

F. J. CAMM'S MOMENTOUS ACHIEVEMENT!

Practical Wireless

3^D

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AND AMATEUR TELEVISION
EDITED BY F. J. CAMM.

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**MOMENTOUS
ANNOUNCEMENT
INSIDE**



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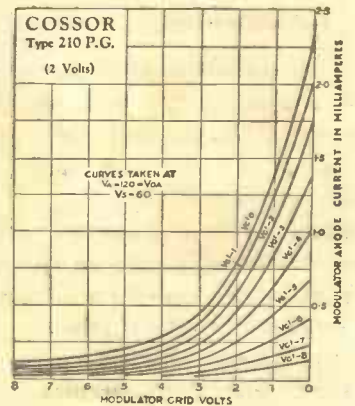


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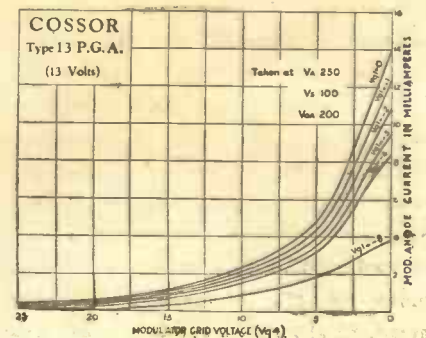
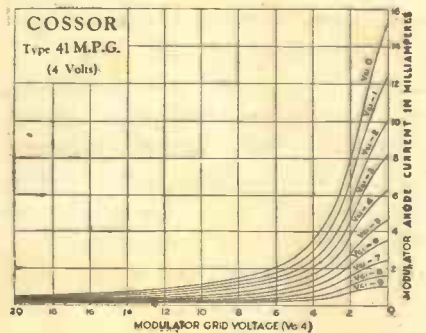
Filament Volts - - - 2
Filament Current (Amps.) .1
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Screen Voltage (Max.) - 80
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Osc. Anode Voltage (M. x.) 150

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A THREE-VALVE SUPERHET AT LAST! See pages 170 & 171



Practical Wireless

EDITOR:
Vol. V. No. 109 || F. J. CAMM || Oct. 20th, 1934.

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



ROUND *the* WORLD of WIRELESS

Mr. F. J. Camm's New Receiver!

For many months the problem of selectivity has held the attention of designers of wireless receivers, and on all sides it has been admitted that the only real solution to interference-free reception is to be found in the superheterodyne circuit. Unfortunately, this has hitherto necessitated the employment of multi-valve receivers and tricky circuits, with all the attendant difficulties which arise from various constructional and operating details. Mr. F. J. Camm has been experimenting with all existing methods of incorporating the superheterodyne feature in a simple receiver, but until recently he has found no real solution to the problem consistent with low price. We fully realize that the home constructor is not prepared to spend a lot of money in trying out a new receiver, although phenomenal claims for it may be justified. However, Mr. Camm has succeeded in designing a receiver which incorporates the valuable superhet. principle (without modification) and yet the total number of valves is only three! Consequently the price of the receiver has been brought down to such a level that

every constructor will be able to take advantage of this new development, and may build a receiver which will end for all time his difficulties in station separation. Quality has been maintained at a high level—due to the incorporation of a linear detector (without reaction), and the output is sufficient for all normal require-

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Turn to Pages 170 and 171 and read the Important Preliminary Announcement. See also the First Paragraph on This Page

ments. The price of the receiver is under £5. Turn to pages 170 and 171 and read some more about this wonderful new receiver.

Talk on Trades Union

ERNEST BEVIN, General Secretary of the Transport and General Workers' Union, gives the second of his two talks on Trades Union in the West on October 22nd. He will tell of the part played by the

Trade Unions in the development of industry in the West.

Talk on Welsh Culture

JORWERTH C. PEATE will deal with the vast amount of work which is necessary to obtain a complete picture of the Welsh rural tradition in a talk in the Welsh Interlude for National listeners on October 20th. He will indicate several aspects of Welsh culture which have been neglected and will suggest ways in which Wales, through preserving her folk material, could give a lead to other countries.

Chamber Music Concerts

THE B.B.C. announces a special series of six public Chamber Music Concerts in the Concert Hall, Broadcasting House, on Friday evenings at 8.15. This is the fourth series of these concerts, the first of which took place in 1932.

The concerts this season will be given on October 26th, 1934; November 16th, 1934; December 7th, 1934; January 25th, 1935; March 1st, 1935; March 29th, 1935.

The Ensembles engaged are The New English Singers, the Pro Arte String Quartet, the Kolisch String Quartet, and the Brosa String Quartet. Among the solo artists are Arthur Rubinstein, Ernst von Dohnanyi, Lionel Tertis, Carl Flesch, Thelma Reiss, Conchita Supervia, Margot Hinnenberg-Lefebre and Jo Vincent.

Concert from West Regional

A CONCERT will be relayed from the Regent Theatre, Truro, on October 22nd, when the artists will be Hedde Nash (tenor), Muriel Kemp (pianoforte), and the Cornwall Symphony Orchestra conducted by Charles Rivers. This orchestra is composed of musicians who come from all parts of Cornwall to Redruth to practise. The day before a big concert other players come from the neighbouring county of Devon, and in addition four or five players come from the British Women's Symphony Orchestra and nine from the Royal Marine Band, Plymouth. Thus is formed an orchestra of seventy-four players. For the last twelve years this orchestra has given annually a short series of concerts in Camborne and in Truro.

ROUND the WORLD of WIRELESS (Continued)

Prince George at Swansea

THE new civic centre at Swansea will be opened by Prince George on October 18th. The proceedings are to be broadcast in the West Region, beginning at 12.10 p.m. and while Prince George is inspecting the new Guildhall and Law Courts a few words of introduction will be given by a commentator. When the Prince has proceeded to the Brangwyn Hall, the Bishop of Swansea and Brecon will deliver a consecration prayer, following which the Mayor will formally welcome the Prince. Prince George will then declare the new Guildhall, Law Courts, and Brangwyn Hall open for public use. Speeches will be given by Lord Sankey, the Earl of Plymouth, and Lord Iveagh. There will be organ interludes by Dr. W. H. Harris.

Royal Philharmonic Society's Concerts

ONE of these popular concerts will be relayed to London Regional listeners from the Queen's Hall on October 18th. Sir Thomas Beecham will conduct the London Philharmonic Orchestra and Myra Hess, Britain's foremost woman pianist, will be the soloist. The programme consists of Overture, Cockaigne, by Elgar, Incidental Music from "The Tempest" (Sibelius), Concerto No. 4 in G (Beethoven), played by Myra Hess and Orchestra, and Suite, Rossiniana (Rossini-Respighi).

On November 1st listeners will have another opportunity of hearing a broadcast in which Sir Thomas Beecham is conductor. He will take part in another Royal Philharmonic Society's Concert at the Queen's Hall, and Jan Smeterlin, Polish pianist, will be the soloist.

British Radio Receivers for France

CRITICAL opinion in France recognizes that so far as technical advance in radio reception is concerned, British-made receivers represent a higher standard than any others. In consequence the General Electric Company is exporting considerable numbers of sets just now to France. Air transport is requisitioned as offering the best facilities in speed, simplification of packing, and in over-all costs, and it is of interest to learn that by utilizing air transport it is possible to convey the goods from the factory belonging to the Company mentioned above at Coventry in only from five to six hours. The illustration on this page shows the first consignment of G.E.C. receivers being loaded on to an Imperial Airways aeroplane at Croydon recently, for despatch to France.

"American Points of View"

AN interesting series of talks entitled "American Points of View" will be given in the Regional programme on

INTERESTING and TOPICAL PARAGRAPHS

Sunday evenings, October 21st, November 4th and 18th, and December 2nd, 16th, and 30th. The following distinguished Americans have been invited to contribute to this symposium, in which they will be at liberty to express their points of view on matters general or particular, according to their choice: Miss Frances Perkins, Senator

Borah, Owen D. Young, Sidney Hillman, Willa Cather, and President Lowell. Owing to the difficulty of fitting in each speaker on evenings which are mutually convenient, some of the talks will be arranged at short notice; but they will be given on the dates stated at 9.0 p.m., G.M.T.

B.B.C. Midland Orchestra

COMMENCING during the present week the new B.B.C. Midland Orchestra appears in both Regional and National programmes. On October 21st Leslie Heward conducts an Edward German programme, and the light symphony programme on October 23rd, when Mozart's Symphony in C is the chief work. H. Foster Clark, who is at present acting as Midland Regional Music Director, is the conductor for afternoon concerts, on the National wavelength, on the Monday and Saturday of this week; while on the Saturday evening Victor Hely-Hutchinson will conduct in a programme of humorous pieces. This last was given a few weeks ago with the Midland Studio Orchestra, but had to be curtailed owing to an electrical breakdown in Birmingham. For the Saint-Saëns suite "Le Carnaval



A large consignment of radio receivers, part of a large order received by The General Electric Co., Ltd., from France, being despatched by aeroplane from Croydon.

SOLVE THIS!

PROBLEM No. 109

Gregory had a small two-valve receiver which had given good results for some time. He gave it a good clean up one day, removing all dust, etc., and when he next tried it out he found that whilst signals were quite as usual up to the Midland Regional, he could hear nothing on wavelengths higher than this station. He examined the coil and found that this was quite in order, but one thing became noticeable after spending some time endeavouring to trace the fault. As soon as he had passed the tuning point of the Midland Regional the usual rushing noise and other background noises ceased to issue from the loud-speaker. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelope to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 109, and must be posted to reach here not later than the first post Monday, October 22nd, 1934.

Solution to Problem No. 108

Owing to the heat in the boiler house, the electrolyte in Smith's accumulator evaporated rapidly. Thus the accumulator became run down much sooner than Smith expected, and when he put it on charge it was only half full. During the charging period it became completely dry and thus failed to function. The following three readers correctly solved Problem No. 107, and books have accordingly been forwarded to them: Mr. W. R. Warwick, 28, Stapleton Hall Road, Stroud Green, N.4. Mr. W. G. Keeler, 45, Ebury Street, Pimlico, S.W.1. Mr. G. L. Hutchinson, The Platanos, Champion Hill, S.E.5.

des Animaux," the pianists will be Margaret Ablethorpe and Michael Mullinar. The orchestra consists of thirty-five players, with Alfred Cave as leader. It forms the nucleus of the City of Birmingham Orchestra, whose symphony concert on October 25th will be relayed. That programme includes the Haydn Symphony No. 102 in B flat and, with Ernst Wolff as pianist, the Mozart Pianoforte Concerto in B flat. Leslie Heward will conduct the concert.

"The Black Dog of Hergest"

ACCORDING to a recent report the Black Dog of Hergest, a phantom hound, has been seen in the neighbourhood of Kington. The legend of its appearance dates from the period of the Wars of the Roses; it inspired fear in generations of Herefordshire people, and has left, to this day, a local saying "Why so fierce, Mr. Vaughan?" which originally referred to Black Vaughan, owner of this phantom hound, which he is said to have kept at Hergest Court. Anyhow, "The Black Dog of Hergest" is the subject of the first of the Midland series of dramatized legends. Helen M. Enoch, who has made a play of it, was born in Herefordshire, and has long been a student of West Midland folk-lore and legend; while as a broadcaster, she is on the eve of her hundredth microphone appearance. Martyn Webster produces the play on October 22nd.

Modern Tuning Scales for the Home Constructor

Some Details which Will Enable the Listener to Modernize the Tuning Device on an Old Receiver

By W. J. DELANEY

There are many listeners who are still using a receiver which has seen service for some considerable time, but which gives such good results that they do not feel disposed to modernize it. They may have obtained certain new items, such as L.F. transformers, but in general it does not conform to modern standard in appearance and operation. A glance at modern commercial receivers reveals the fact that the method of indicating the setting of the tuning condenser has been the cause of much experiment, and some

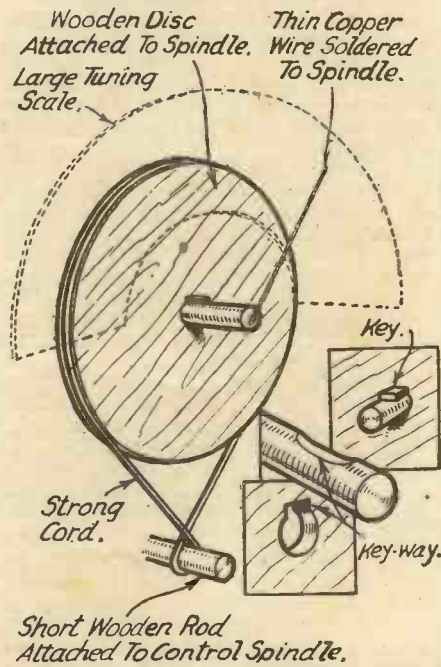


Fig. 1.—A simple method of fitting a pointer to an old condenser spindle.

very novel schemes are to be seen in the various types of receiver which are available. In place of the small window behind which a celluloid scale moved, we now have wide, open scales with really substantial pointers which leave no doubt as to the exact tuning point. Furthermore, in place of a few arbitrary figures, we can have the names of the various higher powered stations clearly marked so that all the members of the household may tune to a desired station without hesitation or doubt. It is possible for the home-constructor to make up quite a number of these indicators for incorporation in an old receiver, but naturally the exact construction will depend upon the particular receiver which is in use, and unfortunately, therefore, we cannot give a particular method which might be modified for any type of receiver.

Various Types Possible

There are many types from which the constructor may choose, varying from a large moving disc to a small metal pointer

carried by a travelling cord. The first thing which has to be done is to remove the present dial, and in the majority of cases it will also be necessary to move the condenser also, so that it takes up a position slightly farther back to enable the tuning device to be positioned between the condenser and the panel. With modern baseboard-mounting condensers this will probably be found a simple matter, but with old pattern single-hole mounting condensers some form of support will have to be given. One of the well-known component brackets will probably be found satisfactory, and these require only two small screws to attach to the baseboard, whilst the long slot will enable the condenser to be locked into the most convenient position. Whatever type of mounting is provided for the condenser, there will obviously be a hole left in the panel, and to avoid the cost of a new panel this may be utilized for the tuning control. Special one-hole mounting bushes are obtainable from most radio stores, and one of these may be locked into the hole to accommodate the tuning control. One of the simplest dials, which gives a good reduction and provides a clear indication of its setting may be constructed by cutting out a large semi-circular section from the panel, mounting a sheet of paper on a piece of wood situated a short distance behind the panel, and soldering a thin piece of copper wire to the end of the condenser spindle. To turn the spindle with a suitable reduction a large disc of plywood is mounted on the spindle, and a groove is made round the edge of the disc. A short control spindle is mounted low down on the panel, and a small wooden disc or piece of rod is attached to this, with a cord passing round the larger disc. The cord should preferably be high-quality fishing line which will not perish and which will give a good grip on the wood. The scheme is illustrated in Fig. 1, although it must again be emphasized that actual constructional details will depend upon the amount of room available in the receiver, type of condenser, etc.

The simplest manner of attaching the wooden disc to the brass condenser spindle is to cut a small key-way in both, and use a small metal key to lock them, as shown in the inset in Fig. 1. Alternative schemes may suggest themselves to individual constructors, according to mechanical ability and tools available.

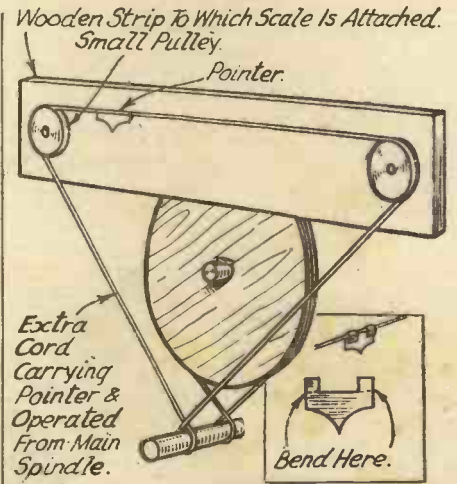


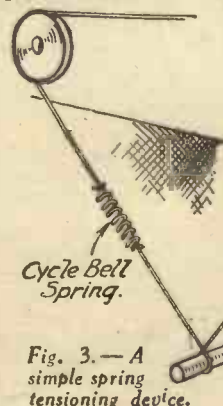
Fig. 2.—Another indicating device which will improve an old set.

A More Ambitious Scheme

A much better appearance is obtained when the scale is viewed through a rectangular opening, and for this type of scale the indicator must travel in a straight line, or be made so long that it is over the scale at each end of its travel. Thus a rectangular scale may be provided in place of the semi-circular one shown in Fig. 1, and the same method of attaching the pointer may be used. By making the pointer very long it will always be in view on the scale, but it will be at an angle at each end. If the scale is mounted on a wooden support, small pulleys may be attached at each end, and the cord may pass over the pulleys, and thus run directly, across the scale. A small pointer may be cut from thin metal with short lugs which may be turned over to grip the cord. The pointer will thus be carried along with the cord as the condenser turns and a very clear indication will be afforded. Details of the main parts are shown in Fig. 2. The pulleys are from one of the well-known constructional toys, and are obtainable at any toy shop, or may be made from plywood with the centre grooved out. It will be seen that by adopting this cord and pulley idea the scale may be arranged vertically if desired, whilst it may also cover two scales, one to indicate medium and one to indicate long waves. By arranging the wave-change switch also to control the illumination of these two scales the exact station which is being received may more readily be seen.

A Tensioning Device

Where sufficient length is available it will pay to fit a tensioning device to the cord. This is carried out quite simply by making the join between the ends of the cord through the medium of a small spring. A bell spring, obtainable from a cycle dealer's for one penny, will prove quite suitable.



SWITCHING DEVICE FOR AN OUTPUT PLUG

A Novel Arrangement for Adapting a Plug for Switching Two Speakers

THOSE amateurs who favour the plug and jack method of connecting the loud-speaker to the set may like to add to their plugs the handy switching device illustrated in the accompanying drawings. This idea allows two speakers

to be used together, or each one separately, simply by a slight turn of the small knob, which operates a switch inside the plug.

The few simple materials required are as follow: A piece of 3 or 4 B.A. screwed rod, 1½ in. long, four nuts, one washer, one ter-

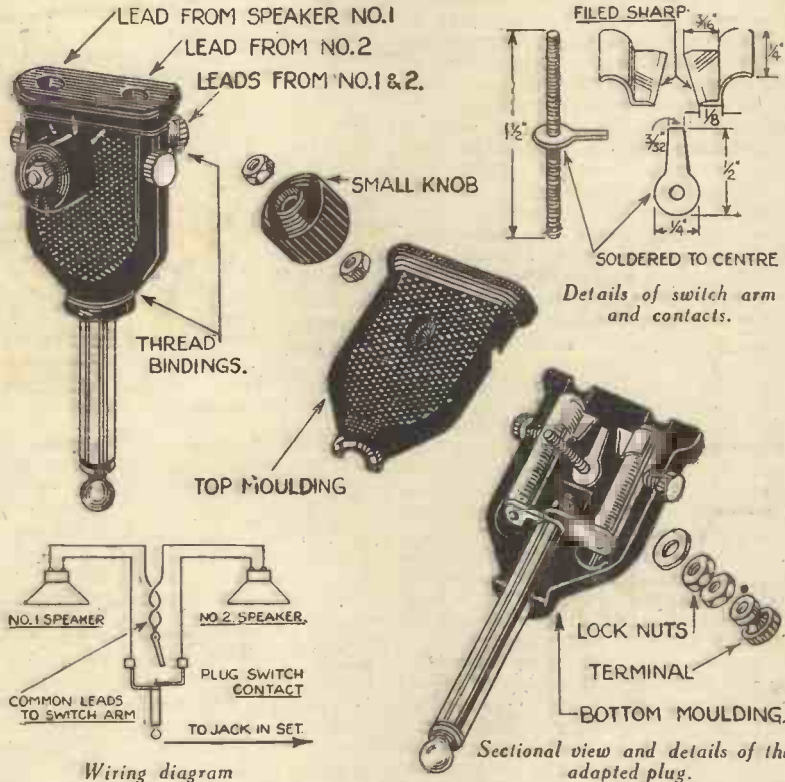
minial top, and one small knob. These should all suit the screwed rod. In addition, a small piece of thin sheet brass will be required. The knob used in the writer's case was taken from an old high resistance of the variable screw-up type, and is ideal for the purpose.

Constructional Details

First, take the plug and remove the small set screw, when it will be found that one half of the insulating moulding can be lifted off. With the metal portion of the plug resting in the lower moulding, make up the two small brass contact pieces as shown, and solder one to each of the metal sockets at the top ends. These contact pieces should lie quite flat on the surface of the moulding.

Next, solder the small switch arm to the centre of the screwed rod, using as little solder as possible, and insert into the original set-screw hole. Then fit the washer and the two nuts, locking the latter to give a sliding fit to the spindle. Replace the top moulding and bind the two sections together top and bottom with black thread. It may be found necessary to remove a slight layer from a small area of this top moulding to allow for the extra thickness of the contact pieces, etc., and this can quite easily be done with the aid of a warmed knife blade.

Then fit the small knob so that it barely touches the top moulding, using the bottom nut as guide, and tighten up the top nut, thus fixing the knob to the spindle. The plug is then ready for use. A lead from each speaker should be taken to the plug sockets, whilst the remaining two leads should be joined together and fastened under the new terminal. This latter will turn slightly as the switch is operated, but is not detrimental. In effect, the switch shorts one or other of the speakers, according to which side it is moved, whilst, when at the centre position, both speakers are joined in series. The very quick change over is extremely useful when comparing two speakers for tone. If desired, the plug can be used in the usual way, for one speaker, by leaving the terminal unconnected, with the switch turned to the central position.



Variety from Scottish Radio Exhibition

ON October 20th a variety programme will be relayed from the model studio, Scottish National Radio Exhibition, Waverley Market, Edinburgh.

Juvenile Performers

TWO "juvenile" artists will broadcast in the North Regional programme on October 27th. They are Muriel Beard-sall (sixteen), pianist from Lytham St. Annes, and Billy Williams (sixteen), violinist, of Pwllheli, Wales. Both have won many prizes, Williams having distinguished himself particularly at the National Eisteddfod of Wales.

"Friday Morning"

THIS is the title of a play by Val Gielgud which is to be revived in the Belfast studios on October 19th. The setting of the play is an air liner between London and Paris, and its drama is the drama of the reactions of a number of quite ordinary people to the fact that a crash seems imminent. Actually, for the benefit of

PROGRAMME NOTES

nervous listeners, the ending is not as sombre as might be expected. Lance Sieveking will produce.

Good Fare from Birmingham

THE late Fanny Davies made some memorable appearances at the Birmingham Town Hall. On October 19th records of her playing Schumann's "Scenes of Childhood" will be given from the Birmingham studio.

On the same evening there is to be a relay of variety from the Grand Theatre, Derby—Billy Cotton and his band topping the bill.

Belfast Philharmonic Society's Concert

THE first Subscription Concert of the sixty-first season of the Belfast Philharmonic Society will be relayed from the Ulster Hall on October 19th. The soloists will be Stuart Robertson (baritone)

and Gaspar Cassado ('cello), and the Chorus and Orchestra of 350 performers will be conducted by E. Godfrey Brown. The programme will open with a Fanfare by the late Sir Edward Elgar.

Minstrels' Concert from North Regional

NEXT Tuesday evening (October 23rd) the Minnehaha Amateur (nigger) Minstrels, well known in Manchester and district, will broadcast an entertainment from the North Regional Studios. The troupe, which is about sixty strong, consists entirely of males—including a score of young boys; their programme will include coon songs, with banjo accompaniment, and comedy sketches.

"Beca"

A PROGRAMME under the above title, which has been arranged by Picton Davies for West Regional listeners on October 23rd, deals with the exciting days of the Toll-gate riots in Wales ninety years ago. The disturbances, known as Rebecca Riots, had their origin in the opposition of the Welsh peasants to the payments of turnpike tolls, but there were numerous other grievances.

ONE-VALVE LOUD-SPEAKER RECEIVERS

A Few Interesting Experimental Circuit Arrangements are here Suggested. By FRANK PRESTON

ELABORATE and comparatively complicated receiver circuits have lately come into such common use that the constructor is rather apt to look upon the simple single-valve set with disdain. Despite this, however, it is a fact that the one-valver has much to recommend it, for it can be made very cheaply and in a very short time, besides which it provides

is fairly conventional, although a high-efficiency pentode valve is used in place of the more general triode. The advantage of the pentode is that it provides a greater degree of amplification and has a greater signal-handling capacity than the ordinary detector valve. In order to obtain the best possible results from a circuit of this kind, it is best to

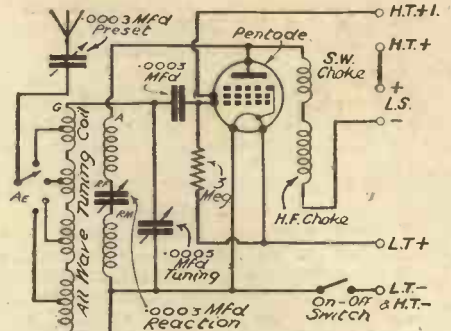


Fig. 1.—An excellent circuit for a single-valve loud-speaker receiver. This is the "All-wave Unipen," but the all-wave tuner might be replaced by a normal dual-wave tuner if desired.

apply a high-tension voltage of not less than 100, whilst voltages up to 150 are often better, provided that they permit of a steady control of reaction.

The set just referred to proved very successful in the hands of a large number of readers, who found that fair speaker reception was attainable up to twenty miles or so, even on a moderate aerial; when a good aerial is employed and the speaker is of a sensitive pattern (preferably one of the older "cone" types) speaker reception up to thirty miles is not impossible.

D.C. Mains Operation

A circuit on the lines of that given in Fig. 1 is very suitable for operation from D.C. mains, since the very minimum of smoothing equipment is called for. The general arrangement of a very convenient D.C.-operated single-valve loud-speaker circuit is given in Fig. 2, from which it can be seen that two fixed resistances and fixed condensers are used to provide all the smoothing that is generally necessary. Filament current for the 2-volt, .2-amp. pentode is also taken from the mains, a 40-watt lamp acting as the necessary "voltage-dropper." Theoretically, such a lamp is only correct when the mains voltage is 200, but in practice it will be found that it functions quite satisfactorily on any supply voltage up to 230. As soon as the switch is turned on the 40-watt lamp will light up, but it can be placed

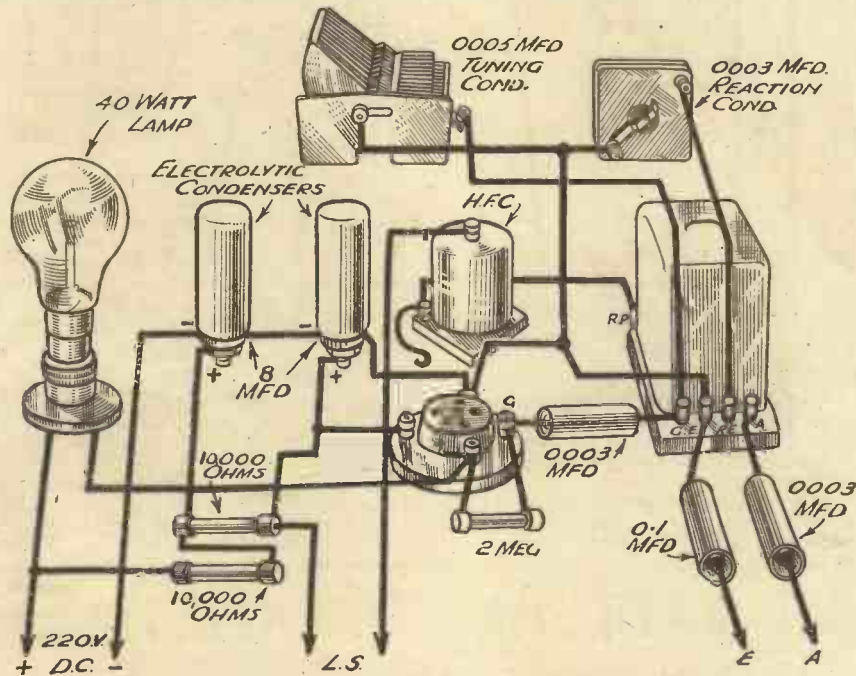


Fig. 2.—A simple single-valver for all D.C. operation.

ample scope for experiment. The latter statement will be the better understood if it is borne in mind that the detector portion (which a single-valve receiver actually comprises) is the most important of any set, large or small.

A common objection to the one-valver is its assumed inability to operate a loud-speaker, but this objection is without foundation, for such a set can be made to give fair speaker results at moderate distances from the Regional and National transmitters, or at a range of fifty or sixty miles of Droitwich. Moreover, the single-valve loud-speaker circuit need not be a "freak" arrangement, or one which calls for considerable skill in handling, as was proved by the "Unipen" described in PRACTICAL WIRELESS dated October 14th, 1933. This set was designed to cover short, long, and medium waves, but there is no reason why the same circuit should not be used round a standard type of dual-range tuner. For those who wish to try the arrangement, the circuit is reproduced in Fig. 1. Apart from the tuner, the circuit

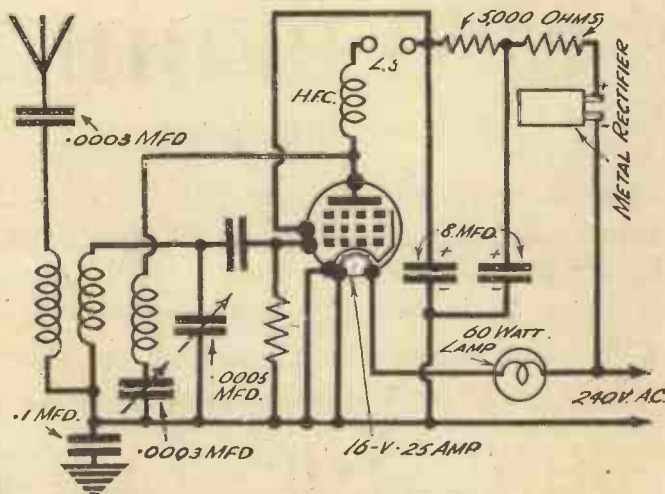


Fig. 3.—This circuit is similar to that in Fig. 2; but is for A.C. operation.

in any convenient part of the room, so that its light is utilized. For example, the lamp might be used in a table light or standard, or it might simply be used to illuminate the receiver.

It should be noticed in Fig. 2. that fixed condensers are inserted in both the aerial and earth leads to prevent the possibility of shocks being received whilst using the set. The condensers provide a further safeguard when the positive mains lead is earthed.

(Continued overleaf)

ONE-VALVE LOUD-SPEAKER RECEIVERS

(Continued from previous page)

A Set for A.C.

Even when the mains are A.C. a single-valver loud-speaker receiver can be made up fairly conveniently, and without too great an expense, by using an indirectly-heated D.C. pentode (with 16-volt, .25 amp. heater) with a 60-watt electric lamp as "voltage-dropper" and a small metal rectifier for H.T. supply. Smoothing, as in the case of the D.C. circuit, is performed by two fixed resistances, although an L.F. choke, or the primary winding of a good transformer, might be used in place of one of them, when the value of the other would require to be doubled. The choke or transformer would prove somewhat better when the mains supply was very "rough," although the resistances will be perfectly satisfactory in the majority of cases.

A Novel Arrangement

An entirely different type of single-valve loud-speaker receiver can be made by using a Class B valve in a "dual" capacity; that is, as both detector and L.F. amplifier. The simplest circuit of this type is shown in Fig. 4, where it will be seen that one-half of the valve acts as a perfectly normal leaky-grid detector and the other half as a three-electrode low-frequency amplifier. Coupling between the two sections is by means of a resistance-capacity network, and everything excepting the method of using the valve is standard.

This type of single-valve circuit will give results equivalent to those obtainable from an average two-valve receiver, which it really is. Somewhat greater output could be obtained by employing transformer coupling between the detector and L.F. circuits, but this generally leads to a certain amount of instability, due to the capacity which exists between the two anodes. At the same time, there is no reason why transformer coupling should not be tried by the experimenter, for, if

a little care is taken in the choice of components, it is certainly possible to obtain good results.

The principal advantage of a receiver of this type is that it can be built in very compact form, due to the very few components required, and the arrangement

miles the circuit will give really good speaker reception, the output being as great as that obtained from the usual small battery-fed power valve. The principal objection is that the quality is not generally too good, and for this reason it is necessary to experiment with G.B.

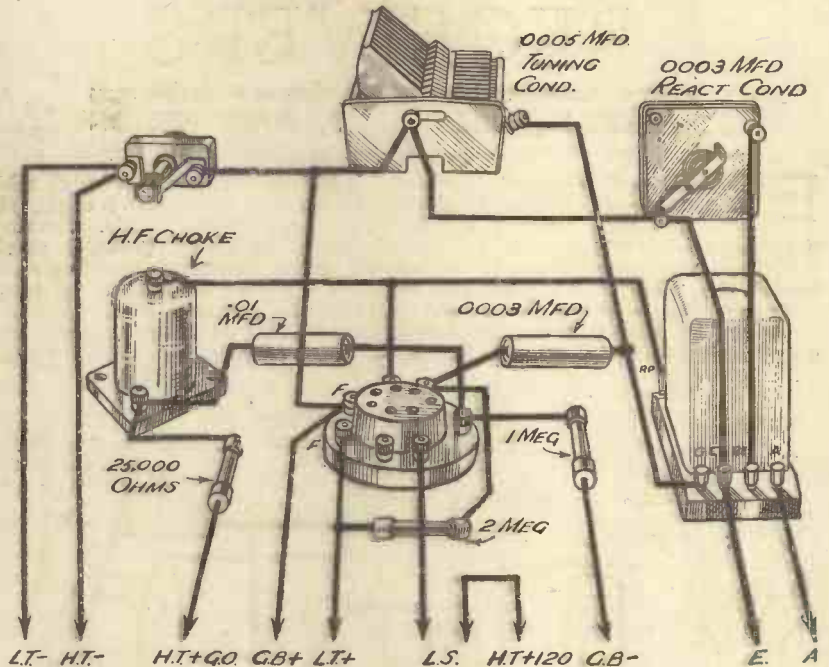


Fig. 4.—An unusual type of single-valve circuit in which a Class B valve serves as both detector and L.F. amplifier.

lends itself to the construction of a simple portable. When used in that way, and with a temporary aerial, however, it would generally be found necessary to use 'phones instead of a loud-speaker. On the other hand, when used on a good outside aerial, speaker reception of stations up to 100 miles or more is possible. Up to twenty

voltages and sometimes with tone-compensating devices, such as a .01 mfd. fixed condenser and 20,000-ohm resistance in series between the speaker terminals. It should be pointed out that the circuit under discussion functions most satisfactorily when the Class B valve is of the type which requires a small negative bias.

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Designed by F. J. CAMM

COMMON MISTAKES

This Account of Some of the Errors which Most Frequently Occur will Serve as a Guide for Avoiding Them in the Future

COMMON errors regarding radio fall into two classes: errors of ideas, which usually do no more harm than produce a sense of confusion; and errors of practice, which certainly affect the performance of a receiver, may put it out of action entirely, and in some instances do considerable damage to apparatus.

Mistaken Notions

Consider, first of all, some of the errors, or mistaken notions. One very often hears some such phrase as: "Turn down the radio to lower volume. It's much too loud, and, besides, we do not want to waste current." Now there is nothing wrong in turning down the volume control if the radio is too loud, but do not think that this will necessarily save you current. There are instances where reduced volume is accompanied by reduction in H.T. consumption, but in the majority of receivers this is not the case.

Using normal high-frequency amplifiers and output valves, the anode current of each valve is fixed once and for all by the value of the H.T. voltage and the grid-bias voltage. The mean anode current remains constant from the moment the set is switched on, even though during some portion of the period the receiver is not tuned in to any station, and the speaker is therefore silent. Whether the volume be great or small, or even non-existent, the receiver will be consuming the same amount of H.T. and L.T. current.

Two Exceptions

One exception to this rule is that if the high-frequency valves are of the variable- μ type in which volume is controlled by varying the grid-bias, then when the volume control is turned down the anode current of the variable- μ valves will be correspondingly reduced. As, however, the current taken by such valves, even when adjusted to maximum volume, is very small compared with that taken by, say, the output valve, the saving on low volume is almost negligible.

The only other instance in which a reduction of the volume control is accompanied by reduced high-tension con-

sumption is when the output stage employs either a Class "B" or a quiescent push-pull arrangement. In each of these two devices, owing to the special design of the valves and of the circuit, the mean anode current when no signal is being received is only a few milliamps, and the anode current consumption rises and falls according to the strength of the signal applied at any moment to the grid of the output valve.

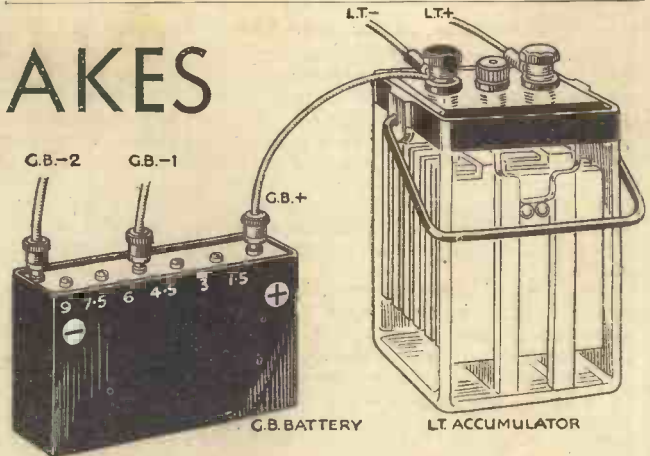


Fig. 1.—The correct connections for a grid-bias battery.

Practical Errors

Quite a number of listeners find difficulty in understanding the correct way in which to connect up a grid-bias battery. Now the normal G.B. battery has a clearly-marked "plus" sign at one end and an equally clearly marked "minus" sign at the other end, the voltage of the intermediate tapplings being marked either on the side of the case or upon the black pitch which seals the top. The correct connections, of course, are G.B. plus to L.T. minus, with the grid returns connected to the appropriate tapplings. I have seen many cases, however, where G.B. plus has been joined to L.T. plus. This is not a very serious fault, for it usually only means that the actual grid-bias is reduced a volt or so below the nominal setting. The other mistake is where G.B. minus has been connected to L.T. minus. This means that the valves are given a positive grid-bias instead of a negative bias, with the result that the anode current rises to an alarming figure with disastrous effects to the high-tension battery, and upon the valves themselves. Fig. 1 gives the correct connections which should be used.

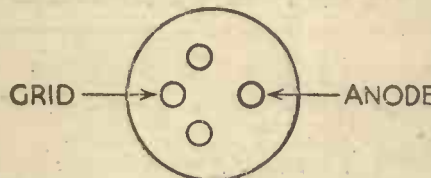


Fig. 2.—The valve connections for a triode.

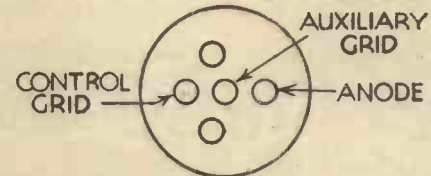


Fig. 3.—Valve connections for a battery pentode or directly-heated mains pentode.

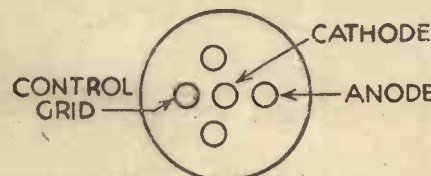


Fig. 4.—The valve connections for an indirectly heated mains output pentode. The auxiliary grid has a side terminal.

Valveholder Points

Mistakes still arise in connecting up valve holders. Occasionally the grid and anode terminals are confused. It should be remembered that the grid connection is the one nearer to the two filament sockets, as shown in Fig. 2.

Pentodes

Pentode connections sometimes cause a little confusion. In the case of a battery pentode it is the auxiliary grid which is connected to either the centre pin or the side terminal (Fig. 3). This is simple enough, but mistakes arise quite frequently in the case of A.C. mains pentodes. If the pentode is of the directly-heated type the auxiliary grid is connected to the centre pin as in Fig. 3. In some cases, however, an indirectly-heated mains pentode has been ruined because the centre pin was mistaken for the auxiliary grid connection, whereas, of course, in this type of valve the centre pin is the cathode contact as shown in Fig. 4, and the auxiliary grid is connected to a side terminal.

This confusion is obviated if pentodes with the comparatively new seven-pin base are used, that is as long as care is taken to study the diagram giving the correct connections for this type of valve.

In some cases bad performance by

(Continued overleaf)

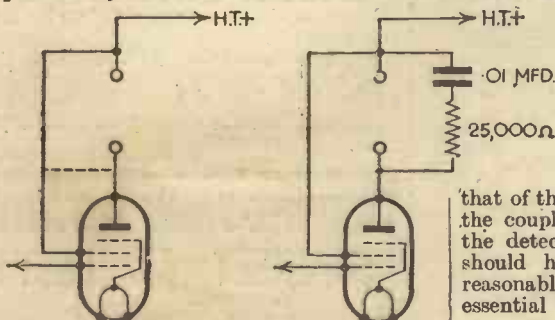


Fig. 5.—The auxiliary-grid of a pentode output valve should be connected to H.T. + and not as shown by the dotted lines.

Fig. 6.—Avoiding the risk of voltage surges by including a shunt impedance across the output terminals.

Mixed Ideas

A reader, seeking radio advice recently, wanted to know what impedance the high-frequency choke in the anode circuit of his screened grid H.F. valve should have, in order that the anode load should match the valve impedance.

It was, of course, not difficult to show him that the all-important impedance, from the amplification point of view, was that of the tuned grid circuit which formed the coupling between the H.F. stage and the detector grid. That the H.F. choke should have as high an impedance as reasonably possible is, of course, an essential to good performance, but there is no question about accurate matching in order to obtain the maximum degree of amplification. That depends almost entirely upon the efficiency of the tuned grid coupling.

(Continued from previous page)

pentodes has been due to the auxiliary grid, being connected to the anode side of the loud-speaker instead of to the H.T. plus terminal of the set (see Fig. 5). Such a mistake, while not leading to damage, does produce very unsatisfactory performance, as the auxiliary grid, instead of being kept at the requisite steady voltage, is subjected to the widely fluctuating voltage which occurs at the anode of the valve.

Mention of voltage variations is a reminder that quite a large number of pentodes are damaged annually, and many even destroyed, owing to the speaker being inadvertently disconnected while the set is in operation. Such an action does not do any harm if the loud-speaker is joined directly in the anode circuit of the valve, but if a choke filter or output transformer

is used, the removal of the speaker does not break the anode circuit, but only causes a very large reduction in the load impedance. Such a sudden change in impedance results in the development of a serious voltage surge, which is quite likely to cause the glass foot of the valve to crack.

It also imposes a severe strain on the insulation of the transformer or choke winding, and this may break down either across the winding or to earth. This risk can be avoided by connecting a small condenser (.01 mfd.) and a 25,000 ohms resistance in series as a shunt to the output circuit, as in Fig. 6.

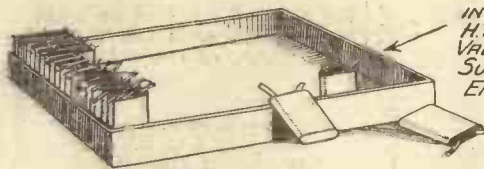
Speaking of load impedance recalls another fairly common mistake. Listeners sometimes design a resistance-capacity low-frequency coupling, and use an anode resistance of the order of half a megohm,

or even one megohm, under the quite mistaken impression that the higher the resistance the greater the amplification obtained. This statement is true only up to a point, because if the resistance is made too high the D.C. voltage drop across it results in such a low voltage at the anode that valve performance suffers.

The best practical results are obtained when the anode resistance is from three to five times the valve impedance. Even with the old R.C.C. type of valve, which had an impedance of about 40,000 ohms it was not safe to use an anode resistance of more than a quarter megohm, and 150,000 ohms usually gave better results. The modern H.L. type of valve, however, generally has an impedance of the order of 20,000 ohms, and an anode resistance of about 75,000 ohms is normally recommended.

THE H.T. battery is regarded by many listeners as an evil, chiefly owing to the expense which it entails. It may often be found, however, that this expense is due to lack of knowledge as to how to choose and use the battery, and a little thought expended when making the pur-

HINTS ON H.T. BATTERIES



FLASH LAMP CELLS CONNECTED IN SERIES MAKE A USEFUL H.T. BATTERY FOR A SIMPLE VALVE SET, BUT ARE NOT SUITABLE FOR RECEIVERS EMPLOYING LARGE POWER VALVES

chase will often result in a considerable saving over a period. For instance, the question of capacity of the battery is of vital importance. Think for a moment of the ordinary small flash-lamp battery, such as is obtainable for 4½d. or 6d. This is intended for intermittent use on a small low-consumption bulb, and it does not need any tests to know that if left with the bulb burning, or if used with a high-consumption bulb, the battery will only last a very short time. Small capacity cheap batteries sold for H.T. purposes are constructed from a number of the elements used in ordinary flashlamp batteries, and thus will only deliver a very small current for short periods. It is useless, therefore, to expect them to give service on a multi-valve receiver.

flash-lamp cells are quite suitable and will give good service. They may be joined in series with small brass clips. A standard capacity H.T. battery will, of course, give

owing to the length of time which it has to be kept. Most manufacturers now state the discharge rate of their batteries, and it is thus a simple matter to choose one which suits the receiver with which it is intended to be used.

Precautions

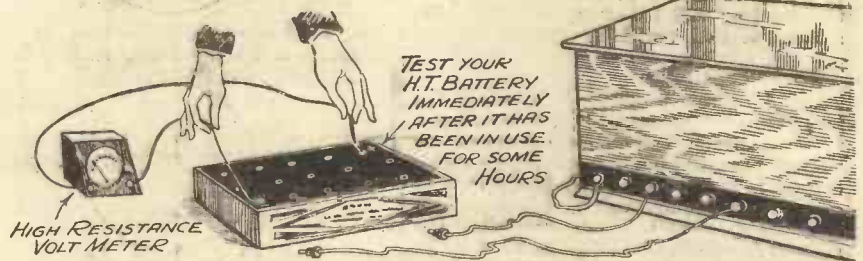
There are certain points to be guarded against when using the battery, and the first is that it must be placed away from heat and damp. Dust also proves troublesome if allowed to cover the top, whilst metal bodies, such as screw-drivers, should not be laid on top in view of the risk of short-circuiting portions of it. Do not short out a defective cell or connect a partially discharged battery in series with a new one. Although these devices appear to work satisfactorily there is an uneconomical drain upon the battery and money is, in

For a Small Receiver

For a one-valve receiver employing a modern low-consumption valve, ordinary

slightly longer life, but it will not prove economical to purchase one of the large types of battery as it may deteriorate

fact, wasted by the practice. Open out wander plugs and make certain that they make firm contact in the sockets, and noises will thus be avoided. For testing the condition of the battery do not use a flash-lamp bulb or a low-resistance meter. Remember that the current taken by these two items is probably heavier than the receiver load, and thus an incorrect indication of the battery's condition will be obtained. Use a good high-resistance meter and test the battery on load if possible.



HIGH RESISTANCE VOLT METER

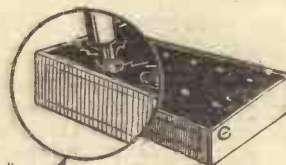
TEST YOUR H.T. BATTERY IMMEDIATELY AFTER IT HAS BEEN IN USE FOR SOME HOURS

NEVER JOIN A PARTLY EXHAUSTED H.T. BATTERY TO A NEW ONE.

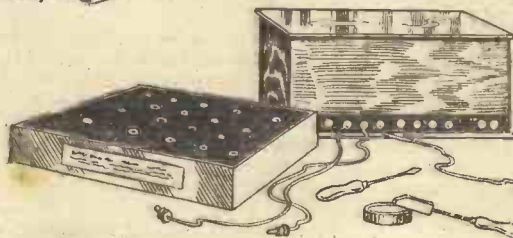


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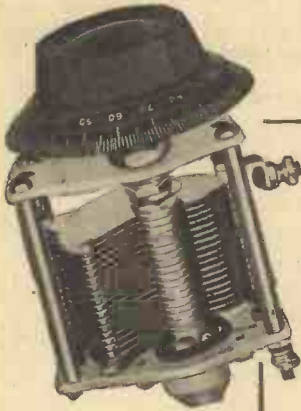
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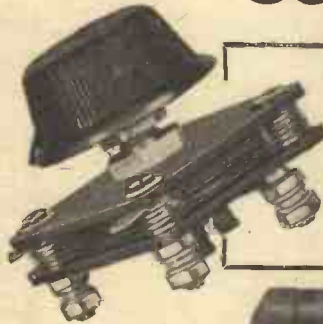
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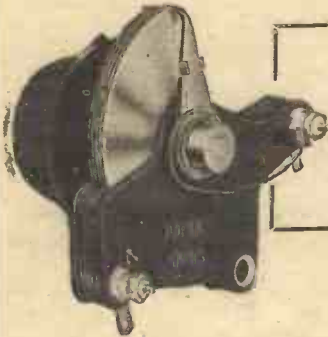
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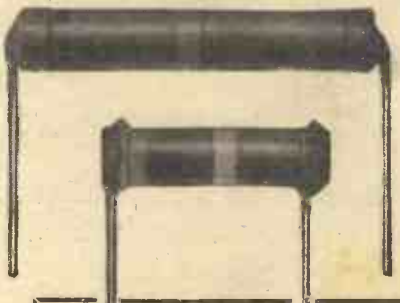
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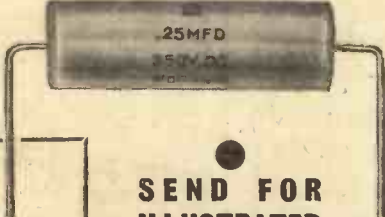
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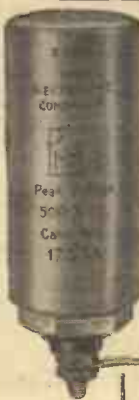
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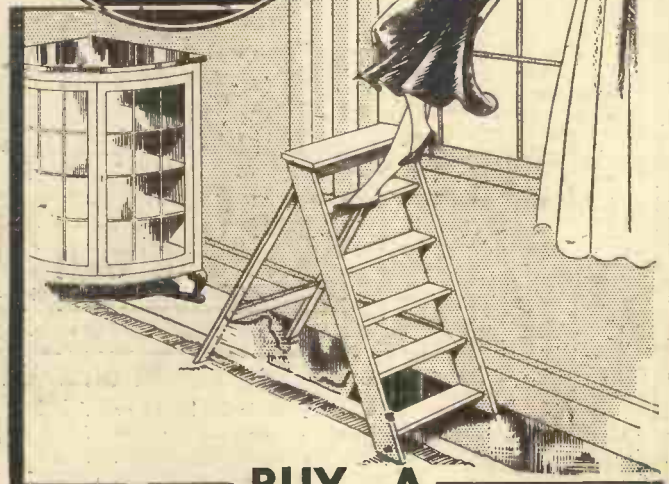
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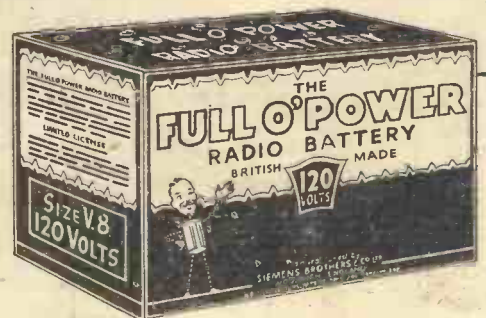
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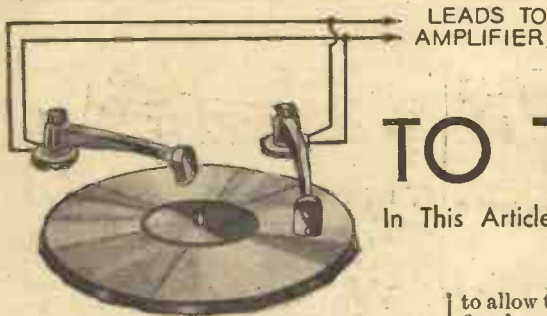


Fig. 1.—Echo effects can be produced on gramophone reproduction by using two pick-ups connected in parallel to the same amplifier.

PROBABLY everyone knows that the effect we speak of as an echo is produced by the combination of "direct" and reflected sound waves. The reflected sounds reach the ear some time after the direct ones, due to "time lag" which occurs between the sounds leaving their source, striking a reflecting surface, and then returning to the ear. Every schoolboy knows that he can produce an echo by shouting down a long narrow passage or even by speaking in a large room which has bare walls, but have you ever tried to make an echo by artificial means, that is without the long passage or empty room?

As a matter of fact, echoes of an artificial character are frequently required in theatrical and broadcast work in order to produce certain "effects." They are also very often necessary for giving a natural tone to the voice on long-distance telephones, where normal methods of tone correction are either impossible or ineffective. Some of the ways of making artificial echoes are very interesting and can be used for providing excellent fun for parties, amateur theatricals, and the like.

Echoes from Gramophone Records

I think the simplest, though by no means the least fascinating, method of producing an echo effect is by employing two gramophone pick-ups working together on the same record. Both instruments are wired in parallel and joined to the same amplifier (an ordinary wireless set can be used, of course), with loud-speaker connected. The general scheme is simple in the extreme, and is illustrated in Fig. 1. By allowing one pick-up to follow closely behind the other, a most realistic echo can be obtained, and the degree of echo effect can be varied as required by altering the relative positions of the pick-up needles in the record groove. In some cases it might be found even better

ADDING REALISM TO THE TRANSMISSIONS

In This Article the Author Describes Some Simple Methods of Obtaining Echo Effects by Electrical Means

to allow the second pick-up to "follow" the first by so much as a complete revolution of the record. A slight variation of the method just outlined is to connect each pick-up to a different amplifier and loud-speaker; then by varying the distance between the speakers and between the ear and each speaker all kinds of weird results are possible.

Another very simple way of producing artificial echoes, and one which has been

is diagrammatically illustrated in Fig. 3. Here two microphones are used and both are connected in parallel and to the input terminals of an amplifier. Also connected to the first microphone is a telephone earpiece, which is placed at one end of a long cardboard tube at the other end of which is the second microphone. It will be seen that, although a portion of the output from the first microphone is immediately amplified

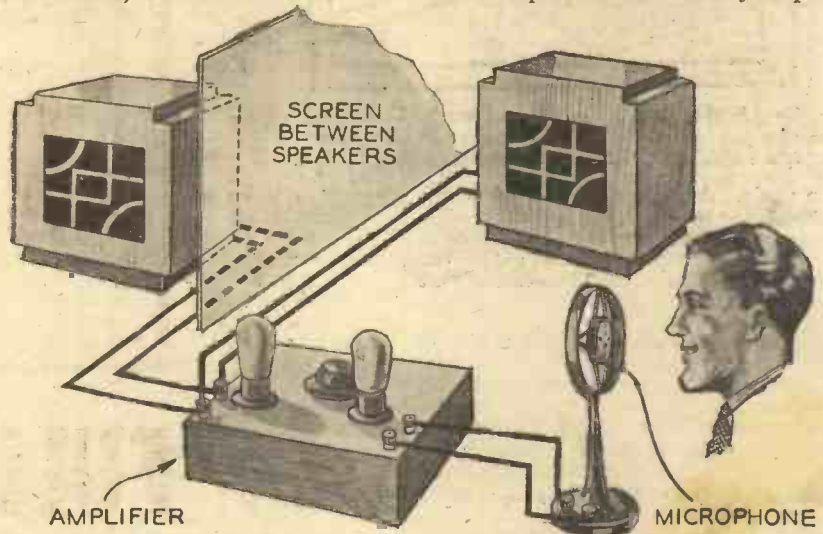


Fig. 2.—A simple way of making echoes: two loud-speakers are used, and these are acoustically screened from each other.

widely employed by the B.B.C., is to connect a microphone to the amplifier in the usual way and to place a speaker (which is joined to the output side of the amplifier) behind the person who is speaking or singing into the microphone. In this system it is necessary to employ a second speaker wired in parallel with the first and placed well away from it—preferably in another room. The sound given out by the second speaker is very "echo-y," and the exact

degree of echo can be properly controlled by moving the first speaker into various positions. When a powerful echo is wanted the first speaker may be arranged some distance away from the microphone and along an empty passage or even in a convenient empty room. The general scheme is represented in Fig. 2.

Another Simple Method

A third method of producing echoes

and reproduced by the loud-speaker, another portion is re-converted into sound by the earpiece. The delay which occurs by the sound from the earpiece travelling comparatively slowly down the tube to the second microphone is thus responsible for the resultant echoes heard in conjunction with the original sound from the speaker. This method is not a particularly good one, due to the fact that a very long tube is required to obtain the best results. It is, nevertheless, a very interesting one, and offers plenty of scope for experiment. If you propose to try it you might find it desirable in some cases to insert an amplifier between the first microphone and earpiece to obtain a sufficiently powerful echo.

Fig. 4 shows the essentials of yet another method of obtaining echo effects. This is really rather similar to that shown in Fig. 1, but can be applied to "original" (as opposed to recorded) sound. A "blank" gramophone record is used in conjunction with a recorder and a pick-up. A microphone is connected to the input terminals of an amplifier as well as to the recorder, whilst a pick-up is also joined to the amplifier input. The sound picked up by the microphone is amplified and reproduced by the speaker as well as being used to "make" a gramophone record. The pick-up follows the recorder in the needle groove, and reproduces the record shortly after it has

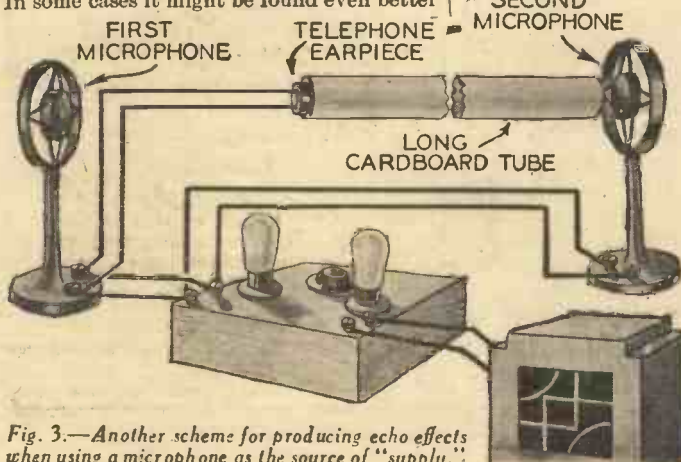


Fig. 3.—Another scheme for producing echo effects when using a microphone as the source of "supply."

THE PETO-SCOTT LUCERNE 3

THE conditions which now obtain under the Lucerne Plan have induced Messrs. Peto-Scott to produce a kit receiver which will enable the best to be obtained at the present time. They have naturally called it the Lucerne Kit, and it incorporates a well-tried circuit in which many up-to-date principles are used. Three valves are employed, and these take the form of a screen-grid H.F. stage, triode detector and a super-power output valve. The components are built up on a flat base-board with vertical panel, and a metal screen is employed to separate the H.F. stage from the remainder of the receiver and thus ensure stability. With this arrangement it is, of course, found possible to dispense with the screening of the coils, and therefore these are able to be constructed on larger lines than is customary with a modern receiver, and the result is a gain in efficiency.

The Components

THE coils are built on long ebonite six-ribbed formers and the medium-wave grid winding is wound solenoid-fashion at one end, whilst the long-wave winding is wound in slots at the lower end. Two of these coils are employed, one for the aerial circuit and one for coupling the S.G. valve and the detector stage. The two coils are arranged vertically on the baseboard, and they are well separated, which fact, coupled with the vertical metal screen, prevents any interaction between the two circuits. Earth return leads are provided through the medium of the metaplex surface of the baseboard, and the remainder of the circuit details are also of good design. To facilitate connection, all components are provided with terminals, and the instructions supplied with the kit will enable it to be rapidly assembled without difficulty. The panel is walnut-faced, and the controls are mounted on to this. Separate condensers are used for tuning the two stages and thus the listener is enabled to obtain maximum results by accurately tuning each stage without the use of any form of trimming device. The complete kit, as already described, is obtainable for 39s. 6d., or by instalments for 2s. 6d. down and eleven monthly payments of 3s. 9d.

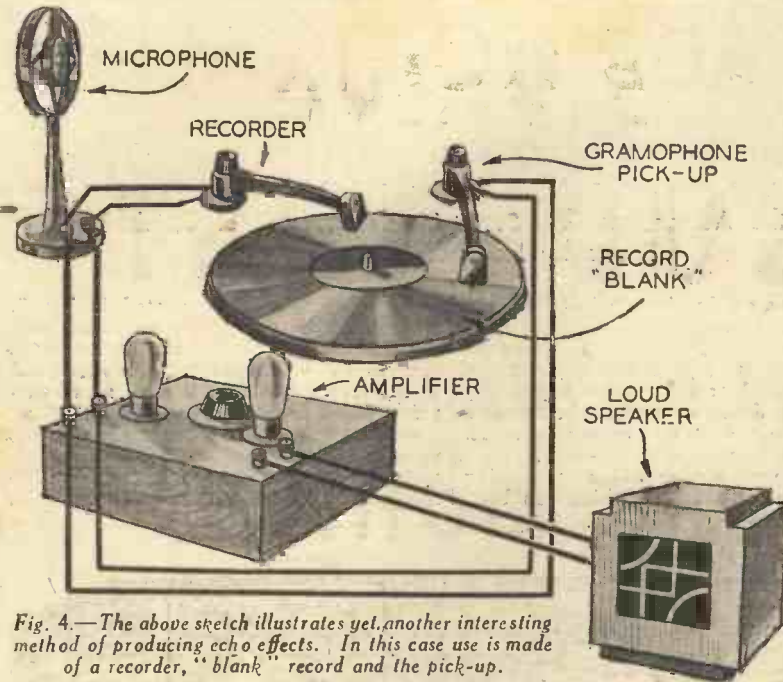


Fig. 4.—The above sketch illustrates yet another interesting method of producing echo effects. In this case use is made of a recorder, "blank" record and the pick-up.

been made. And since the pick-up is connected to the amplifier, the sound from it is reproduced by the speaker at any desired time after the original sound; the two combine to give a most realistic echo effect.

A More Complicated System

The most satisfactory system of producing echoes is that represented diagrammatically in Fig. 5. Unfortunately this idea cannot be tried out by the amateur, since it depends upon the use of a fair amount of expensive and complicated apparatus. It is, however, extremely interesting for its scientific value and because of the novel schemes involved. The microphone is again connected to an amplifier, the output from which is divided; one portion is passed on directly to a second amplifier, to which a loud-speaker is connected, and the other portion is impressed upon a steel tape arranged in the form of a moving endless belt. The method of impressing the output on to the tape is precisely the same as that used in the Blattner-phone system of recording used so frequently and successfully by the B.B.C. In the first (microphone) amplifier the tape passes between two electro-magnets on which are high-resistance windings connected to the output terminals of the amplifier. Thus as the tape is drawn past these magnets it

tape eventually passes on to the second amplifier, where it is passed between a second pair of electro-magnets, which this time re-convert the magnetic impulses into purely electrical ones. These actuate the loud-speaker in precisely the same manner as do those supplied to the amplifier directly from the microphone. It can thus be seen that the magnetic tape introduces some delay into the speech applied to it, and as a result the reproduction given by the loud-speaker has a distinct echo. On its "return journey" from the final amplifier to that taking the microphone output, the tape is passed between a pair of exceptionally powerful permanent magnets and the magnetic impressions made upon it are therefore completely "erased," so making the tape ready to receive another "speech record" as it passes through the primary amplifier.

It will be seen that any desired effect or time lag can be produced by the very simple means of altering the length of the tape or by varying its speed of passage between the two amplifiers. Incidentally, it might be added that the system just described is being used experimentally in America by the Bell Telephone Laboratories, and will probably be employed permanently at a later date in connection with trunk calls over long distances.

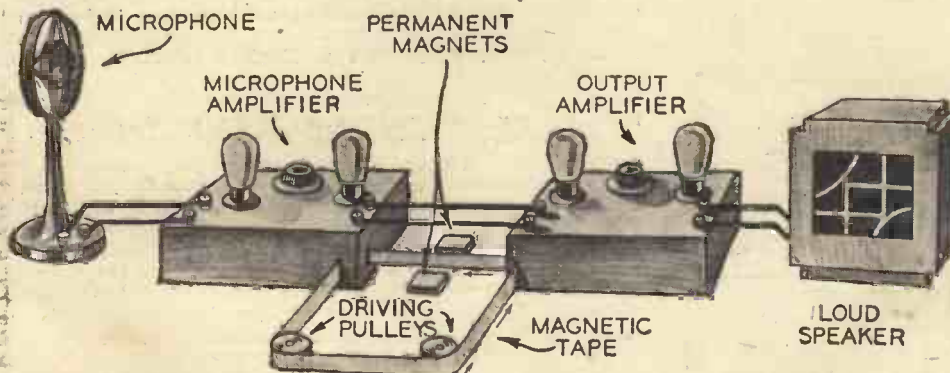


Fig. 5.—An elaborate system for producing artificial echoes. In this case use is made of a magnetic tape arranged as an endless belt and passing between the "microphone" and "output" amplifiers.

The Cabinet

FOR those who desire to complete the receiver with a neat cabinet and loud-speaker the makers also provide a fine walnut table cabinet of the vertical type, having a cut-out front portion into which the panel fits. The upper portion is provided with a neat fret backed with silk, and the batteries are accommodated on a shelf dividing the cabinet into two. The cabinet will accommodate a moving-coil speaker, and the makers can supply the kit with valves and speaker and cabinet, or to any desired combination. The complete apparatus, that is with valves, moving-coil speaker and cabinet, costs £5 6s. 6d.

KB

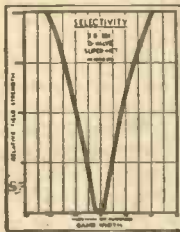
5-valve SUPERHET

with automatic volume control

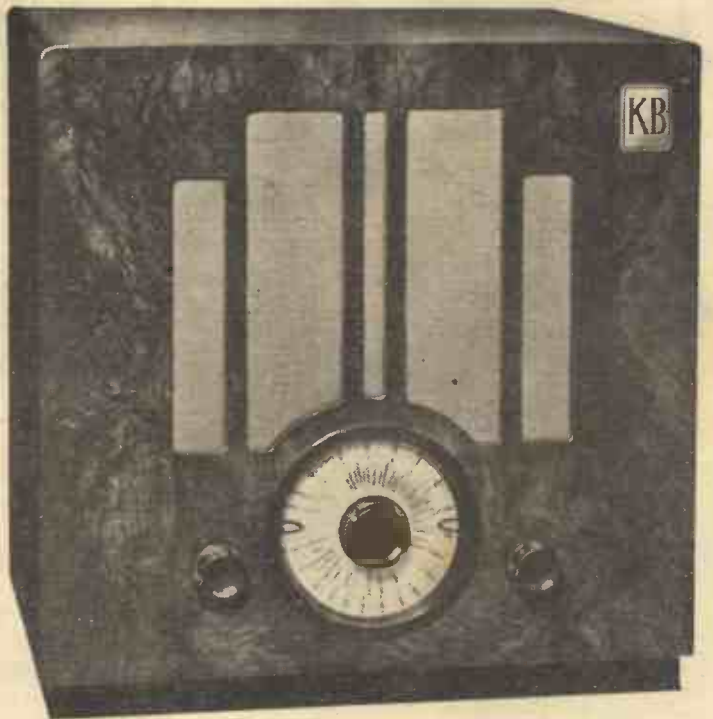
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This diagram shows the high selectivity of the new KB '381' Superhet



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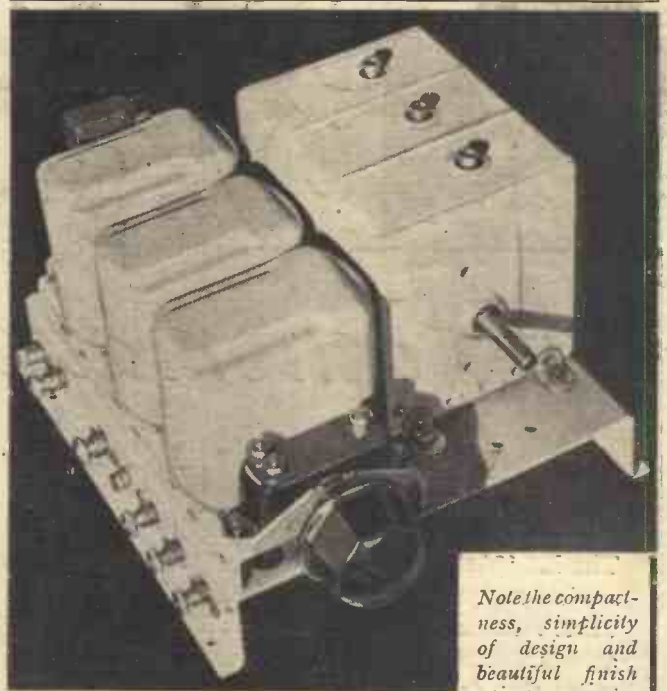
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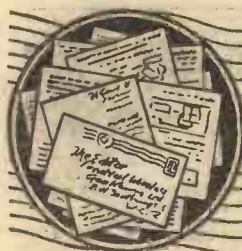
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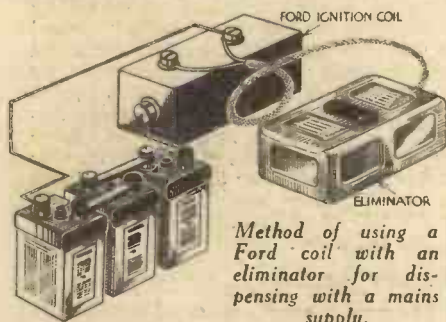
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READERS' WRINKLES



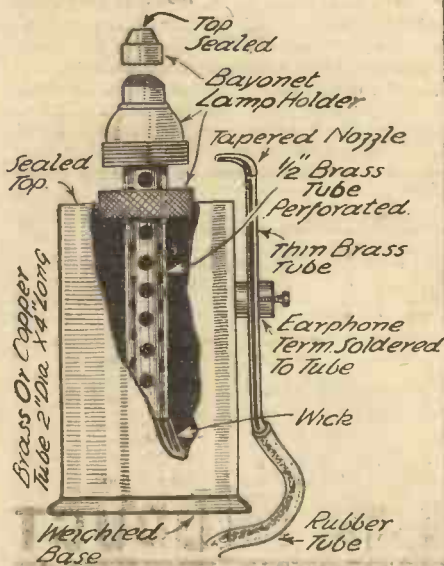
Using an Eliminator Without Mains
 SOME time ago you gave details in your pages regarding the running of an eliminator from a Ford coil. If the eliminator is connected as shown in the



accompanying sketch it will supply up to a four-valve set with ease, and there will be no need to take the coil to pieces.—J. R. Burns (Cork).

A Handy Blow-lamp

THIS easily-made blow-lamp is very useful for doing soldering where an ordinary iron could not be used. A length of copper or brass tubing about 1/4 in. diameter by 3 in. long is first perforated by drilling holes in it and is then fitted to an old bayonet lamp-holder, as shown in the sketch. This is then fitted with a wick of several strands to fill the tube. The outer spirit container is a 3 in. or 3 1/4 in. length of brass or copper tube about 2 in. diameter. A brass disc is made to fit this after a suitable hole has been made to accommodate the bayonet lamp fixing ring, which is soldered to the disc. The disc is afterwards soldered to the spirit can, which is used for filling purposes.



A useful blow-lamp made from odds and ends.

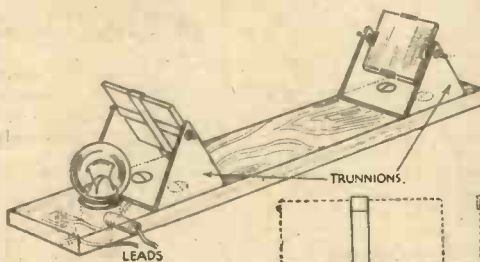
THAT DODGE OF YOURS!

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 £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

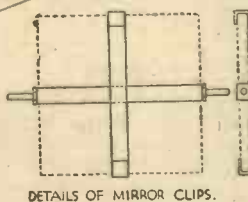
The bottom is also sealed, and it would be an advantage if it were also weighted with lead. A pillar terminal is fitted to the spirit container, as shown, a thin piece of brass tubing having been first bent to shape and passed through the terminal hole. The screw holds this in position. The lamp-holder top is sealed, and is used as a screwed cap to prevent evaporation of the spirit.—JAMES MORRISON (Birtley).

A Viewing Mirror and Inspection Lamp

THE accompanying sketches show a combined viewing mirror and inspection lamp which is useful when



A viewing mirror and lamp for inspecting awkward corners in a radio set.



inspecting the internal fittings of a set, especially in dark corners. The device consists of a strip of wood, about 1/4 in. thick, at one end of which a hole is made to hold the flashlamp bulb which provides the illumination. The hole should be drilled a little smaller than the bulb, so that the end will just screw in. The contact with the side of the bulb is made by driving a screw into the edge of the wood, so that it breaks through the other hole and makes contact with the side of the bulb. The contact with the pip of the bulb is made by fixing a thin strip of brass, taken from a flashlamp battery, over the bottom of the hole.

Leads can be soldered to the strip of brass and to the screw, and wander-plugs fixed on the ends, so that the lamp may be plugged into the grid-bias battery. To hold the mirrors, two pieces of sheet brass are cut out and bent to form support, as shown. The mirrors themselves are fixed in clips made from narrow strips of light-gauge tinplate soldered together. At each end of one strip a metal pin is pushed through the tinplate and soldered to it, the heads of the pins being against the edge of the mirror. These pins should be a tight fit in the holes in the trunnion supports, thus holding the mirrors firmly in place.

The mirrors are adjusted so that their planes are at right angles to one another, instead of being parallel as in a periscope. No sizes have been given, as these can be adjusted to suit individual requirements. The device is used by lowering into the set so that the light illuminates the interior, whereupon the mirrors will show the undersides and backs of components, etc., as desired.—M. D. ARMITAGE (Goole).

A Neat Dial-lighting Arrangement

THE accompanying sketch shows an improved dial-lighting device which I recently fitted to my set. Previously, it was provided with two lights, one for each dial, but the bulbs were placed in such an awkward position in the set that when one burnt out I had to partly dismantle the set to put in a new bulb. I therefore contrived the simple lighting system shown in the illustration, which shows clearly how a single bulb is used for effectively illuminating both dials. Two small mirrors are fixed behind the panel in the positions indicated and at angles of 45 degrees, a single bulb being fitted midway between them. The mirrors being opposite the holes in the escutcheons, reflect the light on to strips of the dials as they come opposite the escutcheon openings.—T. Mayo (Swanbourne, W. Australia).

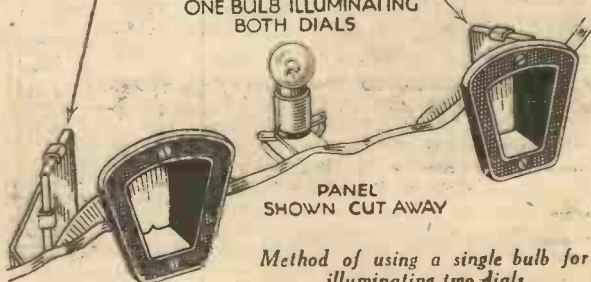
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SMALL MIRRORS SET AT 45° TO PANEL

ONE BULB ILLUMINATING BOTH DIALS



YOUR SET: WHAT IS ITS EFFICIENCY?

A Simple Explanation of the Difference Between
Wattage Output and Wattage Dissipation

$$\frac{\text{WATTAGE OUTPUT}}{\text{WATTAGE INPUT}} = \text{EFFICIENCY}$$

THE two terms wattage dissipation and output watts are used in wireless parlance, but they are rarely fully understood. There is no great difficulty in following the meaning of them, although care must be taken to ensure that they are not confused one with the other. By way of giving a very general explanation of the difference in meaning between the two expressions it might be said that wattage dissipation (so far as wireless work is concerned) is usually applied to a D.C. circuit, whereas the expression "output watts" is used in connection with circuits which handle A.C. current of audio, or sound, frequencies.

The Difference

Thus, it is usual to speak of the wattage dissipation of a voltage-dropping or feed resistance, but to refer to the power supplied to the loud-speaker by the last valve as the wattage output. The chief reason why the two expressions are often confused, however, is that they may both be applied to the output valve in the set. For example, the maximum wattage dissipation of the output pentode used in the "1934 A.C. Fury-Four Super" is over 6 watts, whilst its rated maximum undistorted output is 3 watts. As a matter of fact, the difference between the two figures in this case is not very great by comparison with that which applies to a number of other less-efficient valves. A popular super-power triode output valve, for instance, has a wattage dissipation of rather more than 25 watts, although its signal output in the same conditions is only 5 watts.

Undistorted Output

The difference between the two figures as applied to any particular valve is not difficult to explain, and is partly accounted for by the fact that a valve—like any other electrical device—is not 100 per cent. efficient. The wattage dissipation of a valve is easily obtained by the simple process of multiplying the anode current by the anode voltage, although in the case of a pentode the screen voltage and current should also be taken into account. The first valve referred to above has an anode current of 30 milliamps and a screen current of 7 milliamps (both at 250 volts), so that the wattage dissipation is 37/1,000 multiplied by 250. It is by no means such a simple matter to calculate the signal output in watts, since the usual formula depends upon the use of various graphs which are of little interest to the average experimenter. Other formulae, which do not directly depend upon graphs, are available, but these give results which are only approximately correct.

Fortunately for most of us, it is seldom necessary to calculate the wattage output of a valve, since the figure is generally given by the makers on the various data sheets, and even when they do not publish any figures they are usually pleased to supply details upon request.

Optimum Load and Output.

It is generally sufficient to know that the output wattage depends upon the (A.C.) voltage and current developed across the load in the anode circuit of the last valve. This load may take the form of an output choke, a fixed resistance, the primary winding of an output or speaker transformer, or the windings of the speaker itself. An important point to bear in mind is that the maximum signal output can only be obtained when the valve is operated at the anode and grid voltages recommended by the makers, and when the output load is of the correct value. The appropriate value of output load is referred to as the optimum load, and is (for three-electrode valves) approximately equal to twice the A.C. impedance of the valve. For the convenience of readers, the table given below shows the optimum loads and maximum outputs (in milliwatts, or thousandths of a watt) for a few of the more commonly used valves.

Valve		Optimum Load (ohms)	Maximum Undistorted Output (milliwatts)
Maker	Type		
Cossor	215 P.	9,000	150
Cossor	230 X.P.	3,500	450
Cossor	41 M.P.	3,000	1,250
Cossor	41 M.X.P.	2,000	2,000
Cossor	220 H.P.T.	17,000	500
Cossor	M.P./Pen	8,500	3,100
Mullard	P.M.2A	7,000	150
Mullard	104 V.	2,500	2,700
Mullard	D.O.24	4,000	5,000
Mullard	P.M. 22A	15,000	425
Mullard	P.M. 24 M.	8,000	3,000
Hivac	P.220	9,000	175
Hivac	P.X. 230	4,000	450
Hivac	Y. 220	12,000	500

L.T. Watts

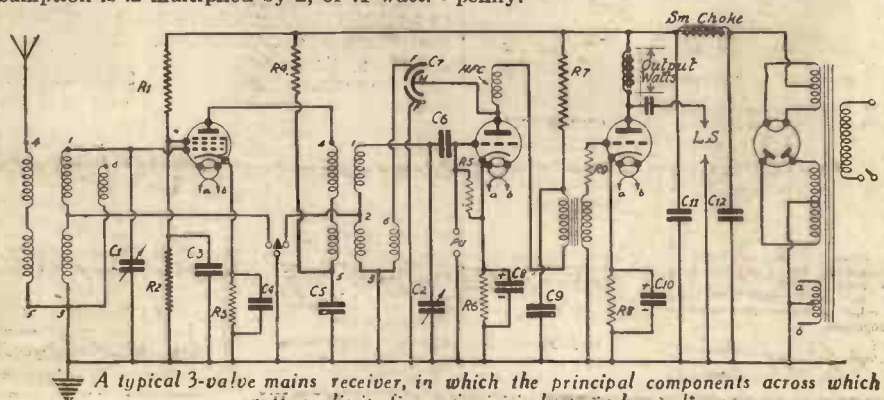
It will have been observed in reading the foregoing that neither the wattage dissipation nor the wattage output of a valve take into consideration the power consumption of the filament or heater. This can, however, easily be calculated by multiplying the filament or heater voltage by the current. Thus, for a battery valve having a filament rated at 2 volts, .2 amp., the consumption is .2 multiplied by 2, or .4 watt.

The consumption of the heater of a standard mains valve taking 1 amp. at 4 volts is 4 watts.

The wattage dissipation of a voltage-dropping or feed resistance is found by multiplying the voltage which it "drops" by the current passing. It can be found more easily in some instances, however, by multiplying the resistance in ohms by the current squared. Thus, the wattage dissipated by a feed resistance of 5,000 ohms passing a current of 50 milliamps is: 50/1,000 multiplied by 50/1,000, multiplied by 5,000. This can more simply be expressed as $1/20 \times 1/20 \times 5,000$, which equals $12\frac{1}{2}$ watts.

Power Consumption of a Receiver

The power consumption of a complete mains receiver may be found by adding together the wattage dissipation of all the valve heaters and the wattage consumed in high tension. If the "A.C. Leader Three" is taken as an example it will be found that the total power consumption is 24 watts. This figure is arrived at by adding together the wattage of the three valve heaters (4 watts each), the wattage of the rectifier filament (4 watts) and the H.T. watts (8—32 milliamps at 250 volts). It might at first appear that the H.T. voltage should be taken as 200 instead of 250, but it must be remembered that the output from the rectifier is at 250 volts, although approximately 50 volts is "absorbed" by the smoothing choke and feed resistances. The figure obtained in this manner does not represent the total consumption of power from the mains supply, since the efficiency of the mains transformer has not been taken into consideration. An efficiency of 80 per cent. is a fair average for a good instrument like that specified, so that the consumption of mains power can be reckoned at approximately 30 watts. From this it is possible to find the cost of running the set; one unit represents 1,000 watt-hours and, therefore, the set under consideration could be run for about thirty hours on one unit. Thus, if power costs 6d. per unit (this is a high figure, of course), the cost of running the set for one hour would be one-fifth of a penny.



A typical 3-valve mains receiver, in which the principal components across which wattage dissipation occurs are shown in heavy lines.



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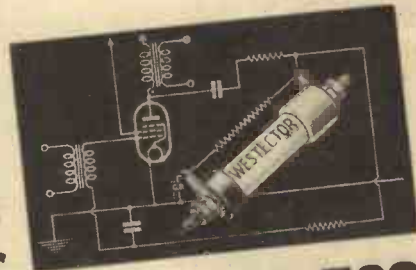
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By F.

I TAKE more than ordinary pleasure in announcing that after more than two years of experiment with all types of circuits and components, I have at long last perfected a receiver which I can fairly claim to be the most remarkable ever placed before home constructors. A three-valve superhet with all of the advantages which the superhet conveys, the kit of parts for which may be purchased for less than £5, is at last an accomplished fact. As with so many other important developments, PRACTICAL WIRELESS is the first again! A year ago my quest for the really simple and cheap three-valve superhet of the battery-operated type seemed hopeless. It is only within the last six weeks that I have discovered the solution. When the full constructional details are presented, together with a Free 1s. Blueprint, next week, I am certain that you will be amazed that with so few wires, so little expense, and with such a simple circuit arrangement, it has been possible to bring to every home constructor the solution to all his many problems. For the "£5 Superhet Three" has none of the drawbacks usually associated with the superhet, notwithstanding the fact that only three valves are employed.

Every Desirable Quality

The quality is unimpeachably satisfying, the selectivity is micrometrical, the range world-encompassing, and the output really robust. Think of it! One tuning control, one volume control, a wave-change switch, and an on-off switch. Only four knobs! I am sincere when I say that, outstanding as "Practical Wireless" receivers have been, this is the most important, the most novel, the most fascinating receiver which it has been

my good fortune to place before the readers of this paper. I am positive that readers will be intrigued by it. It will be made in its thousands. It provides all of the features which readers expect but which no one receiver up to the moment has been able to provide.

The superheterodyne is looked upon by most, and with justification, as an expensive multi-valve set which eats up H.T. current and is costly to run. It has not been considered feasible to make a practicable and satisfactory three-valve superhet before. It is a momentous achievement and one which opens up an entirely new era in home-constructed receivers. It has never been part of my policy to deride the efforts of other designers. Quite often we do not see eye to eye. I have made the bold move of demonstrating my £5 Superhet Three to some of the most important set designers in the country, and all have agreed, although they serve rival interests, that this is the most remarkable receiver since the inception of home construction as a hobby.

Our Guarantee

Readers of this paper know that I take a personal interest in every receiver built from my designs, and that I guarantee them when constructed according to my instructions and when the components which I specify are used. So enthusiastic am I, however, over the £5 Superhet Three, which I regard as my greatest success, that I propose to accentuate the guarantee I have formerly issued.

Hear It Yourself

Obviously my time is limited, and it would be impossible for me to visit every reader of this paper, but it

will give me great pleasure, as time permits, to demonstrate the £5 Superhet Three in various districts. I suggest that readers in various districts who wish me to demonstrate the receiver should get together and make such local arrangements as will enable me to demonstrate it to a number of them on a particular evening. I shall, of course, provide my own equipment and merely need an aerial and earth. In order that I may complete arrangements with this end in view, I hope readers will get into touch with me without delay. It should scarcely be necessary for me to repeat that I guarantee that the "£5 Superhet Three" will do all that I claim for it, and you may build it with the confidence that you may avail yourself of my advice and help, free of charge.

So confident am I of this latest receiver, and so enthusiastic con-

Write to the Editor for a Local Demonstration

cerning its possibilities, that I am positive that every reader of this paper will make it. I do not over-

Reserve Your Kit

COMPONENTS FOR THE

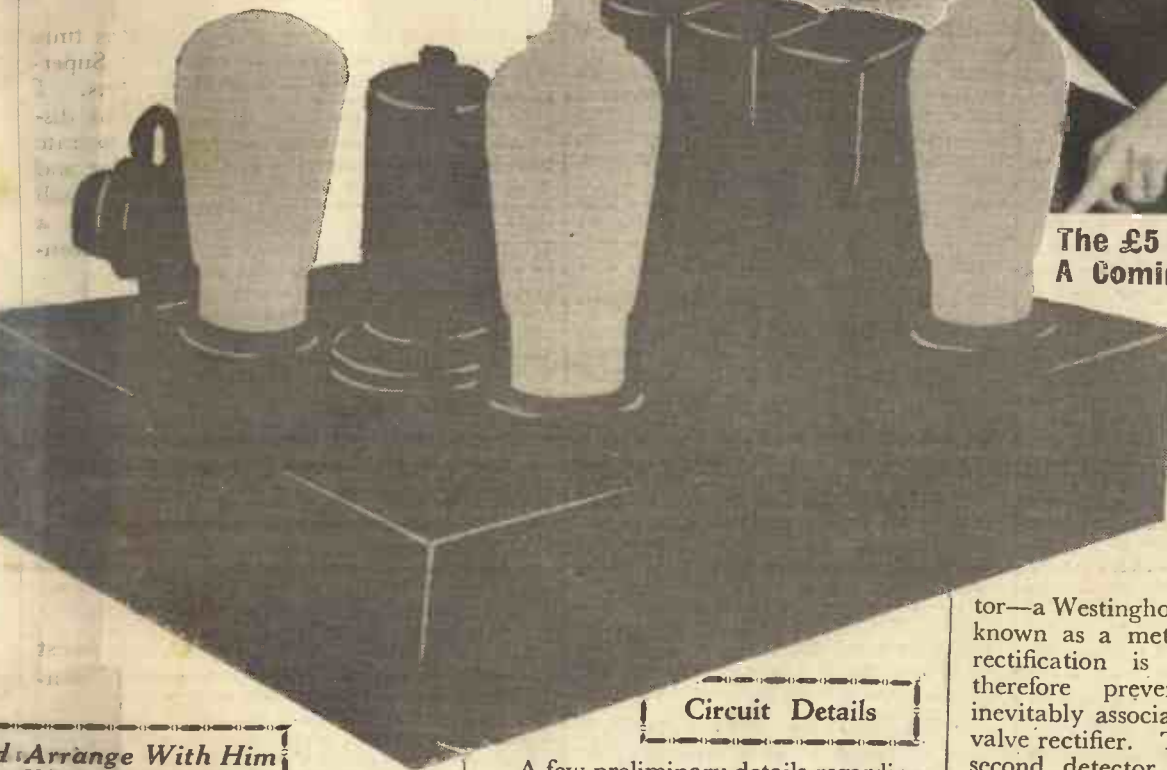
- One set 3-gang superhet coils, type W.476 (Telsen).
- One 3-gang superhet Midget variable condenser, type 2124 B, and disc drive (J. B.).
- Two "Practical Wireless" I.F. transformers (110 K.C.) (Varley).
- One .002 mfd. Formodenser (Formo).
- One 50,000 ohm potentiometer (Graham Farish).
- One 1 mfd. fixed condenser (Graham Farish).
- Two .5 mfd. fixed condensers (Graham Farish).
- One .01 mfd. tubular condenser (Graham Farish).
- Two .0001 mfd. fixed condensers, type 34 (C.C.).
- Three ohmite resistances, 150,000, 100,000, 30,000 (Graham Farish).
- One Max. L.F. transformer (Graham Farish).
- One potentiometer bracket (Peto-Scott).
- One 3-point on-off switch (Graham Farish).
- One 7-pin sub-baseboard valveholder, terminal type (Clix).
- One 5-pin sub-baseboard valveholder, terminal type (Clix).

ACHIEVEMENT!

THREE

Only Two Switches, One Tuning Control.
Simpler Than a Straight Three. Free

J. CAMM



**The £5 Superhet Three!
A Coming Event Casts
its Shadow!**

mediate - frequency stage gain without introducing distortion. A second double-tuned intermediate-frequency transformer couples the H.F. pentode to the second detector—

a Westinghouse cold valve, better known as a metal rectifier. Linear rectification is thus achieved and therefore prevents the distortion inevitably associated with the triode valve rectifier. The output from the second detector is passed to a low-frequency transformer and then to a pentode output valve.

Circuit Details

A few preliminary details regarding the circuit will convey how these results have been achieved. Selectivity is the modern problem which cannot satisfactorily be solved with "straight" receivers. In the £5 Superhet Three, selectivity is ensured by the use of a band-pass H.F. tuner, which absolutely avoids second channel interference. I use a modern 2-volt pentagrid valve as frequency changer, working in conjunction with a highly-efficient oscillator coil and tuning condenser with specially shaped vanes. This arrangement ensures ganging with microscopical accuracy. The intermediate-frequency transformers are double-tuned. One is used, of course, as a coupling for the pentagrid and H.F. pentode. It should scarcely be necessary for me to say that the H.F. pentode is employed to provide a high interme-

Utter Simplicity

The circuit diagram to be given next week will convey at a glance the utter simplicity of this receiver—unbelievably simple. You will want to make it straight away, and so enthusiastic is the trade concerning it (most of the manufacturers concerned have examined and listened to it) that they have been working at high pressure for the past three weeks to ensure that an adequate supply of components is available before "Practical Wireless" is actually published. I insisted on it, for it has unfortunately been the experience of some of my readers in the past that

(Continued on page 172)

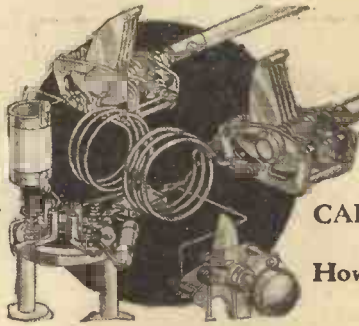
Arrange With Him
With Your Friends.

state the case when I say that this receiver is the most momentous in the history of home construction.

or Parts **NOW!**

£5 SUPERHET THREE.

- One 4-pin sub-baseboard valveholder, terminal type (Clix).
 - One Westingtor, type W6 (Westinghouse).
 - Three winder plugs (H.T.+1, H.T.+2, H.T.—) (Belling Lee).
 - Two spade terminals (L.T.+ , L.T.—) (Belling Lee).
 - Three G.B. plugs (G.B.+ , G.B.—1, G.B.—2) (Belling Lee).
 - Two terminal strips (A.-E. and L.-S.) (Clix).
 - One Meaplex chassis, 11in. x 10in. with 2½in. runners (Peto-Scott).
 - Three valves, 210PG, 210VPT, 220PT (Cossor).
 - One Stentorian Standard P.M. loud-speaker (W.B.).
 - One 120-volt H.T. battery (Drydex).
 - One G.B. 16½-volt battery (Drydex).
 - One L.T. 2-volt accumulator (Exide).
- Kits or separate parts are supplied by Peto-Scott, Ltd.



Short Wave Section

CALIBRATING THE SHORT-WAVE SET FROM LONG WAVES.

How a Normal Broadcast Receiver May Be Used as an Aid to Short-wave Work.

NOT the least of a beginner's difficulties in short-wave reception is that of not knowing exactly to what wavelength his set is tuned; he may be able to guess from the size of his coils whether he is on twenty or fifty metres, but this is much too vague to be useful. The difficulty can be considerably lightened, however, by a rough calibration of the receiver by means of harmonics of an oscillating medium-wave receiver.

If we have an oscillation whose wave form is anything but a perfectly pure sine wave (which can only be obtained under special laboratory conditions), it will give rise to a series of harmonic oscillations having frequencies that are an integral multiple of the original frequency. The main oscillation is called the fundamental frequency, and its second harmonic has a frequency of twice the fundamental (or a wavelength equal to half the fundamental wavelength), the third harmonic is three times the fundamental frequency and so on; the total number of harmonics depends on the wave form of the fundamental and the power of the oscillator producing it, and there may be any number of them. Suppose now we have an ordinary broadcast receiver working on the medium-wave band and tuned to the London Regional on a frequency of 877 kc/s (342.1 metres); if we turn the reaction control round to maximum, so that the detector valve oscillates strongly, we have an oscillator, working on a frequency of 877 kc/s, that will give rise to a series of harmonics, the second being on 1,754 kc/s, the third on 2,631 kc/s and so on. The sixth harmonic is on 5,262 kc/s (or 57.05 metres) and so if we tune our short-wave set to this frequency, and adjust the reaction control so that it just oscillates, we shall hear a whistle arising from the beat note between the harmonic and the short-wave receiver. Similarly, if we tune the short-wave receiver to a higher frequency (shorter wavelength) of 6,139 kc/s (48.87 metres), we shall pick up the seventh harmonic of our medium-wave oscillation. Thus we have two known

frequencies in the range of our short-wave receiver.

Some Difficulties

Unfortunately it is not quite as simple as that, because since we have only a very vague idea of the frequency of the short-wave set to begin with, we have no means of telling to which particular harmonic we are listening; it may be either the sixth, seventh, or even eighth. We can, however, check this in the following manner. If our short-wave set is tuned to the sixth harmonic of 5,262 kc/s, there is a frequency on the medium-wave band whose fifth harmonic will also be 5,262 kc/s; this new frequency is $\frac{5,262}{5}$ or 1,052.4 kc/s. There-

fore if, without touching the short-wave set, we slowly tune the medium-wave receiver (still oscillating) to a higher frequency (shorter wavelength), we should hear another whistle in the short-wave set when we reach 1,052.4 kc/s, or 285 metres. Still further reducing the wavelength of the medium-wave receiver should produce a third whistle in the short waver, without touching its tuning controls, due to the fourth harmonic of 1,315 kc/s or 228 metres. It must be noted that three such check points are needed to avoid error; if only two were used we might be misled. For example, if the receiver was tuned to the twelfth harmonic of 877 kc/s it would be on 10,524 kc/s and so the tenth harmonic of 1,052.4 kc/s would also give rise to a whistle; thus, although the short-wave set is actually tuned to 10,524 kc/s, unless the check of the third point was obtained the operator might assume that he was listening on 5,262 kc/s and of course be hopelessly out.

A Practical Scheme

The best method of carrying out this calibration is as follows. The medium-wave receiver, which must be fitted with

reaction, is calibrated by drawing a graph showing the setting of the tuning dial for different frequencies throughout the medium wave band, easily done by tuning several different stations and noting their frequencies (from the published lists) and the dial reading at which they are heard. The aerial is disconnected from this set and put on the short-wave receiver, which is connected to the same earth as the medium-wave receiver, and the coils that tune to the highest wavelength, usually about 50 metres, inserted in it. With the medium-wave set oscillating strongly on the local station, say the London Regional, the reaction control on the short-wave set is advanced so that it is just oscillating and the tuning condenser turned very slowly down from maximum capacity until a strong whistle is picked up; if manipulation of the reaction control on the medium-wave set causes this whistle to change its pitch and finally disappear, then it is clear that it is due to the oscillating medium-wave detector and is in fact a harmonic. When this point is found the short-wave set is tuned to zero beat with the harmonic, that is, until an alteration of the tuning condenser in either direction causes the whistle to reappear at a low pitch, rising in pitch as the condenser is further detuned. Without altering the short-wave adjustment in any way the medium-wave receiver is slowly tuned to a lower wavelength until another whistle is heard in the short-wave set, great care being taken to ensure that no whistle is missed. This time the medium-wave set is adjusted to zero beat with the short-waver and the frequency to which it is tuned read off from the calibration curve. The tuning is then continued until a third, and if possible a fourth, whistle is heard and in each case the frequency of the long-wave receiver noted. Then comes a little arithmetic, for the calculations amount to finding the Least Common Multiple of the three medium-wave frequencies.

To complete the calibration of the short-wave set, when one point has been determined the medium-wave receiver is returned to the local station and left at that adjustment while the short-wave receiver is slowly tuned to a lower wavelength until the next harmonic is picked up and checked in the same way as the first point. The process is repeated throughout the range of the short-wave receiver. It will be found that the higher harmonics (fourteenth, fifteenth, etc.) are rather weak. In this case a shorter wave station on the medium waveband, the London National for example, can be used as the first point, and lower and therefore stronger harmonics will be heard at any particular short-wave length.

£5 SUPERHET THREE

(Continued from previous page)

they have been kept waiting for several days when, owing to the popularity of some of my designs, the supply has been totally inadequate. The manufacturers concerned have co-operated whole-heartedly with me, not only on matters of delivery, important though that is, but also on the question of price. Although the set for purposes of euphony is named the £5 Superhet Three, it can actually be made (I, of course, refer to what is now popularly known as Kit "A") for £4 17s. Messrs.

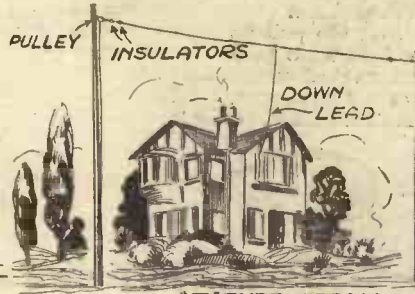
Peto-Scott, Ltd., who supply kits absolutely to my specification, tell me that they anticipate a colossal demand for kits and for parts. I am anxious that you should not be disappointed. It would help them, it would help me, but most of all you will really be helping yourself if you drop them a note reserving a kit. It is possible, for none of the components is specially designed, that you will have a good many of the components by you. I have kept that point well in mind in laying out the receiver, for it is my desire to save your money. In that case, check over the list of com-

ponents to be given next week and order those parts immediately. Messrs. Peto-Scott, Ltd., have promised to do their utmost to co-operate with me by speedy dispatch of the parts or kits, so that readers may rapidly possess themselves of the "finest receiver ever placed before home constructors." I do not comment on my own work here. This is the remark made by an important component manufacturer as he listened to the receiver, but is merely a mild variant of the laudatory remarks which it would be immodest of me to repeat.

THE EASY ROAD TO RADIO.



THE BEGINNER'S SUPPLEMENT



T TYPE AERIAL

AERIAL AND EARTH SYSTEMS

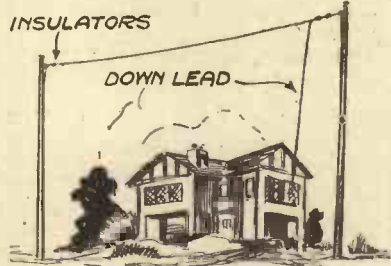
The Strength of the Received Signal Depends Upon the Amount of Energy which is Picked Up, and therefore the Aerial and Earth System is of Vital Importance.

ALTHOUGH a great deal of care is generally expended upon the choice of a receiver or circuit, it is too often found that the listener simply slings up a length of any type of wire in any position, and connects a lead to any point which might go to earth, and then spends a considerable amount of energy in trying to make the set efficient. It should be remembered that the amount of energy which is radiated from the transmitting station is extremely small, and the farther away the receiver is situated the weaker becomes the signal which is received by the aerial-earth system. It is therefore essential to provide some

one valve or ten, the most efficient performance.

Types of Aerial

It is not possible for every listener to erect the same type of aerial, and it must be remembered that the total length of



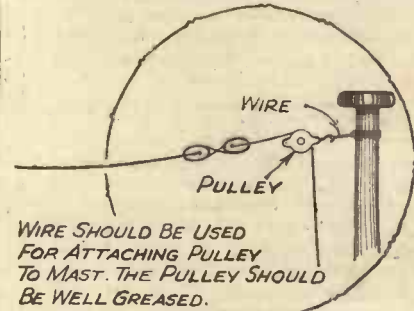
INVERTED L TYPE AERIAL

wire which is permissible under the receiving licence is 100ft. This quantity includes also the lead-in wire, so that if two masts are erected having a total height of 30ft., it will only permit of a distance between the masts of 70ft. if the authorized length of wire is not to be exceeded. With modern conditions it is generally preferable to use a much shorter length of wire than this, and in general it will probably be found that a total length of 60ft. provides ample signal strength consistent with good selectivity. Before mentioning the various schemes which may be adopted for the aerial it will be well to state that the type of wire which is employed should provide the largest conducting surface possible, consistent with lightness of weight. It must be remembered that the received impulses are high-frequency currents, and these travel on or near the surface of any conductor. In order, therefore, to restrict the passage of these currents as little as possible we must provide them with a large surface area, and it is obviously impracticable to use a large diameter wire for the purpose of an aerial. Fortunately, there is a simple solution to be found in the employment of a stranded cable, made up from a number of small diameter wires twisted together. This type of wire is known as 7/22s, due to the fact that it is built up from seven strands of 22 gauge wire, but to obtain maximum results from this type of wire each separate strand should be of the enamelled variety. In this manner the full surface of each wire is retained, whereas with bare copper wires,

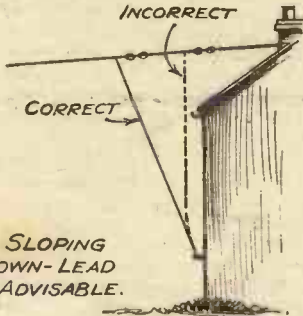
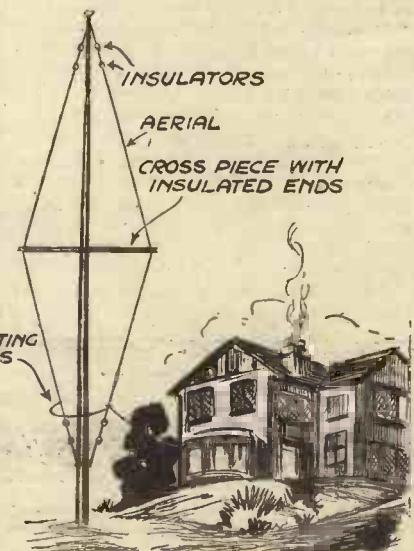
only a portion of each surface is made use of.

The Earth Wire

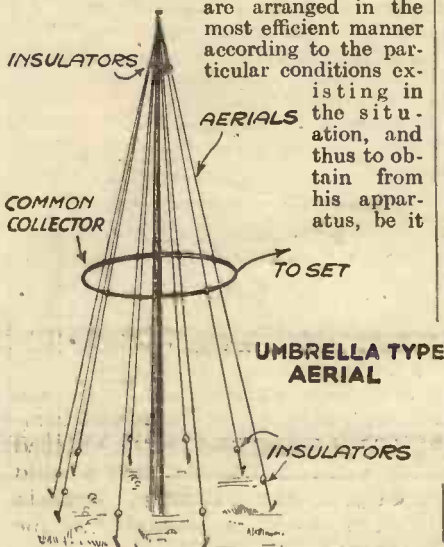
The earth wire should not be of a thinner gauge than the aerial, although, of course, there is the question of the actual coil which is interposed between aerial and earth. The great thing about the earth lead is that it must be of low resistance. Thus, use a thick wire and make quite certain that there is a sound joint at the earth plate. However, this will be dealt with later. Having decided upon the type of aerial which it is best to erect in your particular situation the problem of support arises. On this page a number of different types of aerial are illustrated, and arrangements should be



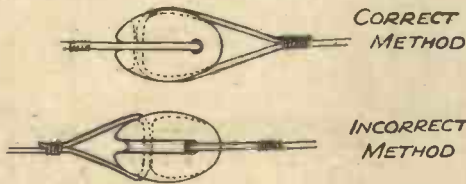
made to erect the necessary mast or support. Scaffold poles are obtainable at moderate prices from a builder's yard, and before erection should be given a good coat of paint. To prevent moisture entering the end grain at the top of the mast a small tin lid or other cover should



really good pick-up medium, although, of course, there is nothing to prevent the use of a few inches of wire and a multi-valve receiver. This is uneconomical, however, and it behoves every experimenter to see that the aerial and earth are arranged in the most efficient manner according to the particular conditions existing in the situation, and thus to obtain from his apparatus, be it



be fixed in position. There is, of course, some risk of the pulley support coming adrift and we have published numerous wrinkles from readers suggesting ways and means of overcoming the difficulty of taking down the mast in order to re-attach

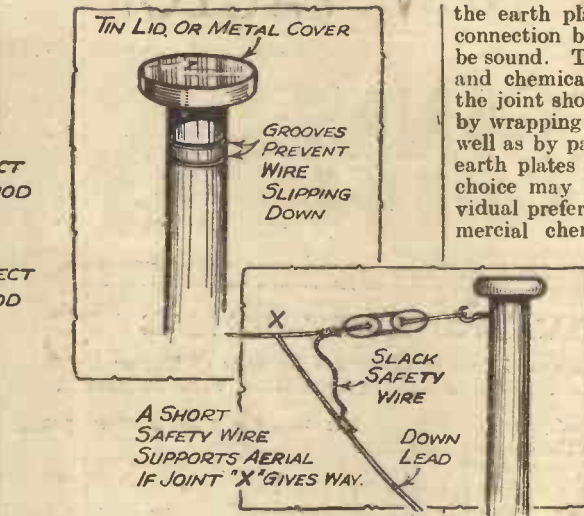


ATTACHING INSULATORS

the pulley. Insulators must be interposed between the end of the wire and the pulley and above the method of connecting these insulators is shown. The correct method not only gives higher insulation, but also increases the strength of the system. At the house-end the lead-in has to be provided, and this should, if possible, be the same piece of wire as is used for the aerial. That is, the wire should not be cut and the lead-in joined to the aerial, unless it is found impossible to carry out the single wire idea. Keep the lead-in well away from walls and other earthed bodies, taking 2ft. as a minimum distance to allow between the wire and wall. Of course, where it enters the house it must come closer, but do not let it run parallel, but bring the lead-in at an angle to the lead-in tube or aerial-earth switch.

The Safety Switch

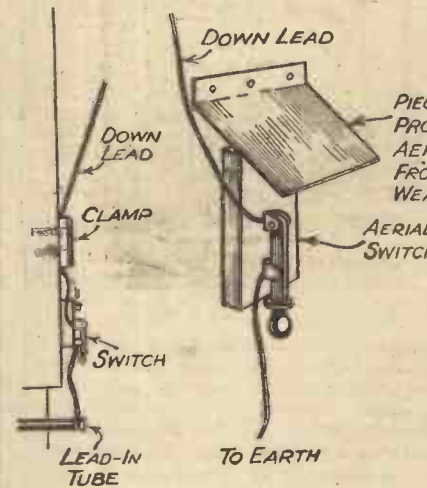
In order to enable the aerial to be earthed in the event of a thunderstorm a safety switch is desirable, and the lead should be joined to such a switch, with a separate lead to earth. Protect the switch from rain, or noises will be introduced to the receiver in a rainstorm due to drips of rain passing from the lead-in to the earth contact. A simple sloping piece of tin or wood will suffice as a screen, or if a more workmanlike job is to be made a complete box may be used to enclose the switch. If possible, the switch should be provided with a safety spark-gap, and then, should the aerial not be earthed, there is a provision for any undue static to leak away without damage to the tuning coil or apparatus. It should be pointed out that should the aerial be actually struck by lightning there is every possibility of damage being done in spite of the switch, but the installation of this device acts as a preventive of lightning discharges by enabling static charges to leak away from the atmosphere. Do not handle the lead-in wire during a storm. If possible, use a separate earth for the switch, and do not run a parallel wire to the switch as well as to the earth terminal on the receiver. In this way, full protection is afforded, and the maximum



efficiency of the aerial and earth system on radio is afforded.

The Earth

The earth must receive as much atten-



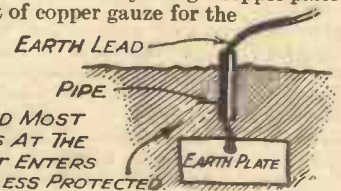
A CLAMP HOLDING DOWN LEAD TO WALL RELIEVES STRAIN ON AERIAL SWITCH.

the earth plate must be moist and the connection between plate and wire must be sound. To avoid the ravages of damp and chemical effects set up by the soil the joint should be thoroughly protected by wrapping with waterproof material as well as by painting. Various commercial earth plates are on the market and the choice may be made according to individual preference, whilst one of the commercial chemical earths will assist in maintaining good conductivity. Although the earth lead is joined to the earth, it does not follow that bare wire may be used for the lead, and that this lead may run along the wall or other earthed object. A heavily insulated wire should be employed and it should not make contact with any earth until it comes into contact with the earth

plate. In this way parallel effects, leading to instability and other difficulties, will be avoided, and any troubles which arise with the receiver at a later date will be more easily traceable when it is certain that the aerial and earth system is free from blame.

The Counterpoise

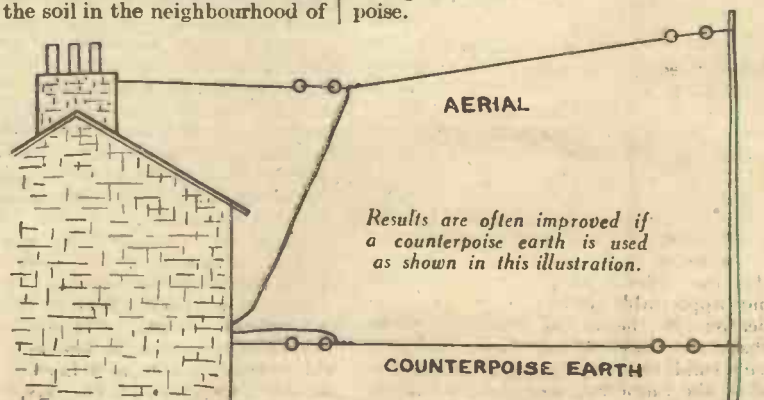
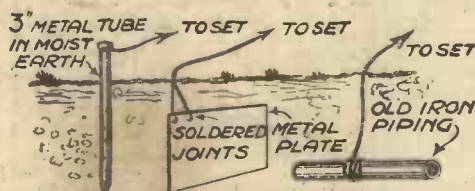
Before concluding this brief discussion on earths and aeriels some reference must be made to the counterpoise. This type of earth consists of a wire suspended a few feet above the ground, and running parallel with the aerial wire. The counterpoise must be erected as carefully as the aerial proper, and insulators must be fitted at each end in order to prevent the wire from coming into contact with the earth proper. Thus the counterpoise may be regarded as an additional aerial, with the exception that it is joined to the earth terminal on the receiver. A counter-effect may be obtained in a "flat-dweller's" receiver by using a copper plate or sheet of copper gauze for the



THE EARTH LEAD MOST OFTEN BREAKS AT THE POINT WHERE IT ENTERS THE GROUND UNLESS PROTECTED.

tion as the aerial, and at the foot of this page some various types of earth connection are shown. Remember that the great feature is low resistance, and therefore the soil in the neighbourhood of

aerial, and fitting this in the upper surface of a cabinet, with a second similar sheet arranged in the lower part of the cabinet, acting as a counterpoise.



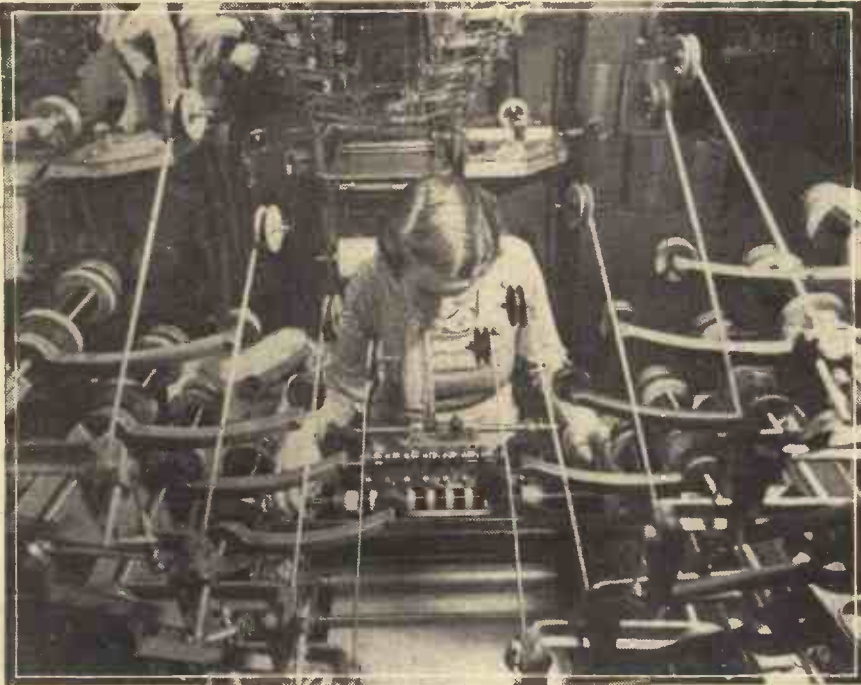
Results are often improved if a counterpoise earth is used as shown in this illustration.

COSSOR'S NEW FACTORY

MORE than forty years ago the firm of A. C. Cossor, Limited, began its career with the manufacture of all types of low-voltage lamps. The products manufactured were, of course, extremely varied, ranging from X-ray tubes to tiny surgical lamps measuring but $\frac{1}{4}$ in. in diameter. In comparison, however, with the vast range of radio and scientific

one of the largest self-contained radio manufacturing concerns in the British Empire.

The opening of this new factory has a special significance, for another thousand workers are now employed on the production of 1935 models. The factory itself is an example of the high efficiency to which modern mass-production methods can be



One of the many multiple-lead winding machines installed in Cossor's new factory.

instruments which they produce to-day, their early efforts pale into insignificance.

For many years the name of Cossor was associated almost exclusively with the manufacture of wireless valves until, in 1927, the firm introduced the first nationally advertised constructor kit—the Cossor Melody-Maker. The success of this pioneer receiver was phenomenal, and the extension of factory and staff became imperative. Throughout the years of depression the House of Cossor has gone from success to success, and their steady growth has continued inexorably until, with the opening of their fifth factory at Highbury they are

brought. The sixty thousand feet of floor-space are already occupied by the vast and complicated machinery necessary in the manufacture of the many components which go to the making of a modern radio receiving set. The numerous operations are carried out in an extraordinarily orderly fashion, and the gradual formation of the sets can be watched as they pass, on slowly moving tracks, from one worker to another.

It is difficult to believe that this huge enterprise has grown in a few years from a modest factory employing a mere hundred workers, to the five multi-floored buildings which to-day give employment to thousands.

DECOUPLING NOT EFFECTIVE

MOTOR-BOATING can always be cured by decoupling correctly, but it is almost impossible to do so when the trouble occurs on the very low frequencies, simply because the capacities required are so large and can only be dealt with by using the electrolytic type of condensers. The question of these sub-audible frequencies is a very difficult one. A good way of avoiding the trouble they cause is to reduce the amplification on the low notes in such a way that there is no appreciable reduction in the amplification in the audio-frequency range. Perhaps the simplest way to do this is to place a small capacity condenser in the grid lead of the amplifier, and then use a grid leak of about one-quarter megohm resistance

value. It will generally be found that much of the overloading which occurs in the L.F. amplifier and in the speaker is more often than not due to resonance at some frequency which is intentionally, or accidentally, introduced. As long as true amplification is provided, the speaker and amplifier may be quite able to carry the volume down to the very lowest audible frequency, yet it is possible they may appear to be overloaded because of some resonance effect.

This resonance may be in the loud-speaker and is pronounced at a certain peak in its characteristic; it may be due to the acoustic property of the room in which the speaker is being operated; in the H.T. supply, or a tuning effect in the coupling units of the circuit. Whenever there is a resonance condition in the bass range it will appear to give a richness of tone in the low notes, but at the same time reproduction will be suffering from distortion.

PETO-SCOTT

SEND US YOUR ENQUIRIES FOR EVERYTHING RADIO...

Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage paid (GREAT BRITAIN ONLY). Any surplus refunded immediately. Hire Purchase Terms are NOT available to Irish and Overseas customers.

PILOT AUTHOR KIT ALL PENTODE THREE

KIT "A" Author's Kit of Yours for First Specified Parts, less Valves, Cabinet and Speaker. **10/3** Cash or C.O.D. Carriage Paid £5/12/6. Balance in 11 monthly payments of 10/3.

KIT "B" As for Kit "A" but with set of 3 specified Valves, less Cabinet and Speaker. Cash or C.O.D. Carriage Paid, £7/13/0. Or 12 monthly payments of 14/-.

KIT "C" As for Kit "A" but with set of 3 specified Valves and Peto-Scott specified Cabinet with Baffle-board, less Speaker. Cash or C.O.D. Carriage Paid, £9/8/0. Or 12 monthly payments of 17/3.

● Set of 3 Cossor Valves as specified .. £2 0 6
● 1 W.B. Stentorian Standard Speaker .. 1 12 6
or 2/6 down and 11 monthly payments of 3/-.

NEW LISSÉN BAND-PASS SKYSCRAPER THREE. Send Complete Kit comprises all components, including set of Lissén Valves. Cash or C.O.D. Carriage Paid, £4/19/6. 9/-
Balance in 11 monthly payments of 9/3 only
NEW LISSÉN SKYSCRAPER FOUR ALL-WAVE CHASSIS SEND MODEL. Complete Kit comprises all components, including set of Lissén Valves. Cash or C.O.D. Carriage Paid, £5/12/6. 10/-
Balance in 11 monthly payments of 10/3.

GRAHAM FARISH RAIDER 3. Complete Set Kit for building, including specified Valves, B.R.G. Cabinet and W.B. Stentorian Baby Speaker. Cash or C.O.D. Carriage Paid, only £7/6/6. 13/6

COSSOR 352. Three-valve battery. Complete Kit with Send all components, Valves, Cabinet and Moving-coil Speaker. Cash or C.O.D. Carriage Paid, £5/19/0. 10/-
Balance in 12 monthly payments of 10/- only
TELSEN S.G.3 KIT, less valves. Cash or C.O.D. Carriage Paid, £1/19/8. 2/6
Balance in 8 monthly payments of 5/-.

If valves required, add £1/11/6 to Cash Price; H.P., 6/- only Deposit and 11 monthly payments of 6/6.



W.B. STENTORIAN SENIOR PERMANENT MAGNET M.C. SPEAKER. For Power, Pentode and Class B. Cash or C.O.D. Carriage Paid, £2/2/0. Send only 2/6. Balance in 11 monthly payments of 4/-.



W.B. STENTORIAN STANDARD PERMANENT-MAGNET M.C. SPEAKER. For Power, Pentode and Class B. Cash or C.O.D. Carriage Paid £1/12/6. Send only 2/6. Balance in 11 monthly payments of 3/-.



GARRARD AUTOMATIC RECORD CHANGER UNIT Send Universal A.C. or D.C. 100-250 volts. Plays pack of eight 10" or 12" records. Cash or C.O.D. Carriage Paid, £10/17/8. 20/-
Balance in 11 monthly payments of 20/- only

NEW GARRARD MODEL 202A. 12-in. Turntable. Send Electric Motor for A.C. Mains. Cash or C.O.D. Carriage Paid, £2/10/0. 5/-
Balance in 10 monthly payments of 5/- only

B.T.H. MINOR PICK-UP AND TONE ARM. With volume control. Cash or C.O.D. Carriage Paid, £1/1/0. 2/6
Balance in 8 monthly payments of 2/9.

COLVERN COLPAK TUNING UNIT. Incorporates the Send famous Ferrocart coils. Cash or C.O.D. Carriage Paid, £2/7/6. 5/-
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DROITWICH BAND CONTROL COILS

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EST. 1919

CONSERVING H.T. VOLTAGE

When Designing a Universal Mains Receiver the Problem of Saving H.T. Voltage Often Arises, and Methods of Solving it are Described Below.

By FRANK PRESTON

WHEN the high-tension voltage is obtained from A.C. mains there is seldom any difficulty in securing a value as high as ever may be required, since it is only necessary to choose a mains transformer and rectifier according to the requirements. In the case of a D.C. receiver, or a circuit of the now popular universal (A.C. or D.C. operation at will) type, however, matters are very different; one is limited to the maximum voltage of the supply. This is because, in the case of A.C., a mains

these two chokes produce a voltage drop of approximately 33 and 5 respectively. It is evident from these figures that the lower-resistance component would prove far more satisfactory in a receiver fed from an input of, say,

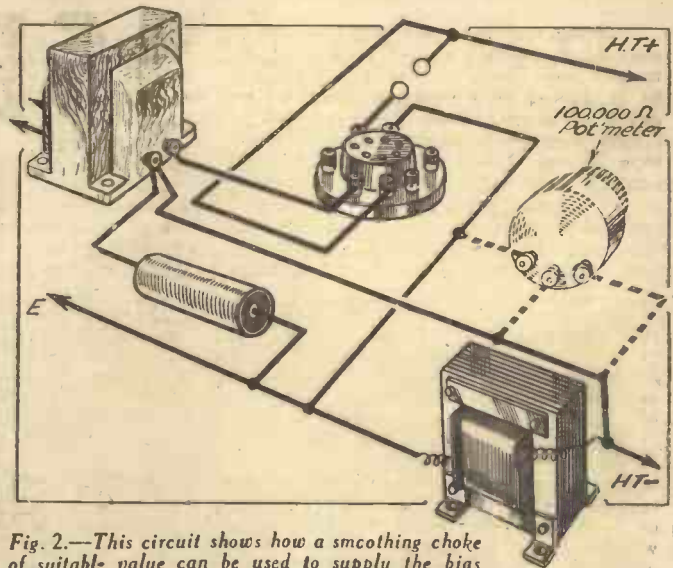


Fig. 2.—This circuit shows how a smoothing choke of suitable value can be used to supply the bias voltage for the output valve. Broken lines show the connections for a bias potentiometer when the choke is of incorrect value.

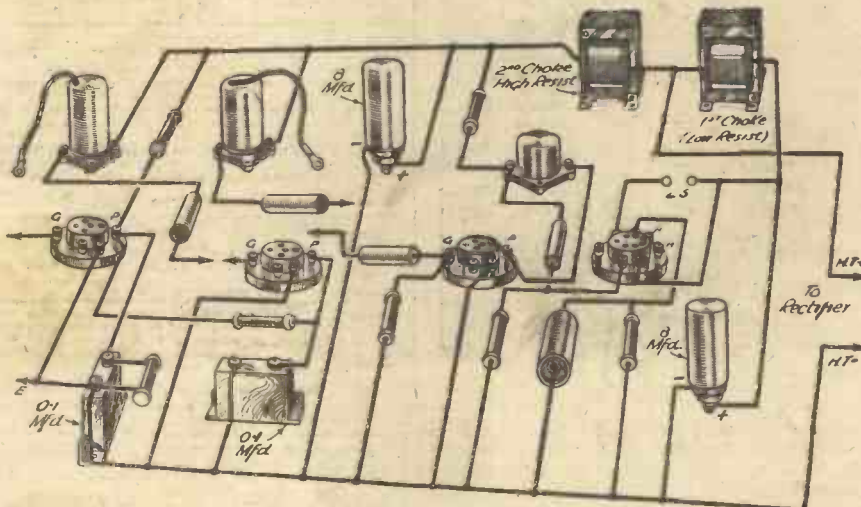


Fig. 1.—Showing the suggested arrangement when using two smoothing chokes instead of only one, as is more usual. The advantage of this scheme is pointed out on this page.

transformer is not used and, in the case of D.C., it is impossible by any simple means to alter the initial supply voltage.

Voltage Drop

Bearing these facts in mind, it is well to consider methods of conserving the available voltage, or of saving as much as possible by preventing voltage-drop across various components. Generally speaking, the greatest source of voltage loss in any type of mains receiver is the smoothing choke. This component is essential and, since it has to carry the whole of the H.T. current, it produces a voltage drop equal to the full current (in amps.) multiplied by its ohmic resistance. It is therefore evident that the voltage drop can be reduced to the greatest extent by using a choke of the lowest available resistance, consistent with a sufficiently high inductance value. This point is more important than might at first be imagined, for one maker lists two smoothing chokes each having an inductance of 40 henries when carrying 30 milliamps., but the D.C. resistance of one is 1,100 ohms and of the other, 160 ohms. When passing their maximum rated currents,

220 volts and incorporating valves rated to take an anode voltage of 200.

Using Two Smoothing Chokes

The difficulty which presents itself, however, is one of cost, for the 160-ohm component costs almost five times as much as that with a resistance of 1,100 ohms. For this reason it is often better (and cheaper) to employ two separate smoothing chokes, one to feed to H.F. and detector valves, and the other to supply the L.F. and output valves. This

is often a very satisfactory method, because quite a low-resistance choke can be employed for smoothing the supply to the L.F. valves, due to the fact that it may be of low inductance, since a certain amount of "ripple" will pass unobserved in the L.F. portion of the set, whereas it would probably result in pronounced hum in the case of the H.F. circuits. A low-resistance, low-inductance choke can be bought comparatively cheaply, as also can the second choke needed for use in the supply circuits to the H.F. valves. The latter choke should certainly have a high inductance value, but it is only called upon to carry up to about 10 milliamps., so that, even if it has a resistance of, say, 1,000 ohms, it will produce a voltage drop of only 10 volts. In any case, efficiency is not greatly reduced by cutting down the H.T. voltage to the H.F. valves. Another worthwhile advantage of the scheme under consideration (illustrated in Fig. 1) is that the second—high-resistance—smoothing choke provides a measure of decoupling between the H.F. and L.F. valves.

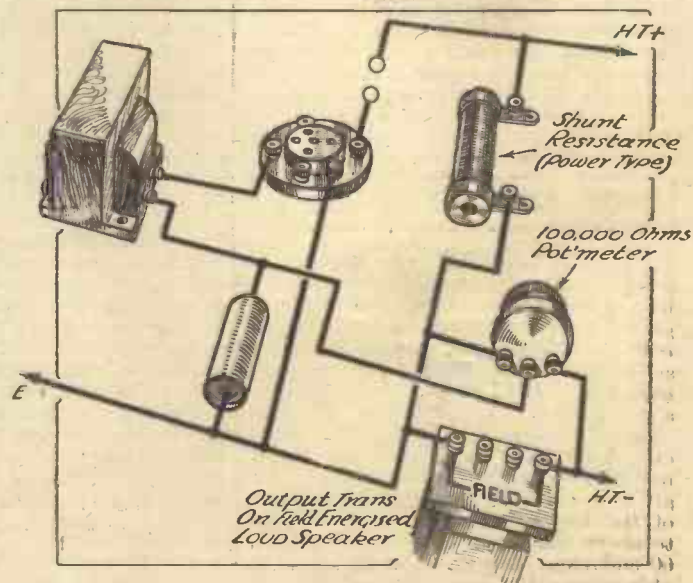


Fig. 3.—The connections for a shunt resistance when the normal anode current is insufficient to energize the speaker.

Although it is customary to insert smoothing chokes in the positive high-tension lead, there is often an advantage to be gained by connecting them in the negative circuit instead (see Fig. 2). The efficiency of smoothing is just about the same whether the choke is in the positive or negative circuit, but when in the latter position it can be used to supply the bias voltage required by the output valve. This might readily be anything up to 30 volts and is normally taken from the H.T. voltage, which is thereby reduced. If the choke has a resistance equal to that required for biasing the output valve, however, it may be connected as shown in Fig. 2, so that the inevitable voltage-drop across it is usefully employed for bias purposes.

Even if the resistance value is not correct for this purpose (it will generally be too high) it is a simple matter to obtain the correct bias voltage by means of a 100,000-ohm potentiometer connected in parallel with the choke, as shown by broken lines in Fig. 2. This potentiometer will have practically no effect upon the normal efficiency of the choke and makes it possible to choose the correct bias voltage while the receiver is in use.

Bias from Speaker-field Winding

This very same idea applies when a mains-energized moving-coil loud-speaker is employed, since the field winding can be wired in the position indicated by the choke in Fig. 2. Unfortunately, it is seldom possible to employ a standard (2,500 ohm) energized speaker with a universal receiver, because such a high resistance introduces too great a voltage loss. At the same time, however, a speaker with a field resistance of 1,500 or even 1,000 ohms can sometimes be used with complete success, provided that the H.T. current consumption of the set is sufficient to energize it. As the necessary current might be anything up to 60 milliamps., however, the consumption by the valves will probably be insufficient. It is possible to pass sufficient current through the windings by connecting a fixed resistance, as shown in Fig. 3. This method is not always satisfactory, because the greater current passing through the windings produces a greater voltage drop. In fact, if the energizing wattage must be the same in the case of either the 2,500-ohm or 1,000-ohm speaker, nothing will normally be gained by using the arrangement suggested. On the other hand, if H.T. voltage is not at a premium—such as in a receiver operating from A.C. only—and the anode current consumption is too low to energize the speaker field, the idea will be found to be perfectly convenient. In fact, it is frequently very useful as a means of fully loading the rectifier. As an example of what is meant, it might be pointed out that if the rectifier gave an output of, say, 350 volts at 120 milliamps., while the valves only consumed 60 milliamps., the voltage would rise to too high a value if the shunt resistance were not included in the circuit.

The value of the resistance must be chosen so that it passes a current equal in value to the difference between that given by the rectifier and the consumption of the valves. In the example referred to above this "excess" current would be 60 milliamps.; assuming the voltage available between the ends of the resistance to be 300, a value of 5,000 ohms would be required.

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THE MIDGET SHORT-WAVE TWO

A Few Difficulties Cleared Up Regarding the Construction of This Ingenious Set.

A NUMBER of readers have completed the ingenious short-wave receiver which was described in our September 15th issue, and some interesting accounts of the results obtained have been received from various parts of the country. A few queries have been asked regarding certain points in the construction, and in order to clear up these we are giving details herewith. Firstly, on page 798 of the issue in question, we gave a wiring diagram which showed only the underside of the metal chassis. The view of the upper surface was not given, as only one wire projects to this side, and a photograph on page 796 was, in our opinion, sufficient for wiring purposes. Certain readers desire to have a complete wiring diagram, and we therefore publish on this page the upper-surface plan of the receiver, from which it will be seen that a single wire passes from the variable condenser down to the grid terminal of V2. The accompanying drawing is to the same scale as that published on page 798.

Coil Data

Certain readers are desirous of constructing coils to cover different ranges from those which were given, and there is, of course, no objection to this, although certain restrictions in the design will have to be made, owing to the fact that there are only four possible connections to the reaction and aerial-grid coils. However, to over-

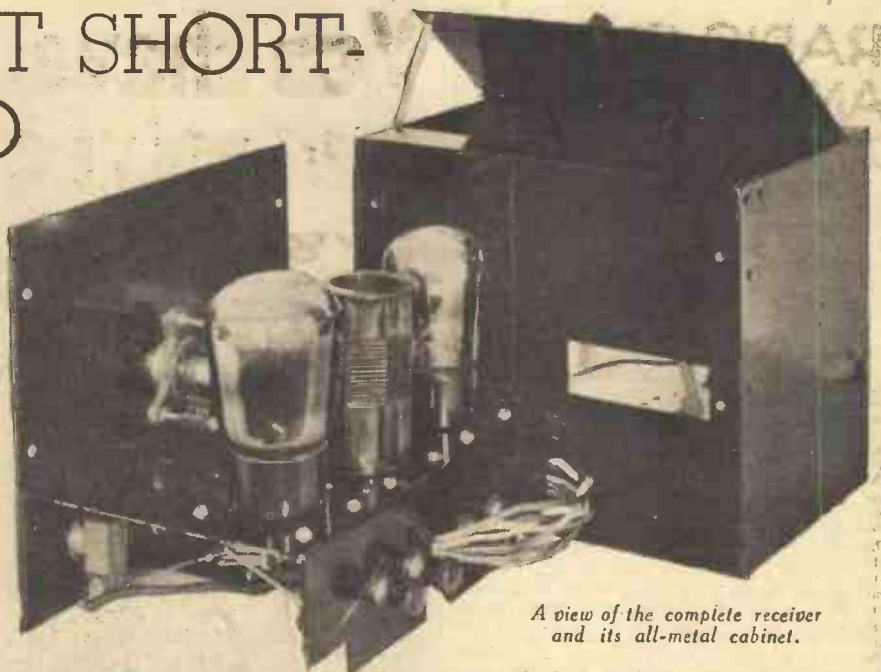
come this difficulty, and to introduce some further selectivity on higher wave ranges, a separate aerial winding may be wound on the coils, the lower end of this extra winding being joined to earth. The "top" end of the extra winding may be soldered to a small length of stiff wire projecting from the former, and the aerial may be joined to this projection by means of a small crocodile clip. This will give added selectivity and also modify the range of a coil. In certain cases, where lack of oscillation is experienced, this method of connecting the aerial may be tried, although the aerial-series condenser should suffice in the majority of cases.

Calibrating the Set

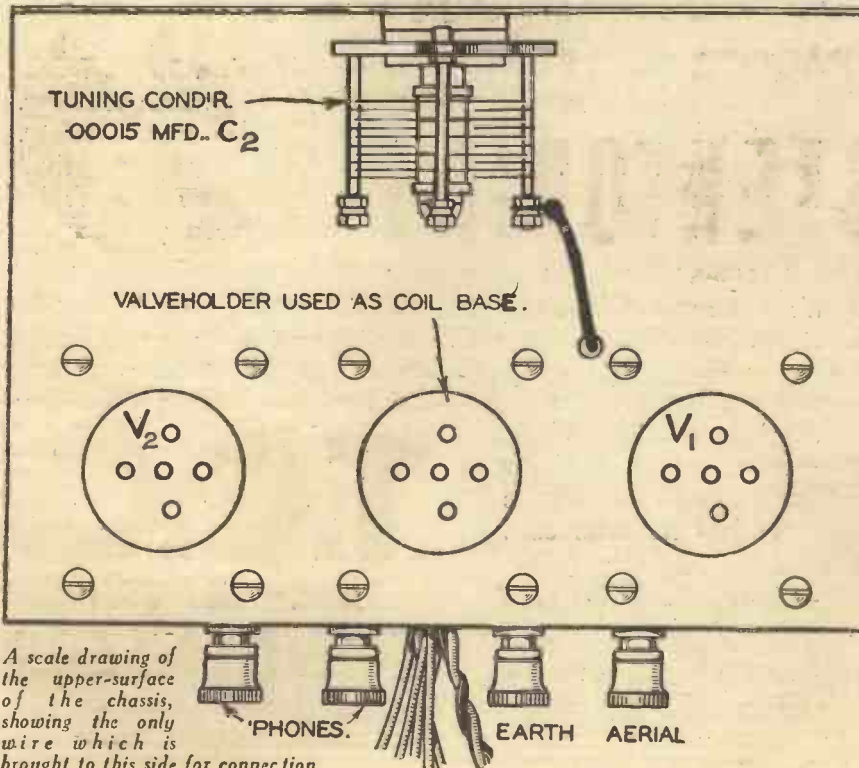
In view of the sharpness of tuning on the short waves, certain constructors have been in doubt as to the stations which they have so far heard, and in some cases have reported that they cannot receive stations which are known to be well received in their locality. It is obviously desirable, therefore, to calibrate the receiver in order that the exact tuning points for various stations may be accurately located, and constructors of the Midget are therefore advised to refer to the article in the Short-Wave Section of this week's issue, where instructions are given for using a normal broadcast receiver to carry out short-wave calibration.

The Aerial

Results may be disappointing if the aerial is not suitable for use on the wavelengths covered by this receiver. In the issue in question it was shown how a short length of flex should be connected to the aerial terminal and then twisted round the aerial lead, thus providing a further small capacity condenser in series with that already fitted to the receiver. A special aerial, erected for short-wave work only, will be found a much more satisfactory scheme, and will enable the receiver to give a better performance. In general, a short vertical wire will be found most suitable, and this may hang from an upper window, or be specially erected from stand-off insulators held at a distance from the house walls. On no account should the wire be less than two feet from the wall, and the wire should be as thick as possible. Piping proves very satisfactory, and, moreover, is easy to erect. If wire is employed, it should be held tightly between its upper and lower extremities so that no movement can take place and affect tuning positions and signal strength. Before finally fixing the wire some experimental tests may be carried out in order to ascertain what length of wire gives the best results in your particular locality, and whilst these tests are being made the efficiency of the earth should also receive attention.



A view of the complete receiver and its all-metal cabinet.



A scale drawing of the upper-surface of the chassis, showing the only wire which is brought to this side for connection.

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.

TRANS-WORLD TESTS

THE Anglo-American Radio and Television Society has arranged tests between members situated in all parts of the world. At present the following schedule is used by two British members, G-2LZ and G-2YH.

First and second Saturdays in each month :—
5 to 5.30 a.m. G-2YH, 40 m. band.
7 to 7.30 a.m. G-2LZ, 40 m. band ; 250 watts.
Third and fourth Saturdays in each month :—
7 to 7.30 a.m. G-2YH, 40 m. band.

These stations will be pleased to hear from overseas readers who may pick them up. Letters may be addressed to Mr. Ernest Hobden, at 10, Denecroft Gardens, Grays, Essex.

SLADE RADIO

A LANTERN lecture entitled "Gallipoli" was given by Lieut.-Commander Brewster at the last meeting of this Society. A large number of exceptionally interesting slides were shown, and the accompanying narrative also proved of great interest. The Society held another midnight D.F. test recently, when a dozen competitors, including parties from Rugby and district, met at the headquarters. This was the starting-point for previous cup winners, the remainder starting from another point about 1½ miles distant. After the first transmission at 12.5 a.m. the parties soon split up and tracking began in earnest. The transmitter, Mr. C. H. Young (G2AK), was hidden in a lane near Hopwas, and five competitors were successful in locating the position. At the conclusion of the test a very happy party of about forty met at a nearby hostelry for breakfast and chatted over their interesting experiences. The Harcourt Challenge Cup and a Novice Trophy Cup were presented to the winners. The organiser of the test was Mr. S. J. Phillips, Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

The programme of future meetings of this Society, up to the end of December, is as follows :—

October 18th. Commercial Photo-electric Cell applications (with experiments). The General Electric Co., Ltd.

October 25th. "Junk Sale."
November 1st. "The Early days of Flying." Lantern lecture by Dr. Ratcliffe.

November 8th. "Single signal superhet." Mr. C. H. Young (G2AK).
November 15th. "The History of the Society," by Mr. W. E. Chilvers.

November 21st. Whist Drive and Dance.
November 22nd. Debate.

November 29th. Annual General Meeting.
December 6th. Annual Dinner.

December 13th. "Dual speaker equipment" (new version), by Mr. G. T. Peck.
December 20th. Lantern Lecture by Mr. A. W. Sutton.

December 27th. No meeting.
Entrance fee, 2s. 6d. Subscription, 8s. per annum.
Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

THE Fifth Anniversary of this Club was celebrated at the meeting of the London Chapter held on Friday, October 5th, which was attended by many prominent radio authorities. Mr. A. E. Bear gave a long talk on the club's history and described how the club was started by three short-wave listeners, one of them being Mr. George F. Brooks, a British-born subject. He then went on to say how the club has extended till now they had thousands of members in ninety-four countries. A lecture on short waves and sunspots then followed, and a receiver especially designed for quality reception of short-wave stations was demonstrated. This receiver is the A.C. Experimental Short-wave Superhet referred to in a recent London Chapter meeting report.—A. E. Bear, Secretary, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

"You have surpassed yourselves" says Mr. F. J. Camm!

(Editor, "Practical Wireless")



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REVIEWS OF THE
LATEST RECORDS

By T. Onearm

ONE of the most popular favourites on the comedy stage, Bobby Howes appears this month on *Columbia DB1424*, singing "Yes sir! I love your Daughter" and "Let's dress for dinner To-night." He infuses his sparkling personality into these two songs, that might well have been written for him. Can't you imagine him in "Yes Sir! I love your Daughter"? If you wish for sentiment and comedy from the most popular recording duettists in the world then hear Layton and Johnstone on *Columbia DB1422* singing "Happy," from the film of that name, and "Night on the Desert." They are still top-liners after years of song success—still home favourites. "The King's Own" and "True till Death," sung by Norman Allin on *Columbia DB1414*, is a record that brings this great basso right into your home. Into these songs Norman Allin has infused his mellow artistry, the first a swinging marching song, the other relating the story of a boy who throws away his toys and becomes involved in the maelstrom of real fighting. Another fine vocal record is *Columbia DB1417*, on which Ina Souez the sweet-voiced soprano, sings two of the greatest successes in modern songs, "Always," from the film "Puritan Lullaby," and "Love, I give you my All." These recordings will give you a real home treat. A fine pianoforte solo that I can specially recommend is Billy Mayerl's own Savoy memories on both sides of *Columbia DB1419*. This record introduces "Kitten on the Keys"; "Ukulele Lady"; "What'll I do"; "Carolina in the Morning"; "Chili-Bom-Bom"; "Dancing Time"; "Keep on Humming"; "April Showers"; "Indian Love Call"; and "I'll build a Stairway to Paradise." Syncopation at its best. Sidney Torch makes a clever record this month on both sides of *Columbia DB1420*. "I want to be Snappy" is an essay in old tunes as hot organ music, as an exponent of which Sidney Torch is considered supreme. From beginning to end he introduces the most unexpected surprises and emphatic rhythms. You should certainly hear this record, which introduces such old-time popular tunes as "I want to be Happy"; "Honey, I'm in love with you"; "Varsity Drag"; "I got Rhythm"; "My heart stood Still"; and "Bambalina." Another hot number equally good is "Kitten on the Keys" and "12th Street Rag" on *Columbia DB1421*. Harry Robbins gives two very fine xylophone solos on this record. You should certainly hear it.

His Master's Voice Records
Gracie Fields' new film "Sing as we go" is just as full of fun as its predecessors, and

even fuller of catchy tunes. Two records released this month, "Love" and "Just a catchy little tune," *B8209*, and "Sing as we go" and "In my little bottom drawer," *B8210*, are the pick of them. "Love" is sentimental and Gracie sings it as only she can when she wants to. "Sing as we go" is a very lively tune, with Gracie playing the part of the Pied Piper of Blackpool. "Just a catchy little tune" lives up to its title, and "In my little bottom drawer" is the best comedy number she has had for years. What a versatile artist she is. Most readers have no doubt read of the recent death of Raie da Costa, the famous syn-copated pianist. One of the last records made by this superb artist appears this month on *B8211*. On this record she plays two of the hit numbers from the film "Twenty Million Sweethearts," "I'll String Along with you" and "What are your intentions." The above film is the musical film of the year—1934's reply to "42nd Street" of 1933. Raie da Costa plays them with astonishing vivacity and breath-taking dexterity.

Sterno Records
The British Homophone Company's lists for this month include a fine record by Pat O'Brien, the famous tenor. Hear him sing "The Isle of Capri" and "Aloma" on *Sterno 1486*—it is certainly an excellent piece of recording. If you like accordeon bands then you will undoubtedly appreciate the great French accordeon ensemble—The Ten Apaches—playing "Les Apaches en fête" and "Lamentation d'Apache" on *Sterno 1485*. The accordeon at its best. Billy Merrin and his Commanders appear again this month with two popular dance numbers in "When a woman loves a man" and "Dearest" on *Sterno 1484*.

**THE WIRELESS
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(2nd Edition)

By F. J. CAMM

(Editor of "Practical Wireless.")

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By JACE

Wireless Time Signals in the Antarctic

WIRELESS time signals are expected to give important assistance in the exploration and survey work to be carried out by the British Graham Land Expedition, which recently left England for the Antarctic under the leadership of Mr. John Rymill. Nearly three years, including two winters of complete darkness, will be spent south of the Antarctic Circle, with the principal objective of exploring the 1,000 miles of almost unknown coastline between Luitpold Land and Charcot Land.

Time signals from Buenos Aires will be received daily, with three Marconi portable short-wave receivers specially designed for the purpose, by the exploring parties, by the party on board the expedition ship *Penola*, and, during the dark months, at the winter base on the ice. The range of reception will vary from 2,200 to 3,000 miles.

The Marconi receivers for the British Graham Land Expedition, which have been designed so that they can be carried, with all accessories, in a standard sledge ration case, have a wave-range of 25 to 50 metres. They incorporate one screen-grid valve for high-frequency amplification, one detector, and one low-frequency magnifier valve, with two high-frequency tuning circuits with condensers calibrated in metres, and adjustable reaction coupling. Portable-type aerials are employed and a wire counterpoise earth. Current for the valves is derived from batteries, both the filament and high-tension batteries being of the inert type.

DX'er's Fine Bag of Stations

MR. RICHARD RAWLES, of Blackwater, Isle of Wight, is an amateur transmitter of world-wide repute, and has worked stations in every part of the globe. In nearly every case an acknowledgement of his reception has been received with an appreciation of his performance. Mr. Rawles is a member of the International DX'ers Alliance and uses Marconiphone equipment exclusively. For the reception side of his equipment he uses a Marconiphone Model "276," the well-known 7-valve super-heterodyne, and receives no fewer than thirty-seven American and Canadian stations with astonishing regularity. In each case the reception has been carried out on the loud-speaker with strength from R4 to 9—average about R7.

Mr. Rawles states that the static suppressor fitted to the Model "276" is an inestimable boon in receiving the more distant transmissions. He uses the ordinary standard type of aerial—the inverted L variety—30ft. high, 7/22 enamelled copper; the earth is the ordinary copper tube. He has also worked South American stations and received programmes from the Near and the Far East.

Young Men in Industry

"A YOUNG man shouldn't settle in one place before he is thirty at any rate," was the advice of John Carruthers, a production engineer at Derby, received from a former employer. And he didn't. He went to Germany to see whether colliery maintenance engineers could teach us anything, found that, by and large, they couldn't; and, soon after his return, he received an appointment at a big chain-belt works. Mr. Carruthers will give a talk in the "Young Men in Industry" series on October 23rd.

Sir Edgeworth David

THE Welsh Interlude in the National programme, on October 27th, will be given by Professor Oliver Stephens, Professor of the History and Philosophy of Religion in the Presbyterian College, Carmarthen. The subject of his talk is Sir Edgeworth David—the famous scientist,



The new Ferranti Battery Portable, which is a completely self-contained 6-valver of the superhet-type.

who died a few weeks ago. Professor Stephens recently spent a year in a village on the Blue Mountains of New South Wales where Sir Edgeworth David had a country residence, and he will give his personal impressions of the great geologist and explorer. In a sketch of his romantic career he will refer to his early researches into the geology of the Vale of Glamorgan, his work on the coral islands of the Pacific, his association with Shackleton in the Antarctic, his ascent of Mount Erebus, and his discovery of the South Magnetic Pole.

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15/- New Mullard MB3. Complete receiver, including moving-coil speaker, valves and all batteries in beautiful cabinet. Remarkable selectivity and quality of reproduction. Very low H.T. consumption. In our opinion the finest battery receiver available at present. Almost equal to a superhet in regard to selectivity with better tone. Cash Price, £8 8/-, or 15/- with order and 11 monthly payments of 15/-.

MANUFACTURERS' KITS.

10/- Graham Farish Raider Kit with valves. Cash Price, £5 6/8, or 10/- with order, and 11 monthly payments of 9/8.
5/6 Graham Farish Raider, less valves. Cash Price, £3 5/2, or 5/6 with order and 11 monthly payments of 6/-.

Every other good kit supplied on the lowest terms. Quotations free.

NEW ATLAS T10/30 H.T. UNIT WITH TRICKLE CHARGER.

6/- Suitable for any battery-operated set, it provides three H.T. positive tapings—60/80 volts, 50/80 and 120/150 volts with positions for either 120 volts or 150 volts. A novel feature is the output panel, which gives a choice of either 10, 20 or 30 m/a., which, operated in conjunction with the power voltage tapings of 120 or 150 volts, enables you to obtain outputs of 10, 20 or 30 m/a. at 120 or 150 volts. A further refinement is the low-tension accumulator trickle-charger, which is incorporated in the unit. This provides facilities for re-charging your 2-volt L.T. accumulator. Cash Price, 69/6, or 6/- with order and 11 monthly payments of 6/4.

MOVING COIL LOUD SPEAKER UNITS.

2/6 New W.B. Stentorian Senior Unit. This is undoubtedly the best of the latest moving-coil units. More volume for the same input and a further improvement in tone. Cash Price, £2 2/0, or 2/6 with order and 11 monthly payments of 4/-.

VALVES.

5/- Every type of valve replacement supplied on convenient terms. 3 Valves, 1 8.G., 1 Det. and 1 Power (Mullard, Cossor or Marconi). Cash Price, £1 5/0, or 5/- with order and 5 monthly payments of 4/7.

Piico de Luxe Rotameter, every possible fault in a receiver can be quickly traced with this instrument. Cash Price, 42/-, or 5/- with order and 8 monthly payments of 5/-.

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SUPPLEMENT TO "PRACTICAL WIRELESS"

AMATEUR TELEVISION

TELEVISION FOR COMMERCIAL PURPOSES

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

AN announcement was made a few days ago concerning the Radio Corporation of America, and the exploitation of television for commercial purposes. This firm furnished a few details dealing with the methods it has evolved for the transmission of pictures and printed matter, and it was hailed in the British press as a means whereby high-speed television transmissions could take place.

Of course, what the R.C.A. has really developed is a method for transmitting still pictures, not television images, this being an improvement on the older schemes which require, in many cases, several minutes for the transmission of one or more pictures to distant points. Various systems of still picture transmissions are used throughout the world, ranging from pictures built up by numbered squares in certain numerical combinations telephoned to the point where the picture is reconstructed to systems embodying an electrically-controlled inked needle tracing pictures on a drum, as illustrated in Fig. 1.

Prime Differences

Although picture telegraphy by line or by radio has certain minor details in common with television, there are vital differences which should be borne in mind. First of all, in picture telegraphy it is necessary to obtain a permanent record at the receiving end, whereas with television we are merely concerned with a fleeting impression to the brain, and only in very isolated cases is it necessary to adopt complicated methods in order to procure a permanent record. Another important difference is in the speed of transmission. To bring about the illusion of continuous movement a minimum of twenty-five complete pictures per second must be transmitted in the case of television, this giving flickerless images at the receiving end. With picture or photo telegraphy, however, the question of speed does not arise, and frequently many minutes are taken in order to transmit completely one isolated picture.

On the other hand, however, if it is not desired to have a permanent record of a picture or, say, a typed message, then high-definition television is immediately applicable to this form of transmission of intelligence. Many months ago the Baird Company, when conducting their demonstrations of 180-line television transmission by ultra short waves, proved conclusively that they could transmit messages at the very high rate of 30,000 letters per second. This was effected by televising an ordinary typed sheet, and one application of this

scheme which comes to mind immediately is in the question of sending stock exchange prices to brokers or clubs instead of these figures coming through slowly, and individually, on a tape machine. A suitable receiving set would enable a considerable

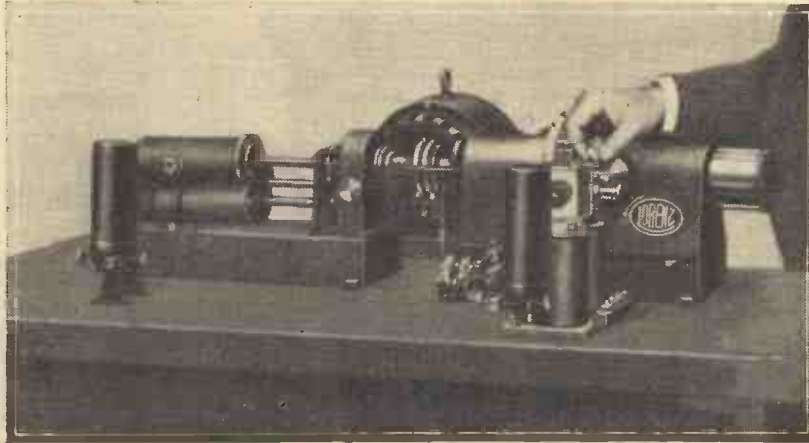


Fig. 1.—One of the recording devices used in photo-telegraphy processes.

number of these prices to be reproduced on a small screen with astonishing rapidity.

Other Applications

While on the subject of commercial applications to television, it will be helpful to review briefly a few other ways in which television processes ultimately can be made applicable to normal commercial working. Perhaps one of the most important of these which may arise is the question of selling wares or merchandise by placing the goods in front of the television transmitter so that the signals can be radiated or transmitted to one or more receiving points. The expert salesman can describe the outstanding features of his own particular product, and the

prospect of effecting sales would be considerably brighter than if he had to send catalogues and write letters to prospective clients.

The ability of the young mind to absorb knowledge as the result of appealing to both the senses of sight and hearing is a well-known fact. Here, then, is a method whereby television should ultimately be able to play an important part in teaching school children by line or by radio. Instead of experts on a particular subject having to visit the schools individually, and thus cover a large area, and take up a considerable amount of time, it would be possible to face the television transmitter and give specialist lectures to almost unlimited youthful audiences. Chemistry, engineering, physics, geology, mathematics, and many other subjects could be covered in this way; and although such schemes are quite embryonic at the present moment, it is well within the realms of possibility that this method of education will find support in the future.

Television and the Telephone

Of recent date considerable attention has been directed in the daily papers towards the question of two-way television and telephony, and this is certainly another important commercial application. By its use it will be possible to have telephone booths in different towns of the same country which can be linked together by line or directional radio.

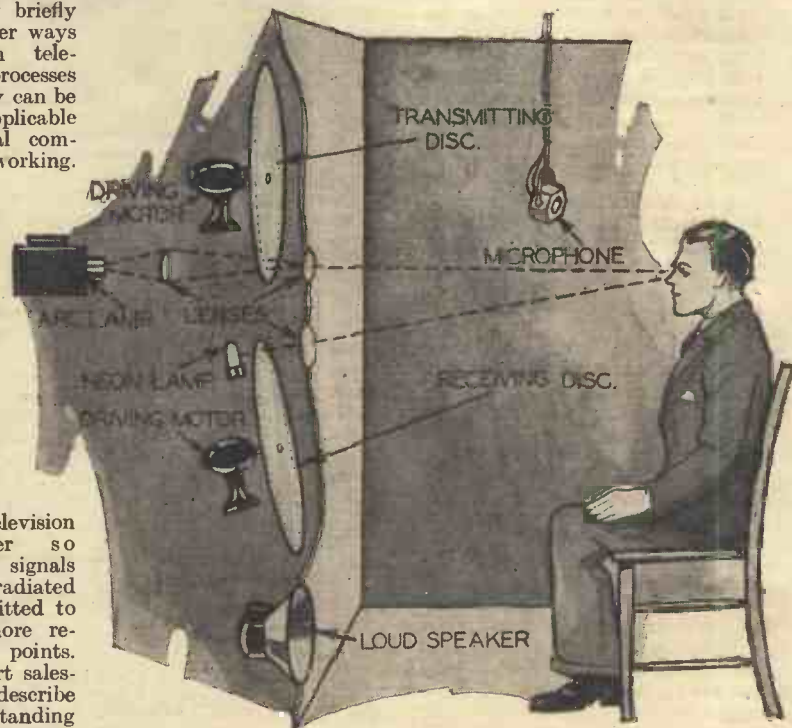


Fig. 2.—Experimental apparatus used in New York for demonstrating two-way vision and telephony.

Facts and Figures

Components Tested in our Laboratory

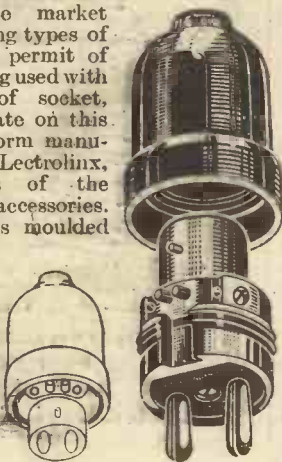
BY THE PRACTICAL WIRELESS TECHNICAL STAFF

The "G.M." Turntable

LISTENERS who are in search of a low-priced turntable which is suitable for use with portable receivers, or other apparatus which has to be rotated without difficulty, will find the "G.M." ball-race turntable of great utility. It is made from annealed cast iron, and consists of two thick plates measuring only 2 1/2 in. square, each with a ball-race having a diameter of 2 in. The two plates are clamped together by means of a central bolt, and a quantity of one-sixteenth steel balls are employed to fill the race. Thus the two plates turn very smoothly upon each other, and as each plate is furnished with fixing holes at each corner it is possible to attach the device in any desired manner to obtain a perfectly smooth action. It is guaranteed to turn 56 lbs. and costs only 1s. 6d. The makers are G.M. Patents Co., Price Street, Birmingham, but the turntable may be obtained from most stores who specialise in the popular constructional toy, as this particular turntable is fitted with holes at such a spacing that it may easily be incorporated in models made up from the perforated strips. In connection with this component the makers are offering some valuable prizes for the best model or apparatus made up to incorporate a turntable. Full details may be obtained from the makers.

New Clix Plug Adaptor

MAINS apparatus is generally fitted with a mains connecting plug which may take the form of either a two-pin plug or a bayonet-socket plug, and, as the average home is usually fitted with both power sockets and lamp-holders, it sometimes becomes convenient if the apparatus can be inserted into either type of connection at will. There are already on the market some interesting types of adaptor which permit of apparatus being used with both types of socket, and we illustrate on this page a new form manufactured by Lectrolinx, Ltd., makers of the popular Clix accessories. This adaptor is moulded in bakelite of substantial thickness, consisting of a hollow "cowl" through which the connecting flex is passed, and which is fitted with



The new Clix mains plug adaptor.

an internal thread. Screwing into this section is another moulded portion which has two pins on one end and an ordinary lamp-socket fitting on the other, the mains leads being joined to small terminals situated in the centre of this part of the complete adaptor. It will thus be seen that the two portions may be screwed together to enable either end to project, whilst the attachment of the lead to the reversible portion prevents this from being lost. The illustration shows the appearance of the adaptor when used for a lamp-socket, and also with the reversible portion removed. It is a very convenient component for the home, and will no doubt find many applications. The price is 1s. 3d.

Lissen Unscreened Coils

FOR the construction of a low-priced receiver where it is not essential to employ screened coils, the Lissen unscreened coils will be found very useful. As may be seen from the illustration on this page, the method of construction follows orthodox lines, a base with six terminals being fitted to the complete coil, and with the further refinement of a small selectivity device mounted in the upper end of the coil. This consists of a small mica-dielectric variable condenser, with an ebonite adjusting screw, and it provides an extremely low minimum capacity, and a maximum of .0002 mfd. A further advantage in the design of this coil is to be found in the fact that the base is designed to fit the Lissen Triple Wave-change Switch. The coil covers the normal wave-bands, and the windings are arranged in slots on the ribs so that the turns cannot move and vary the calibration of a receiver. The price of the coil is 5s. 6d. with selectivity device, and 4s. 6d. without. The triple wave-change switch costs 3s. 6d.



A neat unscreened coil with selectivity device. A Lissen product.

Ostar-Ganz Price Reductions

THE well-known Ostar-Ganz Universal valves are reduced in price as from October 1st last. In addition, several new types have been added to the com-

plete range. The types and prices are now as follow:—

	s.	d.
Screen-grid valves (Types S.25, S.100, MS.18 and MS.70)	18	9
Triodes:		
Type D.130	17	6
Types A.520 and U.920	16	6
Type L.1525	17	0
Types K.2060 and K.3560	25	6
Pentodes:		
Type Pt.3	18	9
Types M.43, H.3, and V.3	19	6
Pentagrid, Type G.5	19	9
Double-diode, Type B.2	17	6
Rectifiers:		
Type EG.50	12	0
Type EG.100	14	9
Type NG.50	22	9
Type NG.100	24	0

All of these valves are designed for a heater voltage up to 250, and the wattage consumption varies with the different types between 4 and 11 watts. They are all fitted with the Continental 5- or 7-pin base, and may be operated on either A.C. or D.C. mains direct.

The 362 Radio Valves

THE range of valves manufactured by the 362 Radio Valve Company is a very exhaustive one, and readers who attended the recent Radio Exhibition will remember the splendid display which the firm made of their products. The principal characteristic of these valves is the low price, a simple triode costing only 3s. 6d., and a Class B valve costing only 9s. Because these valves are low in price, however, it does not follow that they are in any way inferior, and some tests which we have conducted reveal that the valves are very satisfactory, when judged from the point of view of performance, and also on the score of reliability. The method of construction results in great strength and absence of microphony, and the S.G. valves have a very low self-capacity.

A novel feature is introduced in the metallised H.F. valves, and this consists of an insulating coating covering the metallised surface and thus affords a measure of safety should an H.T. lead come into contact with the valve. A further novelty to be found in these valves, and one which we should like to see on other makes of valves, is the marking of the principal characteristics on the valve base. This is carried out in gold type and is easily readable, and thus does not leave the user in doubt at any time regarding the particular characteristics of the particular valve in use. The information which is given is the type number, the amplification factor, the mutual conductance and the impedance, and, in view of the changes which certain valves undergo from time to time, whilst still retaining their original type number, this information is of the utmost importance. Each valve is guaranteed for a period of six months. The following list shows the principal types which are obtainable for the battery user, and the prices:—

	Impedance	Amplification Factor	Price
H2	32,000	32	3/6
HL2	16,000	24	3/6
L2	12,000	15	3/6
LP2	5,000	15	4/-
P2	3,000	9	4/6
SG2	400,000	600	7/6
VS2	400,000	480	7/6
ME2	20,000	(Output 1,000 milliwatts)	10/-

(All the above valves are also obtainable at the same price for 4- and 6-volt supplies.)
 BA2 Class B Output (1,500 milliwatts) Price 9/-
 BX2 Class B Output (3,000 milliwatts) Price 9/-

ANNOUNCEMENT

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OUR COURSES

Included in the I.C.S. range are Courses dealing with the Installing of radio sets and, in particular, with their Servicing, which to-day intimately concerns every wireless dealer and his employees. The Operating Course is vital to mastery of operating and transmitting.

There is also a Course for the Wireless Salesman. This, in addition to inculcating the art of salesmanship, provides that knowledge which enables the salesman to hold his own with the most technical of his customers.

Then there are the Preparatory Courses for the City and Guilds and I.W.T. Exams.

We will be pleased to send you details of any or all of these subjects. Just fill in, and post the coupon, or write in any other way.

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- WIRELESS ENGINEERING
- WIRELESS OPERATORS
- EXAMINATION (state which)

Name

Address

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 Appreciation from Shanghai

SIR,—Please accept my thanks for the safe receipt of the Wireless Encyclopaedia and Data Sheets. I have just glanced through the Encyclopaedia and it seems to be all that your readers claim. It is a valuable addition to my library, where it will be the standard reference work.

In PRACTICAL WIRELESS for July 21st, 1934, is a short waver that interests me, and I intend to build it. A two H.F. pentode circuit should pull in most stations out here, and if the details of its performance would interest you, I will gladly supply them. There is only one alteration that I would like to see in PRACTICAL WIRELESS, and that is a longer Short-Wave section.—J. BOYCE (The Bund, Shanghai).

[We are always pleased to hear from readers overseas, and shall be glad to have particulars of the performance of your short wave two-valver when completed.—ED.]

Unintentional Interference

SIR,—My experience regarding the sensitivity of a modern receiver and of the ease with which it "picks up" unwanted interference may be of interest. Recently I had occasion to examine a receiver belonging to a friend, which failed to operate; on testing out the primary of the speaker transformer for continuity with a 2-volt cell (and 500 ohm resistance in series), I heard a series of "crackles" from the speaker next door (and this through a fairly thick wall), every-time contact was made to the transformer winding. I think this is a good example of unintentional interference, which could be caused by anyone testing out wireless components, such as transformers, chokes, etc., as well as mystifying to the owner of a receiver, who happens to reside nearby.—GEO. H. EATON (Fulham).

Do you know

- THAT a single wire may be used for an extension speaker lead provided a filter-output circuit is used.
- THAT in the above case a short earth wire at the speaker end will complete the circuit.
- THAT where an extension speaker is to be used at a considerable distance from the receiver, i.e., in a garden or in a far part of the house, a small amplifier may be included in the speaker cabinet.
- THAT generally speaking a speaker with a large cone will give better low note response.

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. Neaves, 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.

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Will bring an unbelievable improvement to your set, because the exclusive "New" magnet gives nearly twice the volume of any previous commercial speaker, and a new method of speech coil assembly obtains astoundingly clear and faithful tone. Also, an improved "Microlode" device provides accurate matching with any set, or when used as an extra speaker.



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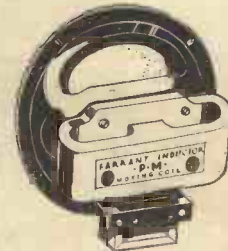
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AMPLION PRODUCTS

IN the new season's list just issued by Amplion, Ltd., full particulars are given of the "Radiolux" superhet and radiograms, together with moving-coil speakers, pick-ups, and microphones. The all-electric "Radiolux" superhet embodies the latest refinements, including an H.F. pentode and octode frequency changer. The price of this instrument has been revised, and the A.C. and D.C. models are now listed at 12 guineas and 13 guineas respectively, housed in attractive walnut cabinets. The price of the radiogram has also been revised and is now 21 guineas. The "Radiolux" auto-gram, priced at 50 guineas, is housed in a beautifully figured walnut cabinet, and is provided with automatic volume control, neon light visual tuning, illuminated full-vision scale (calibrated in metres), and a British Capheart record changer, with a ten-second loading. The range of speakers include the well-known Amplion "Lion" "Lifen-Super," and "Audiola" models. The microphones listed are high-class instruments.

"WHEN BIG MEN FIDDED"

THIS is the title of an interesting little booklet issued by the Celestion people, and it gives a brief résumé of the progress of radio from the days of cat-whiskers to the advent of Celestion speakers. It also gives some particulars of the achievements of Celestion in the field of sound reproduction, together with a few notes concerning their latest moving-coil models.

BOOKS RECEIVED.

CHRONICLE WIRELESS ANNUAL

THIS popular radio handbook, which is intended to appeal to all classes of radio users, contains 180 well-illustrated pages. For the home constructor there are a number of designs for modern receivers, including a five-valve superhet, a double S.G. four with Q.P.P. output, a three-valve with S.G. detector and pentode, and an easy-to-build two-valve. Half-size wiring diagrams of these receivers are given on a separate sheet.

Other sections give some useful information to enable the ordinary listener to get the best results from his receiver, and for those with little interest in the technical side of wireless there are chapters explaining how a typical radio programme is drawn up and how it is broadcast. For readers who are keen to know something about the why and wherefore of radio there are articles on such subjects as the methods used to rectify A.C. current, getting the best results from an external speaker, set-testing, and all about the newest valves. Television, home-recording, and noise suppression are among the other subjects dealt with, and there are also instructions for making a short-wave converter. The price of the Annual is 7s. 0d.

BROADCAST TALKS

A PAMPHLET giving the programme of B.B.C. broadcast talks for the session ending December, 1934, is now available. The regular late evening talks have, with two exceptions, been abandoned in favour of various talks features which will appear irregularly in the programmes. The series that provides the most imposing list of speakers is at 10.0 p.m. on Fridays, and presents one of the two exceptions just referred to. This series will be on "The Causes of War" and will give a number of distinguished people with different opinions an opportunity of putting forward their own theories as to how wars come about. The following speakers have agreed to contribute:

- The Very Rev. W. R. Inge, K.C.V.O., D.D.
- Sir Norman Angel.
- The Rt. Hon. Lord Beaverbrook.
- Professor J. B. S. Haldane, F.R.S.
- Aldous Huxley.
- The Rt. Hon. Winston Churchill, C.H., M.P.
- G. D. H. Cole.
- Major C. H. Douglas.
- Sir Josiah Stamp, G.B.E.

Morning talks will be at 10.45 as usual. The Tuesday and Thursday talks will be devoted to household matters. On Mondays the speakers will recall their childhood of thirty, fifty, seventy years ago. The Marchioness of Reading will talk on Wednesdays about life in general. On Fridays there will be child welfare talks, and on Saturdays "The Week in Westminster." On Sundays there will be two short talks of twenty minutes each between 4.50 and 5.30 p.m. The pamphlet can be obtained free from any B.B.C. office.

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D 210	Non-Microphonic Detector..	3/9
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PP 220	Medium Power.....	6/6
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AC/SL	Screen Grid Amplifier.....	13/6
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AC/VH	Variable-Mu High Gain S.G.	13/6
AC/HP	H.F. Pentode Type.....	13/6
AC/VP	Variable-Mu H.F. Pentode Type.....	13/6
AC/HL	Detector.....	9/6
AC/DDT	Duo-Diode-Triode.....	12/6
AC/L	Small Power.....	12/6
AC/Y	Output Pentode Type.....	15/6
AC/Z	High Slope Output Pentode Type.....	15/6
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UU/120/500	Full Wave Rectifier (I.H.C.)	15/-

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REPLIES TO

LET OUR TECHNICAL STAFF SOLVE
YOUR PROBLEMS

QUERIES and ENQUIRIES

by Our Technical Staff

The coupon on Cover iii 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. Neunes, 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.

A Mains Query

"I have a S.G., detector and power set, but wish to build a pentode three. I am using a commercial 25-milliamp eliminator. Can I make the new set 'all-mains'? If so, how? Or do you think it would be better to make it a battery set and use the eliminator (which has a trickle charger for the L.T.)? If I did the latter would I have good volume?"—F. A. (Kingston-on-Thames).

Probably the battery receiver with the trickle charging arrangement would prove most suitable to you. You would have to arrange for a much greater H.T. voltage if you desired to get the best from mains valves, as these require 200 to 250 volts on the anode, and your climinator only delivers a maximum of 150 volts. Thus you would not be working the mains valves at their optimum points and would probably get poorer results than with battery valves at full voltage.

No Reaction

"I have a three-valve set, but I cannot get any reaction at all. The reaction condenser is all right and the reaction winding is intact. Please could you tell me where else I could look for the trouble?"—H. H. (Oldham).

If the reaction circuit is intact the only failure of the set to oscillate will be found in the fact that insufficient H.T. is being applied to the anode. This may be due to too high a value of decoupling or coupling

resistance, or to a run-down battery. We presume you have ascertained that the valve is O.K., and that the quantity of wire used for the reaction winding is sufficient to cause oscillation with the particular value of condenser which is in use.

Hissing Noises

"I have a commercial super-het. (battery-operated) which I obtained cheaply from a big store near me. It is an American set, and functions quite well except for one thing. All over the dial there is a loud hissing noise, something like steam escaping from a boiling kettle. Is there any way of preventing this, as it becomes annoying after trying to search for some distant stations?"—H. G. (Blackheath).

The noise is probably valve hiss and is due to the particular valves which are in use. There is generally a background of this type when a number of highly efficient valves are employed, and the only thing you can do is to fit a large-capacity condenser across the output terminals. Naturally, high notes will be cut, but this may not prove a disadvantage if the background noises are reduced. The actual value will depend upon the speaker and output arrangements, and some trial will thus be necessary to find the most suitable condenser to use.

Faulty Aerial

"My set has worked very well for two years but I have lately been troubled with some intermittent crackling noises. These are very loud and only appear at odd times. I have tried various methods of tracing them but so far I can only state that when the aerial lead is removed I can still hear the local station faintly, but there is no crackling. The noises are by no means regular. What can you suggest?"—T. U. A. (Highgate).

The fault is probably to be found in the aerial. It may be a poor joint where the lead-in is joined, and this may have become corroded and loose and is moving when a wind blows. Alternatively, the lead-in may swing against a metal gutter or pipe and thus produce the noise. There is still, however, the possibility that the aerial is not responsible, but that the loud-speaker

(if of the M.-C. type) is not accurately centred. Thus when a loud signal is received the speech coil shorts against the pole piece, but when signals are reduced by removing the aerial the movement of the cone is not sufficient to cause the noise. This may be verified by reducing signals by means of the volume control and then listen for the noise. If it still persists, you should look to the aerial, whilst if the noise ceases, then the speaker is at fault.

Microphone Difficulty

"I have a small button microphone and have connected it to my set as shown on the attached sketch. I can get no results whatever and would thank you if you could certify my connections as correct. I used no transformer. Would this make any difference?"—J. H. (Hayle).

The connections shown are between grid and grid bias, and whilst this is the correct position for the input arrangement it is necessary to interpose a transformer between the microphone and receiver. Generally speaking, the resistance of these small microphones is in the neighbourhood of 100 ohms, and therefore you must obtain a special transformer in order to use the microphone with your receiver.

A Neon Problem

"I have purchased a television neon lamp but cannot get it to glow when connected across the loud-speaker terminals on my commercial receiver. I tried to connect it across the mains with a resistance in series and it glowed but although I connected it quickly to my set it still would not light. Can you help me?"—T. H. (Bristol).

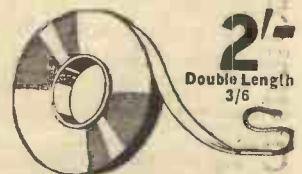
The striking voltage has to be continuously applied, and it is useless to apply the voltage and then remove it. The cause of the lamp not glowing with your receiver may be due to the fact that the anode current of the output valve is insufficient, or that an output filter circuit is fitted. You need about 20 milliamps direct current for the lamp, and if a filter is fitted you will have to arrange to incorporate a separate polarizing source.

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(Continued at top of column three)

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