit would be multiplied by 100. It can be seen that this would give better coupling, and one could expect an improvement in both selectivity and signal strength.

Auto-transformer Coupling

Although there are factors which tend to counteract the theoretical improvement to be obtained by the use of a small and separate aerial winding, the fact remains that, if the winding is carefully chosen to suit the aerial characteristics, a decided improvement can be secured. The aerial impedance cannot readily be measured by the amateur, but it is by no means a difficult matter to vary the size and position of the separate aerial winding until optimum results are secured. An alternative to the separate winding which gives precisely the same effect is the use of a tapping on the grid coil for aerial connection. This is shown in Fig. 4, from which it will be seen that the turns between the aerial tapping and earth represent the primary of the H.F. transformer, the total turns on the coil acting as the secondary. This arrangement is known as an auto-transformer and is frequently used on the L.F. side in conjunction with resistance-feed.

When using home-made coils, or when modernising a receiver, it is well worth while to experiment with various aerial tappings until that which gives the best coupling is found. Trials can easily be made by connecting the aerial lead to a pin, which can be pushed through the insulation of different turns so that it makes contact with the inner wire. When the best position has been found, the appropriate turn can be lifted slightly away from the former with a knife blade, a strip of mica placed under it and a tapping soldered on. See Fig. 5. This should be repeated on the long-wave winding where possible and the two tappings brought out to a combined transfer and wavechange switch as shown in Fig. 6. Incidentally, it should be mentioned that this system is used on most up-to-date coils, and it is not generally to be recommended that any alteration should be made.

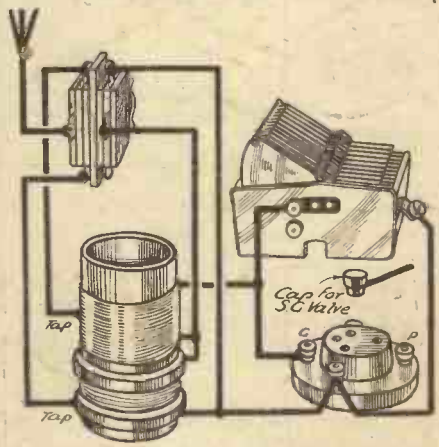


Fig. 6.—Best results are obtained by tapping both long and medium wave windings and using a double-pole wavechange switch connected as shown above.

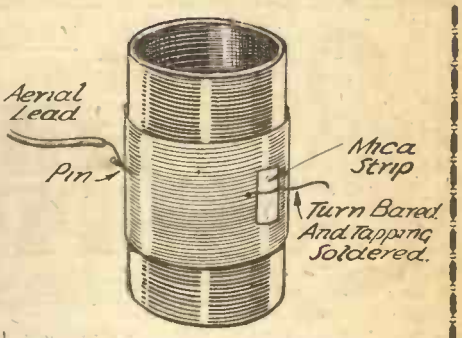


Fig. 5.—The optimum tapping point can be found by connecting the aerial lead to a pin which can be connected to various turns. After that a permanent tapping can be made as shown.

It will be understood from the explanation given above why improved reception is often secured by employing a pair of impedance-matching transformers in conjunction with a screened lead-in for obviating electrical interference. The transformer connected between the aerial and the lead-in gives a step-down effect, while that between the lead-in and the aerial terminal on the set steps-up the signal voltages. By carefully choosing the ratios of these two transformers it is possible to secure an optimum coupling when the aerial-earth impedance is exactly matched to the grid-filament impedance of the first valve in the receiver.

The principles explained in connection with the coupling of the aerial to the first valve apply with equal force to the coupling circuit employed between the H.F. valves, and between the last H.F. stage and the detector. It is for this reason that it is in many cases possible to secure much-improved reception by using tuned-transformer coupling and carefully experimenting to find the most suitable number and position of turns for the primary winding.

HOW A CONDENSER IS MADE NON-INDUCTIVE

Concluded from p. 104, October 6th issue.

WE have already explained the necessity of using a condenser of the non-inductive type in various parts of the wireless circuit. It has been explained how the property of inductance is brought into a condenser owing to the manner in which the component is built up. On the normal wave-band the effect of the condenser is very marked, but when dealing with the lower frequencies the inductance due to the coil-like formation of the plates has a comparatively small effect on the impedance of the condenser. In this case it is the capacity which is the ruling factor, so that to obtain a low impedance path for L.F. currents it is necessary merely to use a condenser of large capacity.

How a Condenser is made Non-inductive

To overcome the deleterious effect of inductance in a paper condenser used in H.F. circuits they are made "non-inductive" by taking a connection from each turn of the rolled-up foil instead of just connecting two wires to the ends of the foil. (The difference was illustrated in Fig. 6.) Extra care is also taken with the disposition of the connecting wires within the case, since even a straight wire has self-inductance. They are therefore wound together to form a non-inductive pair, so that the inductance of the one wire neutralizes that of the other. In this way it is possible to reduce the inductance of the condenser to negligible proportions. In fact, the small residual inductance present is usually masked by that of the external wiring which connects the condenser to other components in the receiver.

The mica condenser is, of course, non-inductive and needs no modification to the normal method of assembly. It is only when the dielectric plates are wound as in a paper condenser that this trouble of inductance arises. It is becoming very common to-day to design fixed condensers in a tubular form in order to produce a compact component for use with the modern small receiver, and it is here again that inductance must be avoided. When purchasing a fixed condenser therefore, make quite certain that the condenser is non-inductive unless you are sure that its position in the circuit does not render this precaution necessary.

HOW'S YOUR WATCH?

IF you meet with an ardent radio fan, one who likes to do a bit of experimenting or generally playing about with his set or moving-coil loud-speaker, ask him the time. He is sure to tell you the history of a wonderful timekeeper suddenly developing a "one day fast and the next day slow" kind of attitude. Of course, if after reading this, he hits you, you will realize how many times he has been asked the question and is feeling very fed up. A mad watch is apt to lead to all sorts of serious situations and excuses. If you have a timepiece of which you are very proud and particularly one of the wrist type, put it away when you start tinkering with your radio set, otherwise you will find yourself, next morning, perhaps, waiting for the 8.30 train at 7.30 a.m. Many people do not realize the caution that is necessary when dealing with magnetic current apparatus, and particularly the more powerful moving-coil loud-speakers. Once the hair spring of the watch becomes magnetized the only thing to do is to take it to a firm of experts and have it "demagged." That is, of course, if you do not know how to tackle the job with a coil of wire and some A.C. juice. Dr. Charles Edouard Guillaume received the Nobel Award in Physics about twelve years ago for finding a new alloy called "elinvar." When a hairspring of a watch is made from this new alloy it is unaffected by temperature changes and cannot be permanently magnetized. Such watches are being made in America for the use of electricians and radio service men, and can be worn near electrical apparatus without any ill effects. Unless they are held deliberately in an exceptionally strong magnetic field they are immune to magnetization. Even in that case a watch equipped with this type of hair spring resumes perfect running immediately it is removed from a magnetic field of such strength as to permanently magnetize every steel part, and which would put out of action any ordinary type of watch. A little precaution is often better than a cure, so accept this word of warning for the protection of that family heirloom.

AN IMPORTANT EVENT!

See Next Week's Issue.

FINDING FAME UPSIDE DOWN

IF a popularity vote was taken of broadcast artists there is little doubt Claude and Jack Hulbert would be very close to the top of the poll. Claude jumped into the limelight not merely head first, but on his head. That was when he played in "Tell Me More," in which he introduced those atrocities, "Oxford Bags," to a long-suffering British manhood. On that occasion he stood on his head on the stage and sang a song! Claude now delights great London audiences and millions of radio listeners. It is not generally known that Jack, his brother, made his début when still at Cambridge.

Radio and Relaxation

Can Wireless Music Aid the Nerves?

A SHORT time ago I sat in one of the B.B.C. studios listening to the Wireless Military Band playing a well-known composition. A few nights afterwards, when visiting a friend, I heard the same band and composition rendered through his radio receiver, to which was attached an excellent mains excited moving-coil speaker. The lady of the house asked the lord and master to please lower the volume. I suppose the volume coming from the speaker was affecting her nerves. In my mind, I wondered whether had she been sat in the studio listening she would have found the music pleasant and a decided aid to relaxation. The majority of set owners never pause to analyse as I did, why, in one case, the result may be nerve-racking and in the other, restful. He may have the finest of radio sets, and be proud of drawing the attention of his friends to the bass response and mellowness of tone from the speaker, but if it continually jars upon the nerves, then there must be something very much wrong with either the set or the way it is handled.

NOISE SUPPRESSION

(Continued from page 134)

applied to the pentode will be equal to the sum of the voltage dropped across R3 and R4. The actual voltage need not be considered, for it will obviously be considerably greater than the normal figure, the result being that the valve is heavily over-biased and cannot function.

Approximate values of the various resistances and condensers are given in Fig. 2, but it must be explained that these might have to be modified slightly according to the particular valves employed; they are, nevertheless, sufficiently accurate as to serve as a basis for experiment. It should also be added that R1 is a variable potentiometer and serves as a normal manual L.F. volume control, in addition to providing the A.V.C. voltage. R2 is also shown as a potentiometer, since it is always best to adjust this carefully in order to secure the most suitable "cut-out" position for the actual receiver in use. The values of resistances R4, R5, and R6 are not indicated, but, instead, the voltage which they are required to drop is shown; the values can, therefore, be calculated according to the valves and H.T. voltage employed.

In practice it is frequently better to replace the double-diode triode by a double-diode pentode, or even to use a separate valve for noise suppression. The reason for this is that a valve is required which has a sharp bend towards the bottom of its grid volts-anode current curve, so that it gives a so-called "trigger" effect. In other words, the anode current must change from maximum to minimum with a very small change in applied grid-bias voltage. The resistance marked R7 is simply a manual-volume control working on the variable-mu valve, and is not a part of the automatic-volume control circuits. The resistances marked R3 are for de-coupling only, and do not call for any particular consideration.

A maximum (smoothed) high-tension voltage of at least 350 is required for satisfactory results with an arrangement like that illustrated, and decoupling resistances of fairly high value should be used in the anode circuits of all except the last two valves, in order to limit the voltages supplied to the anodes to a maximum of 200.

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.

SLADE RADIO

THERE was a lecture on "H.F. currents in connection with electro-medical apparatus," by Mr. L. G. Coade at a recent meeting of this society. After describing how the flow of electricity through the body raised the temperature, he went on to deal with the galvanic effect. The system used for H.F. treatment was described together with the apparatus and the circuit. Diathermic systems came next, and their uses were described. During the evening demonstrations with H.F. and diathermic apparatus were given, and it was shown how current flowing through the body could be made to light a lamp. The effect of H.F. apparatus on reception with an A.C. wireless receiver was also demonstrated. A short description of the H.F. knife was given and at the conclusion of the lecture a large number of questions were raised.—Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

THORNTON HEATH RADIO SOCIETY

THE eleventh annual general meeting of this society was held at St. Paul's Hall, Norfolk Road, on Tuesday, the 25th ult. In his opening remarks the Chairman, Mr. S. J. Meares, welcomed the Vice-President, Mr. Ernest Scratchley, and said that in his recollection he had attended every annual general meeting of the society.

Before vacating the chair Mr. Meares informed the members that Mr. Scratchley had decided to resign his position as Vice-President of the Society, and then asked Mr. Scratchley to give his reasons for making this decision.

Mr. S. J Meares, Mr. J. T. Webber, and Mr. O. L. Crossley were again elected to fill the offices of Chairman. Hon. Secretary and Hon. Treasurer respectively. Mr. Meares then outlined the future policy of the society, which he said must cater for those members who were interested in short waves and television. Some discussion ensued, as a result of which it was decided to alter the name of the society in such a way as to indicate that these subjects were also included, but it was left to the Committee to decide upon the new name. Hon. Secretary, Mr. Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

INTERNATIONAL DX'ERS ALLIANCE

THIS go-ahead society has still further increased its activities by expanding its S.W. Section, and Captain H. L. Hall has been appointed to take charge of this branch. The ever growing importance of short-wave work, coupled with the fact that the I.D.A. numbers many S.W. enthusiasts among its members, has led the society to take this important step. The current issue of the *Globe Circler*, the official organ of the society, gives full particulars of the new venture, together with other information of special interest to DX fans throughout the world. All inquiries should be addressed to Richard L. Rawles, Blackwater, Isle of Wight, England.

ANGLO-AMERICAN RADIO & TELEVISION SOCIETY.

THE society wishes to make it clear that it cannot guarantee to answer letters when a stamped addressed envelope is not enclosed. Those desiring to join may do so by sending their names and addressed to H.Q.

The first winter lecture to be held under the auspices of the West Middlesex and East Buckinghamshire Branch of the Anglo-American Radio and Television Society will be given by Mr. J. Louis Orton on October 31st, 1934. The lecture will be given in aid of the funds of the branch. Full particulars may be obtained from Mr. Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

Random Jottings

By JACE

Pifco's New Premises

THE illustration given below shows Pifco House, the new premises of The Provincial Incandescent Fittings Co., Ltd., particulars of which were given in a recent issue.

The End of Morse Telegrams

AFTER seventy years, the last morse telegram was dispatched a few days ago from the Central Telegraph Office. In future all telegrams will be sent by automatic teleprinter machines, which can send 100 telegrams of average length an hour—more than double the capacity of the old morse instruments. An operator can be trained in six months to send eighty telegrams an hour.

Wireless for Empire Airways

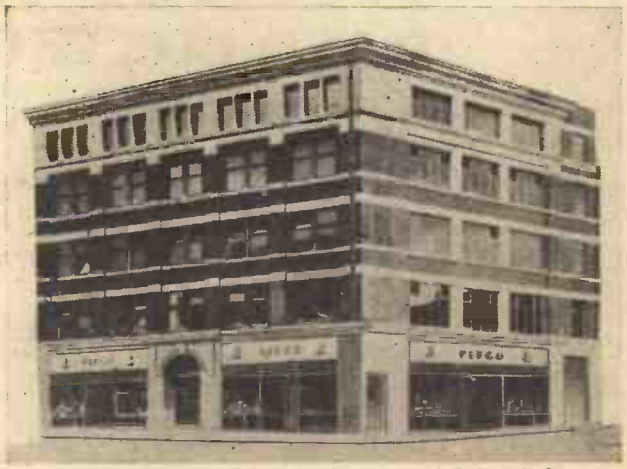
THE five new D.H. 86 four-engined aeroplanes for the Singapore-Brisbane section of the England-Australia air route, which is expected to be opened by QANTAS Empire Airways Limited, in December this year, are being fitted with Marconi transmitting and receiving equipment to enable them to maintain constant wireless contact with the ground or with ships and coast stations. They will also carry the Marconi "homing" device, type A.D.32d, as an aid to navigation.

The sets with which they are being fitted are of a special type, known as the A.D.37 c/38b, designed particularly for long-distance routes of this nature. Transmission and reception, by telephony or telegraphy, can be carried out on either short or medium wavelengths (40 to 80 and 500 to 1,600 metres), an arrangement which enables regular communication to be maintained under severe atmospheric conditions and over great distances.

The A.D. 37/38 apparatus was used with conspicuous success on the survey flight for this air route carried out by Major H. G. Brackley, Air Superintendent of Imperial Airways Limited, in the aeroplane *Astraea* in the summer of last year, when messages were exchanged between the ground and the aeroplane at distances of up to 3,500 miles.

The "Homing" Device

THE Marconi "homing" device is one of the latest aids to air navigation, requiring no special ground organization. It enables a pilot to set a direct course towards any suitable wireless transmitting station along the route, and has proved simple and efficient in actual operation on the Indian and African air routes.



Pifco House, the new headquarters of Pifco, Ltd.

Centenary of Birmingham Town Hall

ACCORDING to a recent B.B.C. announcement, the whole of the concert which is to celebrate the Centenary of Birmingham Town Hall will be broadcast from the Midland Regional on October 4th. Birmingham Festival Choral Society, the City of Birmingham Choir, and the City of Birmingham Orchestra will be heard in Handel's Coronation Anthem, Coleridge-Taylor's "Hiawatha's Wedding Feast," and Mendelssohn's "Thanks be to God." The conductors are Harold Gray, G. D. Cunningham, and Leslie Heward respectively. Frank Titterton, the tenor soloist, is a native of Birmingham. The orchestra will give Purcell's Trumpet Voluntary and Elgar's Enigma Variations. G. D. Cunningham, the City Organist, will play Bach's Fugue in E flat. In the interval a local veteran will relate his reminiscences of Town Hall concerts during the past fifty-five years. Birmingham Town Hall was designed by Hansom, who went bankrupt before it was completed; he afterwards invented the hansom cab. The building has seen several notable first performances—Mendelssohn's "Elijah," conducted by the composer, who appeared three times at the Triennial Festival; Elgar's "Dream of Gerontius," "The Apostles," and "The Kingdom." Jenny Lind and Patti have both sung there, and Dickens once gave readings. A great festival to celebrate the Abolition of Slavery, the launching of Joseph Chamberlain's Tariff Reform Campaign, and the presentation of the Freedom of the City of Birmingham to Mr. Lloyd George after the Great War are notable events in the history of the Town Hall. During the Boer War, Mr. Lloyd George had to make his escape from the rear of the building disguised as a policeman!

Choosing a Set

A REQUEST was recently sent to me asking if I would recommend a really efficient commercial all-mains receiver, the outstanding merits to be selectivity and fidelity of reproduction. I studied the district in which it would be required to operate, got particulars of the acoustic properties of the room, and, together with other information, I found the operator had a musical ear, for he was a teacher of music. This was a problem which required careful thought, because too much selectivity and perfect reproduction do not run very well together in harness. However, I decided on a receiver and advised the inquirer to arrange with the manufacturers for a demonstration in the home and under the actual conditions it would be required to operate. The set had two stages of variable-mu high-frequency amplification, power detector, and a push-pull output. This was coupled to what I consider to be the finest and most faithful energized moving-coil loud-speaker. Eventually I received a letter which did not contain any thanks for the trouble I had taken, but upbraided me for suggesting such an instrument. The set was selective, but the heavy bass reproduction made him feel positively ill. He could not listen to it with the least pleasure. The letter went on to say he had visited the local radio store and had been induced to allow the storekeeper to make him up a three-valve set from a well-known kit, together with a cone speaker. This was giving perfect satisfaction at about one-eighth of my suggested cost. I am left wondering whether the musical ear has lost much of its keyboard perfectibility or whether it is a case of jingling coins covering up the desideratum.

SUPPLEMENT TO "PRACTICAL WIRELESS"

AMATEUR TELEVISION

TELEVISION SIGNAL DISTORTION AND CORRECTION

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

(*Continued from October 6th issue*)

AS well as phase and attenuation distortion there is a third type of distortion which is sometimes present in transmission circuits for television signals. This arises when a line of one characteristic impedance is joined to another of a different characteristic impedance without adequate compensation at the junction. A pulse of current provided by a television signal on reaching such a junction is partly transmitted and partly reflected, the phase of this reflected pulse depending on whether the signal is propagated from a line of less to greater or greater to less impedance.

To overcome the effects of reflection, which, if several uncompensated discontinuities occur in sequence, gives rise to "echoes" or "ghosts" in a reconstructed television image, somewhat as indicated in Fig. 1, a compensating network is used. This presents an impedance in one direction equal to the characteristic impedance of one line, and in the other an impedance equal to that of the other, and a network of this character is called a transducer.

On the Radio Side

When the television signals are transmitted by radio, although the various forms of line distortion just discussed are not present in the actual radio link, another set of equally, and sometimes greater, deleterious effects is noticeable. First of all, at the radio transmitter itself precautions must be taken to ensure the correct handling of a wider range of frequency components than is required for the transmission of sound. To obtain a recognizable image reproduction the full 9 kilocycles channel width is necessary even with the normal thirty-line B.B.C. transmissions, and if this frequency band could be increased to 20 kc/s then the reproduction would improve considerably, especially if equalization for aperture distortion in the actual television transmitter itself is effected.

Added to this is the necessity for dealing with a number of inconstant and random distortions depending on conditions largely beyond human control. Of these, night fading (image dims or vanishes), atmospheric interference (light streaks or splashes right across the image), and frequency shift (image blurring) can be very largely reduced by taking due precautions, such as automatic volume control, balanced circuits, and crystal control. Others, however, like skip distance, night-phase distortion, and "echo" are almost beyond human control, although there is reason to believe that even these effects may be minimized or perhaps obviated by the use of aerial arrangements of special form.

An Artificial Limitation

The most serious form of distortion in the television service is the artificial one of imposing the 9-kilocycle sideband width. This sets a limit upon the amount of intelligence which can be propagated per second in so certain a manner that searching for a system of television which will overcome sideband difficulty, without resorting to extremely low wavelengths, is akin to inventing perpetual motion machines.

Even when the correct characteristic is provided at the transmitting end of a radio link, it is still necessary to pay attention to the radio set employed for feeding the signals to the television receiver. For example, the best means to obtain tuning efficiency is to use two or more tuned circuits connected up by one of the band-

Fig. 1.—A television image with its echo or ghost image.

pass tuning schemes. This, of course, reduces the possibility of "cutting" the higher frequencies so essential for detail in the image, although there is an artificial method which has been suggested for obtaining an extended band-pass in radio receivers, as shown in Fig. 2.

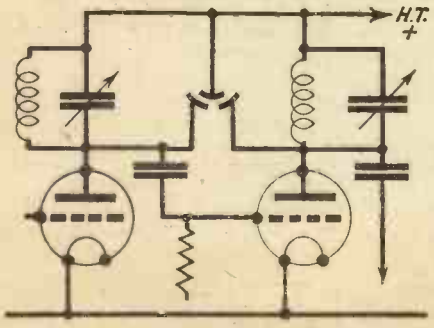


Fig. 2.—An artificial method for obtaining extended band-pass in radio receivers.

NEW TELEVISION TRANSMISSION TIMES.

The times of the television transmissions are being altered and the new hours are as follows:

Week commencing October 8th. One transmission only, on Saturday, 4.30 to 5.15.

Thereafter there will be two transmissions per week: Wednesday evening, 11.0 to 11.45, and Saturday afternoon, 4.30 to 5.15.

REVIEWS OF LATEST RECEIVERS

IN 1927 A. C. Cossor introduced the first Melody-Maker, and it proved a very popular kit set. Each year the receiver has been brought up to date, and the two newcomers, introduced just before the Olympia Exhibition, are excellent examples of present-day design and embody every possible improvement and many advanced features. The two new kits are exactly similar in appearance, but one is an A.C. Mains model while the other is intended for battery working.

The Circuit

The circuit of the mains model employs three valves and a rectifier. The first is a Cossor MVSG acting as a high-frequency amplifier with high-efficiency iron-cored coils in both grid and anode circuits. These coils are very robust and at the same time exceptionally efficient, a combination not easy of attainment.

The detector stage is particularly interesting as it employs the Cossor MS/PEN, a high-frequency screen-grid pentode acting as power-grid detector. The advantages of such a detector are threefold—the stage amplification is much greater than that available from a triode; the selectivity is greater for all reasonable settings of reaction and, in addition, quality is improved, partly due to the low inter-electrode capacity of the valve and also due to the use of resistance coupling instead of the more usual transformer arrangement.

The output valve is a Cossor 41MP feeding a mains-energized moving-coil loud-speaker with an output transformer specially designed to suit the valve, which when thus correctly loaded is capable of an undistorted output of something over 1 watt.

Simple Control

The controls are provided for single knob tuning (with trimmer), selectivity (reaction), volume, and switching. An ingenious arrangement is incorporated so that when the wavechange switch is in the long- and short-wave position, only the appropriate section of the dial is illuminated, while the gramophone position is indicated by the illumination of both scales. The gramophone position on the switch allows the pick-up to be permanently connected to the receiver and obviates the nuisance of having to withdraw a plug and jack.

The chassis is of heavy-gauge steel, sopper plated on the underside, the latter o ensure that good contact is made with uch wires as are earthed direct to the base plate. The constructional chart is an outstanding example of clear and fool-proof instruction, and assembly is also facilitated by the clean cut holes in the chassis and the ease with which all the parts fit together.

A considerable saving of time is effected in wiring, as the length of each piece of systoflex and flexible wire is already correctly made as shown on the chart. With customary thoroughness a small spanner is included for getting at the awkward fixing nuts, a large spanner for tightening up the large component nuts, and a special small screw-driver for tightening grub screws.

Test Results

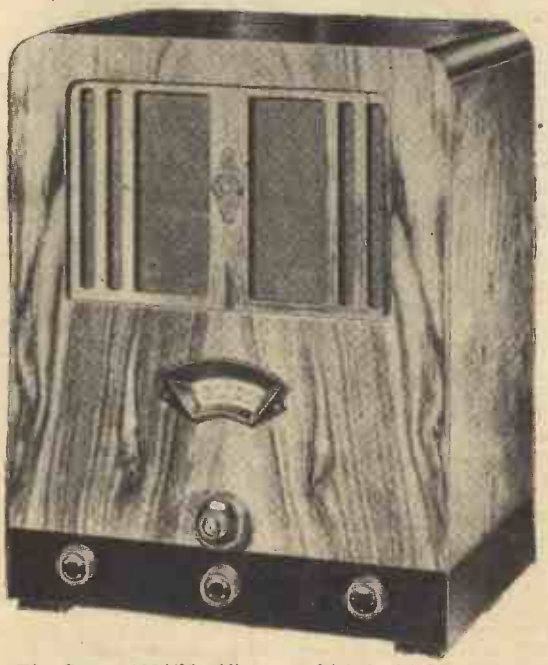
On test the performance reached a high standard, selectivity and sensitivity being present at the same time in a remarkable degree, thus justifying the makers' claim that the set is more selective than had hitherto been thought possible when using only three valves.

Reproduction is excellent, and the increase of top brilliance due to the pentode detector is most noticeable. Mains hum is absent, and cannot be heard at a distance of eighteen inches from the speaker, even during an interval.

The cabinet is well finished in walnut and black and conveys the idea of a relatively expensive factory built receiver rather than a kit of parts.

The Cossor All Mains Melody-Maker, which is known as model 357, is sold complete with four valves (including rectifier) and every conceivable item required from the smallest screw to the ready finished cabinet. It has terminals for a gramophone pick-up and plug and socket for extension loud-speaker and is suitable for use on A.C. Mains only 200/250 volts (adjustable) 40/100 cycles.

In addition to this kit set, Messrs. Cossor also supply some other highly efficient receivers in which novel and up-to-date features are included. These range from a simple battery set to all-mains radio-gramophone. The all-mains radio-gram model 536 employs four A.C. valves, consisting of variable-mu, S.G., H.F. pentode as a detector, and a pentode-output stage with a valve acting as a full-wave rectifier. A loud-speaker of the mains-energised moving-coil type is fitted and the circuit embodies the useful features described in the preceding paragraphs. That is to say, single-knob tuning, full vision scale calibrated in wave-lengths, combined on-off wave-change gramophone switch, and volume control. The motor is of the induction type, perfectly silent in operation, and accommodating up to 12-in. records. The pick-up and tone arm are of advanced design and give really high-class reproduction from standard gramophone records. The console cabinet in which this receiver is fitted measures 3ft. by 1ft. 6in. by 1ft. 5in. deep and is thns highly suitable for the modern house, in which it will be perfectly in keeping with normal furnishing methods.



The Cossor 1934/35 All-mains Melody-Maker in its attractive cabinet.

The chassis of the new Cossor Melody-Maker is made of blued steel, and employs a rather unusual form of mounting for the rectifying valve.

CATALOGUES RECEIVED

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

MAGNAVOX

AN attractive booklet recently issued by the Benjamin Electric Ltd. contains full technical particulars of the new Magnavox Model Sixty-Six Loud-speaker. This is a mains-energized moving-coil model with an 11in. diameter cone having a number of corrugations spaced about 3/16in. apart across the diaphragm. This arrangement makes a considerable difference to the behaviour of the speaker at medium and high frequencies. This new speaker is finished in ebony and chromium plate, and is available in either D.C. or A.C. types. There are two D.C. models, having 700 and 2,000-ohm field coils respectively, each model being supplied complete with hum neutralizing coil and tapped transformer. The A.C. model (for 200 to 240 volts, any frequency) includes a Westinghouse rectifier and full smoothing circuit. The current consumption is 25 watts.

DUBILIER CONDENSERS

A FULL range of these well-known components is given in a new season's booklet just issued by the Dubilier Condenser Co., Ltd. The condenser and resistance requirements of the latest modern practice are adequately represented. Included in the range are mica condensers for use where operating conditions demand large capacities and high voltages; paper dielectric condensers; non-inductive condensers; high voltage and low voltage dry electrolytic condensers. A range of metallized resistances, ten-watt wire-wound resistances, car radio suppressors, and anti-interference devices is also dealt with in the booklet. The particulars of each component are set out in a concise and categorical manner making for quick reference, thus making the booklet particularly useful to experimenters and set constructors, who are advised to write for a copy.

TALKS FOR DISCUSSION GROUPS

A NEW B.B.C. pamphlet entitled "Talks for Discussion Groups" is now available. In this pamphlet details are given of the various series which have been planned for the coming winter in the National programme, and are specially devised to meet the needs of those who listen in discussion groups. This is the first time that talks have been deliberately arranged for this purpose, although in the past there have been a number of series which have been recommended to groups. During this autumn the three series will be: Poverty in Plenty; Freedom and Authority in The Modern World; The Child, The Parent, and The Teacher.

Two other series to be broadcast after Christmas, of which details will be found in the pamphlet, are "Markets and Men" and "The Artist and his Public," by Mr. Eric Newton. An outline is also given of a special series in the Scottish Regional programme called "Changing Scotland." The pamphlet, which also contains syllabuses of nearly every talk, together with special questions for discussion, suggestions for group leaders, maps, etc., can be obtained from any B.B.C. station, price twopence (post free). Free copies are being supplied to leaders of wireless discussion groups.

BOOKS RECEIVED.

"RADIO COMMUNICATION: History and Development," by W. T. O'Dea, B.Sc., A.M.I.E.E., price 2s. 9d. post free. This book is a brief and profusely illustrated Science Museum Handbook which traces the history of radio communication from what were inexplicable phenomena in 1780 up to the latest modern developments. Some of the subjects covered are: early experiments, types of detector, the growth of commercial telegraphy, the thermionic valve, telephony and broadcast transmission, the development of the broadcast receiver, television, loud-speakers, and microphones. The illustrations include historical apparatus from the museum collections and elsewhere, early and modern transmitters, and several drawings and diagrams. Technicalities have been reduced as far as possible to a concise description of cause and effect, so that the majority of those interested in the story of radio science should not find this handbook too difficult to follow. At the same time it should provide a valuable supplement to the text-books of the radio student.

A MOMENTOUS ANNOUNCEMENT IN NEXT WEEK'S ISSUE!

PRACTICAL LETTERS FROM READERS

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

An Invention Wanted

SIR,—I have read all your issues since No. 1, and have also seen many other wireless journals. I am, however, afraid I have never seen a device described which would suit a scheme which I have for long desired to make up. I have a commercial set, not fitted for an extra loud-speaker. I have connected an ordinary output filter to the set, and have arranged to disconnect the internal speaker when an extra one is in use. I only run one wire to the additional listening point and take a return earth wire from the extra speaker to a convenient earth point. I have tried many volume control devices across this extra speaker, but only with the result that tone of reproduction is spoiled. Is there absolutely no way of controlling the amplification of the set by means of a device situated at a distance, without extra wires running all over the place? I have looked through your wrinkles, but cannot say that I have seen an efficient solution yet. Perhaps one of your readers has met this problem and found a solution; if so, I should be glad to know of it.—R. PULSON (Highbury).

[*We have not the advantage of knowing how it is possible to control the amplification of a receiver with only one extension wire, but maybe a reader has found some volume control method which would be suitable for Mr. Pulson.*—ED.]

Cost of Maintenance

SIR,—I have had some argument with friends regarding the cost of operation of mains receivers. Is it true that these take more current than a normal lighting circuit? I heard of a case where a listener had purchased a good mains unit from one of your advertisers, but he found that in one week it consumed more current than he normally used for lighting all over the house. What is the normal rating of a set, surely it is not so high as some people make out? It would be a good idea if in future you gave the loading of the mains sets you described as well as certain other details which are of interest to the keen experimenter. The cost is one of the points which every constructor wishes to know before undertaking the building of a set.—T. HARRIS (Pimlico).

[*The loading of a good radio-gramophone should not be in excess of* 100 *watts, and the case you mention rather points to the fact that a defective mains unit was being used. About* 60 *watts is the average loading of a good mains receiver, although a small set may take only* 15 *watts. We will bear your other remarks in mind.*—ED.]

"Alternative Connections"

SIR,—I notice you have published my letter *re* alternative connections in the September 22nd issue of PRACTICAL WIRELESS, with your remarks that no mistake was made. May I point out again that there is an error. The article definitely states that Fig. 1 passes the A.C. through the speaker to filament negative, and that Fig. 2 passes the A.C. back through the H.T. This is exactly the reverse, for how can the A.C. component get to earth but through the resistance of the H.T. battery? Fig. 2 is the one that does this. I have taken the trouble to go through numerous periodicals, and in no one case have I seen Fig. 1 even mentioned, while Fig. 2 is the one shown as the more practical circuit.—H. V. WATLING (Colchester).

[*In his previous letter Mr. Watling stated that Figs.* 1 *and* 2 *should have been reversed, and with this we agree. If this is done, however, the statements made in the article are quite correct.*—ED.]

Short-wave Superhets

SIR,—Since PRACTICAL WIRELESS first came out, you have published circuits and details of sets, and these have been of a very high standard. You have not, however, published full constructional details of a good short-wave set. Why not? The average price of a commercial short-wave set is £20, and I think a great saving can be obtained by the home constructor if you published constructional details of a short-wave set.

In your issue of March 17th, 1934 (No. 78), was published a circuit of a short-wave superhet which had 2 H.F. pentodes, det., pentode output and automatic volume control, which, according to the author, really did function well on the short-wave. With a set of this type results are practically certain, and it would be welcome to the constructor who thinks tuning on the short waves is a fine art. It would also induce many others to try the short wave. Now what about it, "P.W."? You cannot afford to shelve this question when so many of us, especially British constructors in our colonies, are asking for such a set. When our colonists write, you say "We have the matter in hand," and then no more is heard from you. If you can design such good sets as the Fury Four Super, etc., then why do you not design a really good super short-wave set on the lines of the above?—E. R. SMITH (Peckham).

[*We have published constructional details of short-wave sets, but have so far not found a reliable solution to the problem of designing a superhet to function on all wavebands. When we do we shall, of course, give complete details.*—ED.]

NOTICE

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL 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 WIRELESS, *Geo. Newnes, Ltd.,* 8-11, *Southampton Street, Strand, W.C.*2.

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

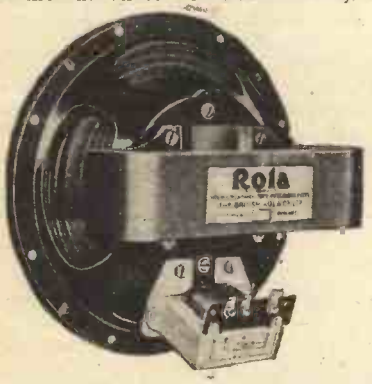
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

A New Rola Speaker

THE Rola speakers have been exceedingly popular for some considerable time, and they have many novel features which set them in a class by themselves. With the general improvement which has taken place in the design of loud-speakers during the past year certain modifications have been introduced to the Rola models, and



The Rola FR6-P.M. moving-coil loud-speaker.

one of the latest type is shown in the accompanying illustration. At a first glance there does not appear to be any radical change in construction between this model and some of the older patterns, but a closer inspection reveals that the cone has been remodelled so that one of the principal causes of trouble with moving-coil speakers has been overcome. We refer to the difficulty occasioned by dust in the air gap. Hitherto, the end of the pole-piece could be seen at the apex of the cone, but in these new models a small "blister" appears at the apex. Although of similar material to that employed for the cone, this small addition is exceedingly thin, and it should not be touched with the fingers in view of the possibility of damage. It closes the air gap from the front, but its shape, thickness, and exact position have received very careful attention, and it makes no difference to the high standard of reproduction which is the hall-mark of the Rola speaker. In addition, a special metal-paper-fabric assembly at the rear of the cone serves to protect the gap from the rear, and it is thus impossible for dust or other foreign matter to find its way into this vulnerable part of the speaker. There are other small refinements to be found in the complete speaker, and in performance it gives full proof of the care which has been taken in design. Reproduction has that peculiar brilliancy for which the Rola speakers are famous, speech being remarkably life-like when the speaker is operated from a good receiver. No trace of boominess or artificial resonance can be detected throughout the complete musical scale, but the lowest and the highest notes appear in all their beauty, with the middle register correctly proportioned at all times. The transformer which is fitted is provided with terminals for power or pentode output circuits and covers a wide range of impedances. The price is 39s. 6d., and the speaker may be obtained with an energized winding, but with all the other characteristics of the permanent magnet, for 35s.

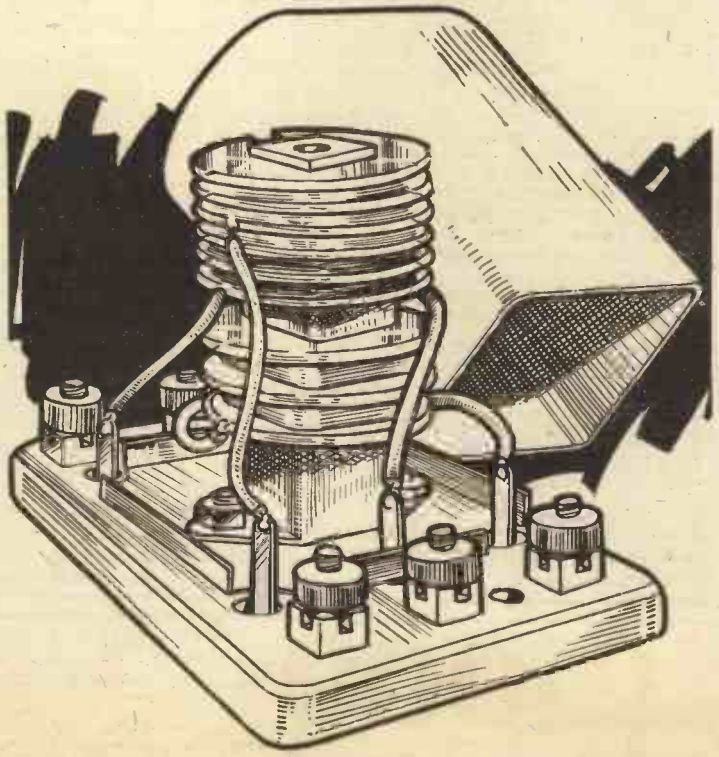
Formo Iron-core Coil

A VERY efficient and neat coil has been produced by the new Formo Company, and our artist's impression of this coil is given on this page. The actual size of the steatite base which is fitted to this coil is 2½in. by 1½in. and the overall height of the coil and screen is only 2¼in. A number of novel features are to be found in this coil, the steatite base being only one of them. Hitherto, this type of base has been fitted only to short-wave coils, but the high efficiency of the iron-core coil warrants the inclusion of a base of this nature in order to remove all possibility of losses being introduced, and so nullifying the advantages of the iron-core. As a further aid to the maintenance of efficiency the former of the coil is made from trolitul, a celluloid-like substance which has extremely low losses. Litz wire is employed for the medium-wave winding, and in every way the losses have been kept down to a minimum, with the result that the coil has a very high standard of performance.

High selectivity, high stage gain, and simplicity of connection are some of the leading features, and it will be found highly desirable when using these coils to take every precaution to keep down losses in the variable condenser and other parts of the tuned circuit in order that full advantage may be taken of these unique properties. The coil is made in three types, T.1—an aerial transformer without reaction; A.1—an aerial coil with reaction; and P.P.1—an H.F. intervalve coil with reaction. Thus, any type of circuit (except a superheterodyne) may be constructed with the coils, and the price of either type is 5s.

Drydex Price Reductions

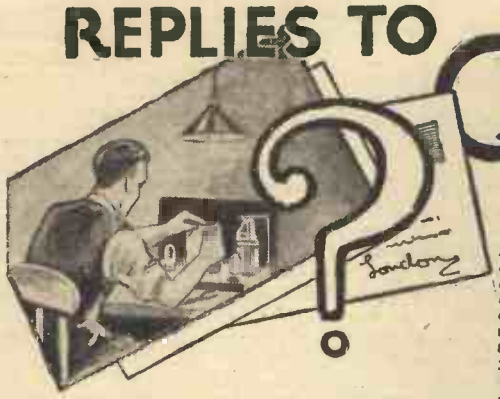
AS from September last the price of the Drydex Pen Torch, type 2 PT5, has been reduced to 1s. 6d., including the battery. In addition, a number of new radio batteries are introduced and are now available. These include, amongst others, two 144-volt batteries (one of 141 volts, plus 3 volts grid bias, and one of 135 volts, plus 9 volts grid bias) at 17s.; one 114 volt (108 volts H.T., plus 6 volts G.B) at 10s. 6d.; one 120 volt at 15s. 6d.; one 24-volt G.B. battery at 2s. 9d.: one 124½ volt (120 volt H.T., plus 4½ volts G.B.) at 14s. 6d.; one 126 volt (120 volt H.T., plus 6 volts G.B.) at 12s.; and a 135 volt (120 volt H.T., plus 15 volts G.B.) at 17s. Although each of these batteries has been designed primarily for a commercial receiver, they will be found extremely useful to the constructor and experimenter, owing to the inclusion of the grid-bias battery, and the removal of the necessity of wondering when to replace this battery. It also ensures that when the H.T. battery is exhausted the grid bias will also be renewed with the removal of the risk of damaging valves due to a discharged G.B. battery.



The novel iron-core coil produced by Formo. This illustration is nearly double the size of the actual coil.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff



The coupon on Page 145 must be attached to every query

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

SPECIAL NOTE

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

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

Please note also that all sketches and drawings which are sent to us should bear the name and address of the sender.

Special Gang Condensers

"In a wireless publication reference is made to ganged condensers in which the different sets of moving vanes can be separately adjusted. Please let me have the name of some reliable firms making condensers of this type."—Dr. W. R. T. (Broadstairs).

So far as we can ascertain, this type of condenser is not now manufactured. If, however, this query meets the eye of any firm who does market such a condenser, and they will communicate with us, we shall be pleased to mention the fact in our pages.

Two-valve Mains Receiver

"May I inquire if you have had, or will have in the near future, a design of the following nature? Two-valve for A.C. mains; output about 3 watts. A few stations with perfect reproduction rather than a host of programmes at very indifferent quality. Overall dimensions as small as possible and cost kept as low as possible."—E. A. R. (Leicester).

The nearest we have to your requirements is the A.C.-D.C. Two, described in PRACTICAL WIRELESS No. 30 and obtainable in blue-print form—Blue Print No. 31. This is designed primarily for universal operation on any type of mains, and gives really high quality with low cost of construction. In addition, it is very compact, and contains a loud-speaker in its cabinet, which measures 17in. high, 11in. wide, and 9in. deep.

A Magnet Problem

"Is it possible to pass an electric current through an energized magnet without any effect on its magnetic qualities?—H. B. O. (Hove).

We are afraid your query is not quite clear to us. What do you refer to as an "energized magnet"? Do you mean an electro-magnet with an energizing winding? If so, it is, of course, necessary to pass a current through the winding in order to magnetize the core. However, if you will repeat your query and give fuller details, we shall be pleased to assist you.

Detector Merits

"I am building a receiver, but am rather uncertain regarding the type of detector to employ. I can choose between crystal, Westector, diode, anode-bend, grid leak, etc., but cannot decide which to adopt. Can you help me when I tell you that I require only a few stations with really high quality? I am going to use a paraphase amplifier after the detector."—T. G. (Balham).

The diode will no doubt prove most suitable for you, although an anode-bend rectifier will serve if only powerful stations are received. Personally we should prefer a modern double-diode-triode, so that you may obtain the advantage of the triode portion of that valve with the good rectification properties of the diode.

Manufacturer's Name Wanted

"I should be glad if you could give me the address of the makers of the Brown screen-grid D.C. mains set. I have one to repair and should like to get the circuit."—P. J. S. (Belfast).

The receiver was made by S. G. Brown, Ltd., Victoria Road, Acton, London, W.3, but this firm no longer manufactures wireless receivers. However, they may be able to assist you concerning the circuit details of the receiver in question.

Wearite Products

"I am anxious to get into touch with the makers of a Wearite transformer which I have got, but I cannot find their name in the London 'phone directory. Could you please let me know their address?"—W. T. (Bloemfontein).

The makers of Wearite components are Messrs. Wright and Weaire, Ltd., 140, High Road, Tottenham, London, N.17. Their advertisements have appeared in our pages on many occasions.

A Droitwich Problem

"I have heard a lot about the new Droitwich station, but I cannot hear it on my set. I have tried several nights when they have supposed to be on, but have only been able to hear Daventry. Can you tell me exactly at what point on the dial I shall hear the station, or is it possible that I am not in the direct range?"—G. T. (Bournemouth).

Droitwich transmits on exactly the same wavelength as Daventry, and at present takes the place of the latter station during the period of transmission. Eventually it will take over completely the present Daventry transmissions. You should adjust your set to the Daventry setting, and you will probably notice that the only difference when Droitwich is transmitting is the increased signal strength. No adjustment of tuning should be necessary.

A Charging Point

"I am building a small charging point, but wish to insert some form of safety device to prevent damage due to the charging current falling below that of the cells on charge. I believe it is possible to fit a kind of automatic cut-out, and should be glad of details."—H. F. T. (Hull).

A small magnet with an armature arranged in the electrical circuit will prove suitable. The strength of the magnet, the weight of the armature, and other details will depend upon the particular charging scheme which you are adopting. A low-priced cut-out may be obtained from Messrs. Ward and Goldstone for 17s. 6d., suitable for 1, 2, 4, and 8 amps. Larger values are obtainable at proportional prices.

THE QUERIES COUPON APPEARS ON PAGE 145

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

Offer the Following Manufacturers' Surplus New Goods at a Fraction of the Original Cost; all goods guaranteed perfect, carriage paid over 5/-, under 5/- postage 6d. extra, I.F.S. and abroad, carriage extra. Orders under 5/- cannot be sent C.O.D. PLEASE SEND FOR ILLUSTRATED CATALOGUE POST FREE.

STUPENDOUS Purchase of Set Manufacturers' Stock. All electric 3 Valve (S.G. Det. Pen.) Set in Walnut Cabinet with moving-coil speaker 200-250 volt 40-60 cycles. Chassis built. 200-2,000 metres with 4 valves, £4/19/6.

ALL Electric 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts, undistorted output, complete with 5 valves, £7/7/-. Suitable speakers, pick-ups and microphones can be supplied.

TYPE 4480, 9in. diameter, permanent magnet. Handles 4 watts. 7 ohms speech coil, 13/6. Multi-ratio transformer, 4/6 extra.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World Famous Continental Valve Manufacturer; all the following standard mains types, fully guaranteed, 4/6 each, H.L., power, High, Medium, Low magnification, Screen Grid. Directly heated Pentodes, 1 watt, 3 watt and 4 watt A.C. outputs.

THE following Type, 5/6 each; 350 v. and 500 v., 120 milliamp full wave rectifiers, 2½ watt indirectly heated pentode.

THE Following American Types at 4/6; 250, 227, 112, 171, 210, 245, 26, 47, 24, 35, 58, 55, 37, 80 and the following types, 6/6 each: 42, 77, 78, 25Z5, 36, 38, 83, 39, 44, 53, 6B7, 2A5, 2A6, 2A7, 2B7, 5Z3, 6C6, 6A4, 6D6, 6E7.

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

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

ALL Premier Guaranteed Mains Transformers have Engraved Terminal Strips, with terminal connections, input 200-250v., 40-100 cycles, all windings paper interleaved.

PREMIER H.T.7 Transformer, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T. L.T., 2/- extra; with Westinghouse rectifier giving 200 v. 30 m.a., 17/6.

PREMIER H.T.8 and 9 Transformers, 250v., 60 m.a. and 300 v. 60 m.a. rectified, with 4v, 3-5a. and 4v. 1-2a., C.T. L.T. and screened primary, 10/-, with Westinghouse rectifier, 18/6.

PREMIER H.T. 10 Transformer, 200v. 100 m.a. rectified with 4v. 3-5a.. and 4v. 1-2a., C.T. L.T. and screened primary, 10/-; with Westinghouse rectifier, 19/6.

PREMIER Mains Transformer, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.) with screened primary, 10/-.

PREMIER Mains Transformers, output 350-0-350v. 90 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.) with screened primary, 10-/.

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

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 65 m.a., 4v. 1-2a., 4v. 2-3a., 6/6; 500-0-500v., 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6.

SPECIAL Offer of Mains Transformers, manufactured by Phillips, input 100-200v. or 200-250v. output 180-0-180 volts 40 m.a., 4v. 1 amp., 4v. 3 amps., 4/6; 200-0-200v., 4v. 1a., 4v. 3a., 4/6.

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

B.T.H. Truspeed Induction Type (A.C. only) Electric Gramophone Motors. 100-250v.; 30/- complete.

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

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

CENTRALAB Potentiometers, 50,000, 100,000 ½ meg. any value, 2/-. 200 ohms. wire wound, 1/-.

(Continued at top of column three)

Easy Terms

Why wait weeks for that new Radio accessory? You'll get it quicker from N. T. S. Any items advertised in this journal on Easy Terms. Strict Privacy Guaranteed. Cash or C.O.D. if preferred. Orders over 10/- carriage and C.O.D. Charges paid. SEND FOR QUOTATIONS FOR ANYTHING IN RADIO YOU ARE NEEDING.

STENTORIAN SENIOR

SENT ON 7 DAYS' TRIAL

Type PMS1. For Power, Pentode and Class B. Send only 2/6 for 7 days' trial. If approved, balance in 11 monthly payments of 4/-. Cash or C.O.D. Carriage Paid, £2/2/0.

2/6 DOWN

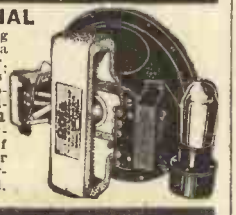
W.B. Stentorian *Standard*. Cash in 7 days, £1/12/6, or 2/6 deposit and 11 monthly payments of 3/-.

ROLA CLASS 'B' SPEAKER-AMPLIFIER

SENT ON 7 DAYS' TRIAL

Complete Class B Amplifying Unit, with Valve and Rola P.M. Moving-coil Speaker. Send only 5/- for 7 days' trial. If approved, balance in 11 monthly payments of 8/3. Cash or C.O.D. Carriage Paid. £3/6/6.

5/- DOWN



LISSEN BAND-PASS SKYSCRAPER 3 KIT

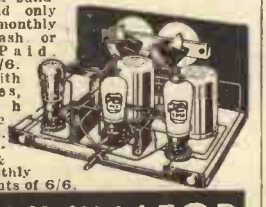
Complete Kit for building, comprising all components, including set of Lissen valves. Send only 9/-; balance in 11 monthly payments of 9/3. Cash or C.O.D. Carriage Paid. £4/19/6.

9/- DOWN

TELSEN S.G.3 KIT

Complete kit of parts for building, less valves. Send only 2/6. Balance in 8 monthly payments of 5/-. Cash or C.O.D. Carriage Paid £1/19/6. Kit with Valves, Cash Price £3/11s. 5/- deposit & 11 monthly payments of 6/6.

2/6 DOWN



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Send for it on 7 DAYS' FREE TRIAL

Model C.A.25. Suitable for all outputs, including Class "B" and Q.P.P. Send only 5/- for 7 days' trial. If approved, Balance payable in 11 monthly payments of 8/6 (or cash in 7 days), £2/19/6. Carriage Paid.

5/- DOWN

D.C. Model 15/25B. Cash or C.O.D. Carriage Paid £1/19/6, or 2/6 down and 10 monthly payments of 4/3.

Model C.A.12. Send 5/- only for 7 days' trial; if approved, balance in 10 monthly payments of 5/3. Cash or C.O.D. Carriage Paid, £2/12/6.

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Dear Sirs,

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(Continued from foot of column one)

EDISON Bell Double Spring Gramophone Motors, complete with turn-table and all fittings, a really sound job, 15/-.

WIRE Wound Potentiometers 1,000, 2,500, 50,000, 90,000, 150,000, 200,000, 500,000, any value 2/- each; 1,000 ohms wire-wound semi-variable resistances, carry 150 m.a. 2/-.

POLAR Star, manufacturers' model, 3-gang condensers, fully screened, 7/6; with trimmers.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Utility Bakelite 2-gang 0.0005 screened with uniknob trimmer, 3/6; Polar Bakelite condensers, 0.00035, 0.0003, 0.0005, 1/-.

BRITISH Radiophone 110 kc/s Intermediates, 3/-.

Cosmocord Pick-ups, with arm and volume control, 12/-.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 magna, 2,500 ohms, 37/6, all complete with humbucking coils; please state whether power or Pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 18/6.

RELIABLE Canned Coils with Circuit accurately matched, dual range, iron-cored, 3/6.

RELIABLE Intervalve Transformers, 2/-; multi-ratio output transformers, 4/6.

T.C.C. Electrolytic Condensers, 550v. working, 650v. peak, 8 mf., 4/-; 4 mf. or 8 mf. 440v. working, 3/-; 15 mf. 50v. working, 1/-; 25v. working, 25 mf., 1/3; 6 mf. 50v. working and 2 mf. 100v. working, 6d.; 8+4 mf., 450v. working, 4/-; 50 mf., 50v. working, 2/9.

T.C.C. Condensers, 250v. working, 1mf., 1/3; 2 mf., 1/9; 4 mf., 3/-; 4 mf., 450v. working, 4/-; 4 mf., 750v. working, 6/-.

WESTERN ELECTRIC Condensers, 250v. working, 1 mf. 6d., 2 mf. 1/-, 4 mf. 2/-. 400v. working, 1 mf., 1/-; 2 mf., 1/6.

H.M.V. Condensers, 400v. working; 4+4+1+1+1+1+0.1+0.1+0.1+0.1, 4/9; 4+2+1+1+1+1+0.5, 3/9.

DUBILIER Condensers, 8 or 4 mfd. dry electrolytic 450v. working, 3/-.

VARLEY Constant square Peak Coils, band-pass type BP7, brand new in maker's cartons with instructions and diagrams, 2/4.

VARLEY H.F. Intervalve Coils BP8 band-pass complete with instructions in original cartons, 2/6.

SCREENED H.F. Chokes by One of the Largest Manufacturers in the Country, 1/6.

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

A LARGE Selection of Pedestal, table and radiogram cabinets, by best manufacturers, at a fraction of original cost, for callers.

THE Following Lines 6d. each, or 5/- per dozen.—Chassis valve holders, 5-, 6-, or 7-pin, screened screengrid leads, any value 1-watt wire end resistances, wire end condensers, 0.0001 to 0.1 Bulgin 3-amp. main switches. Cyldon capacitors, double trimmers.

PREMIER SUPPLY STORES

20-22, High St., Clapham, S.W.4. Telephone: Macaulay 2188. Nearest Station, Clapham North Underground.

EAST ANGLIAN SUPPLIES, for genuine manufacturers' surplus by makers of repute, new goods, satisfaction assured, by return. Over 5/-, carr. paid. ELECTROLYTICS, 450v. working, 8 mfd., 3/-, 4s, 2/9; 8+4+4, 4/9; 25v. 25 mfd., 1/2. Tubulars, up to .1, 4/6 doz. .0003 reaction, with knob, 1/2. COILS.—Colvern T.D. (list 8/6), 4/6; others, manf. type, 1/4, 2/-. Chokes, H.F., 9d., screened, 1/5; L.F., 30 hy. 50 ma., 4/9; 30 ma., 3/3. Vol/controls, 10,000 ohm, graded, switch and knob, 3/-; 25,000, 50,000, no switch, 2/4.

25 MA. ELIMINATORS, 200-250 input, D.C., 10/6; A.C., 21/-. Post free. 4 tappings, guaranteed. L.F. TRANSFORMERS, 3:1, 5:1, 2/-; "B" drivers, 4/3; Mains, 325-0-325, 4v. 2a., 4v. 4a., C.T. screened primary, 12/6.

HEAVY sheet aluminium for chassis, any size, 2/- sq. foot. Interference suppressors, recommended by G.P.O., very efficient, 3/9.

HUNDREDS of lines. Ask for quotation for speakers, chassis, gangs, kits, cabinets, anything. The firm you can rely on.—East Anglian Supplies, 23, Hampton Rd., Ipswich.

REPAIRS—REWINDING. Any component, mains transformers, etc., rewound. New cones/coils fitted any speaker. Guaranteed, quick service. —Write Dept. C., WEEDON P.L.R. Co., 80, Lonsdale Avenue, London, E.6.

VARLEY Constant Square Peak Band-Pass Coils, type B.P.5. Complete, all accessories and instructions. New, boxed, 2/4. (List, 15/-.)

ERICSSON 3-1 L.F. Transformers, new and guaranteed, 2/3. (List, 17/6).

VOLUME Controls, 50,000 ohms, New, 1/3.

CELESTION Energised M.C. Speaker, 2,500 ohms. Model D.C. 2054, with universal transformer. List price, £2/5/0. Our price, 12/6. PIONEER RADIO CO., LTD., Coptic Street, London, W.C.1. Museum 9607.

CONSTRUCTORS of coils, chokes, transformers. Send for 1934-35 lists.—Lumen Electric Coy., 9, Scarisbrick Ave., Liverpool 21.

SOUTHERN RADIO'S Bargains.—Set manufacturers' guaranteed surplus.

VARIABLE Condensers.—Lotus 3-gang 0.0005, 12/6; Lotus 2-gang, 0.0005, 8/6; Lotus Dyblock single, 0.0005, 4/9 (list 9/6); all these condensers are complete with dials, escutcheons, knobs, fully screened with trimmers, and boxed; Hydra block condensers, 16 mfd. (2+2+8+2+1+1), 1,000 v. D.C., 7/- each; Dubilier 4 mfd. (2+1+1), 1,000 v. D.C., 2/9; 4.5 mfd. (2.25+2.25), 1,000 v., for mains noise suppression, 3/-; fixed 4 mfd., 2/3; 2 mfd., 1/6; 1 mfd., 1/-; Utility Midget 2-gang variable condensers, 0.0005, with concentric trimmers, 3/5; T.C.C. 0.1+0.1, 1/3 each.

SPEAKERS.—Blue Spot permanent magnet, with universal transformer for power, super power, pentode and Class B; 23/- (list 39/6).

G.E.C. Stork Speaker in Cabinet; 19/6 (list £3/15).

S.T.400 Kits, all specified proprietary components; (£2/19/6 (list £4/17/6).

REGENTONE A.C. Eliminators. Type W5A, combined with trickle charger. 20 milliamps. Brand new and sealed, 39/6 (list £4/12/6).

IGRANIC Superhet Coils, set of 4 (1 Osc., 2 I.F., with pig tails, a L.F. plain); 12/6 (list 50/-).

LISSEN Superhet 3 Coils Kit, screened, ganged on base with wave change and filament switches; type L.N.5181, for battery or mains; 12/6 (list 30/-).

VARLEY Constant Square Peak Coils, complete with all accessories, new, boxed, B.P.5; 2/4.

VARLEY H.F. Inter-valve Coils B.P.6; 2/3.

FRAME Aerials.—Lewcos dual wave superhet, 9/- each (list 27/6).

PICK-UPS.—Marconi No. 19 (1934), 22/6 each (list 32/6).

READY Radio Instant Transformers, for matching any valve to speaker; Junior model, ratios 1 : 2, 1 : 1, 1¼ : 1, 2 : 1, 3 : 1, 7/6 (list 27/6); Senior model, ratios 10 : 1, 12½ : 1, 14 : 1, 16 : 1, 20 : 1, 25 : 1, 12/6 (list 37/6).

RECEIVERS.—Lissen 2-valve A.C. sets. Universal Model, type L.N.8014, 100/250 volts. Complete with valves and speaker in attractive bakelite cabinet, £2/19/6 each (list £6/6/0). D.C. models, L.N.8012, 200/250 volts as above, £2/19/6).

BOTOLPH Light weight Portable Receivers, complete with 5 Mullard valves, Exide batteris and accumulator, overall size 13in. × 11in. × 8in., £2/19/6 (list £8/8); a real suitcase portable.

MULLARD Radio for the Million, "Station Master Three" battery kits, complete with cabinet and 3 Mullard valves (screen grid, H.L., power), brand new in original sealed cartons; £2/19/6 complete.

MISCELLANEOUS.—Westinghouse metal rectifiers, H.T. 6, 7, 8, 9/3 each; Ferranti chokes, 20 henry 60 m.a., 6/9 each; Lewcos superhet, 8-way bases, complete with valve holders, grid leak, fixed condenser type "48," 2/- each; Lissen tone turntables, 1/6 (list 5/-); Lewcos coils, B.P.F./R., 4/-; T.B.F./C., 3/3; O.S.C./126 (Extensor), 3/3; T.O.S./R., 3/3; Morse tapping keys, with buzzer and flashlight signals, complete with battery and bulb, 2/- each.

LISSEN General Purpose Output Chokes 28 Henrys, 20 M.A. and 18 Henrys, 60 M.A. type L.N.5301, 6/- each (list 12/6).

IGRANIC Resistance-fed Transformer Units, 4/6 each (list 10/6).

BRAND New American Valves. All Types Available. Please Ask for Quotations.

ALL Goods Guaranteed and Sent Carriage Paid.

BRANCHES at 271-275, High Rd., Willesden Green, N.W. 10, and at 46, Lisle St., W.C.2. Please send all post orders to 323, Euston Rd., N.W.1.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Museum 6324.

VAUXHALL.—Magnavox Permanent Magnet Loudspeakers, universal, suitable for Class B power or pentode; 7in. cone, 17/6; 10in. cone, 23/-. Energised 2,500 or 6,500, 10in. cone, 22/-; 7in. cone, 15/3. All new with humbucking coils.

VAUXHALL.—U.S.A. Rola Energised 8in. diameter, 2,500, 6,500 ohms, 17/6; 10in. diameter, 25/-; P.M. 8in. diameter, 28/-; 10in. diameter, 33/-.

VAUXHALL.—Radiophone Radiopaks, Band-pass or R.F. superhet, with Lucerne wavelength station-named scales, medium and long, complete, 32/6.

VAUXHALL.—Radiophone I.F. transformers, with terminals, 6/-. Radiophone volume controls, with switch, 3/6.

VAUXHALL.—Coils, set of three on base with switch, 16/6. Three-gang condensers, with covers—superhet, 14/6; ordinary type, 12/6. Disc drives, complete, 4/9.

VAUXHALL.—Pickups, 8/—£2. Write for quotation. State make, B.T.H. Collaro Motors, 32/6. Gramophone switches, 3/6.

VAUXHALL.—Westinghouse Rectifiers, H.T.8., 9/6; H.T.9, 10/-; Westectors', W4, WX6, 5/9.

CASH with Order, post paid over 2/6, or c.o.d.; all goods unused manufacturers' surplus; guaranteed perfect. Lists free.

VAUXHALL UTILITIES, 163a, Strand, W.C.2. 'Phone: Temple Bar 9338. (Facing Bush House, over Dennys.)

ALL goods advertised in last week's issue still available.

WARD, 2nd floor, 45, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

150 volts at 15-50 ma.

When buying a Mains Unit, be sure you get the products of SPECIALISTS. Heayberd have specialised in Mains Apparatus for over a decade, and have recently marketed a remarkable mains unit.

1. Voltage regulation practically constant at 150 volts throughout the whole range of current.
2. Suitable for any set and specially suitable for Class "B" working.
3. Absolutely free from all hum and background.
4. GUARANTEED THREE YEARS.

These are some of the remarkable features of the New Heayberd Mains Unit—Model 15/50.

MODEL 15/50—Output 150 volts at 15-50 ma. H.T.1 Variable 40-110v. H.T.2 Variable 60-130v. H.T.3 Fixed 150v. Employs Westinghouse Metal Rectification. PRICE 88/6

Post Coupon for Heayberd handbook on Mains Working

I enclose 3d. stamps for NEW Handbook of Mains Equipment. Packed with Technical Tips, Service Hints and diagrams

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10 FINSBURY STREET, LONDON, E.C.2
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