

The Wireless World

4^D

THE PRACTICAL RADIO JOURNAL

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Complete Foreign Programmes

Friday, October 27th, 1933.

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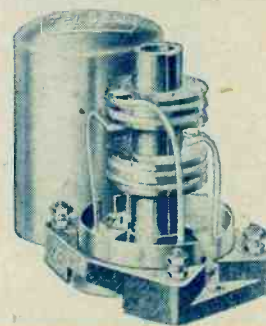
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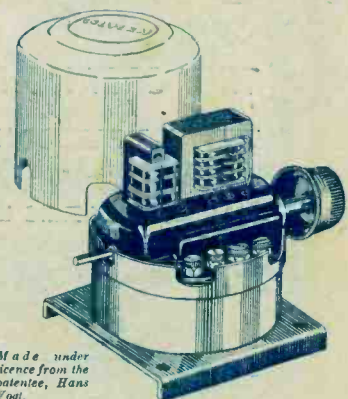
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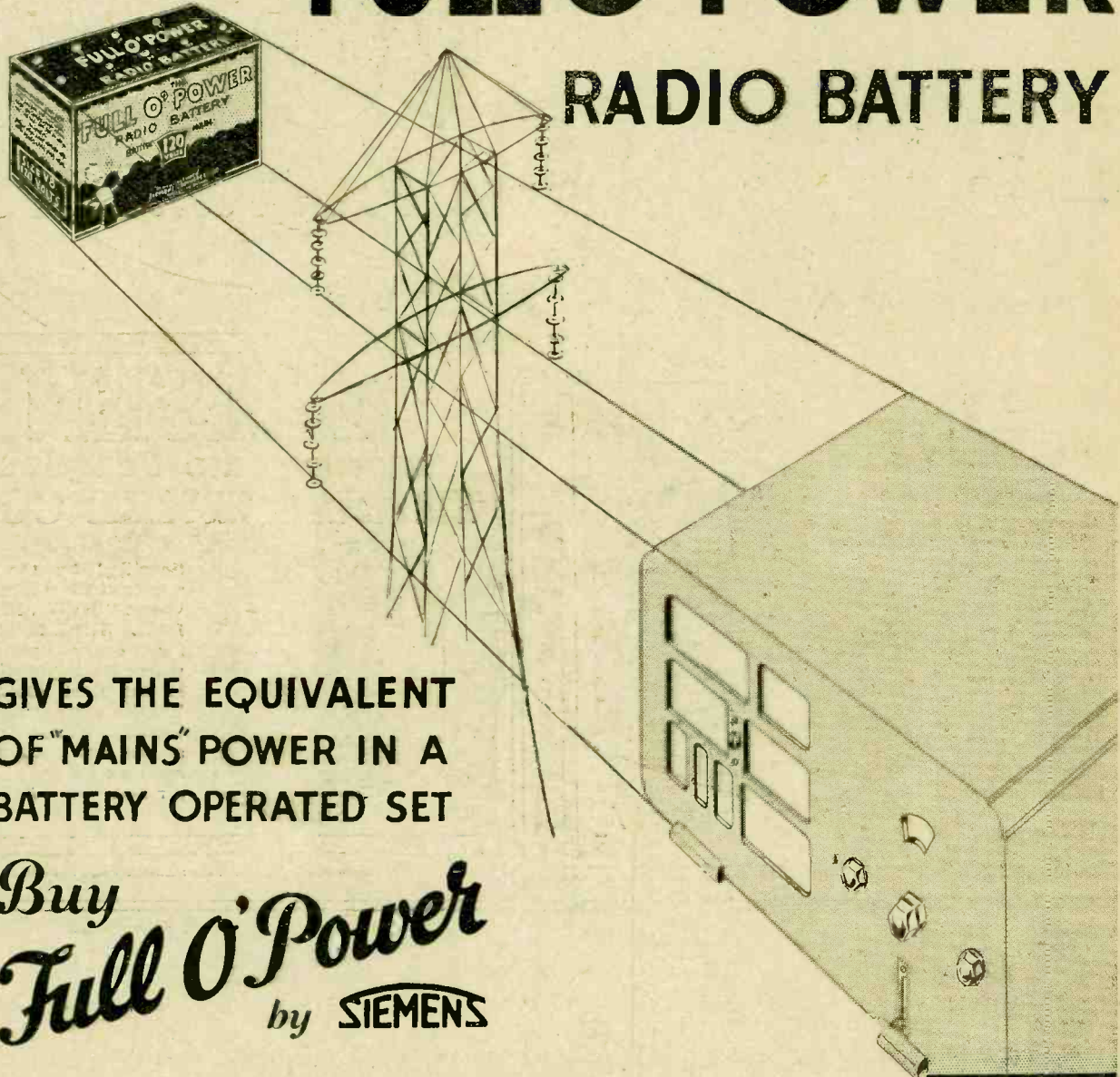


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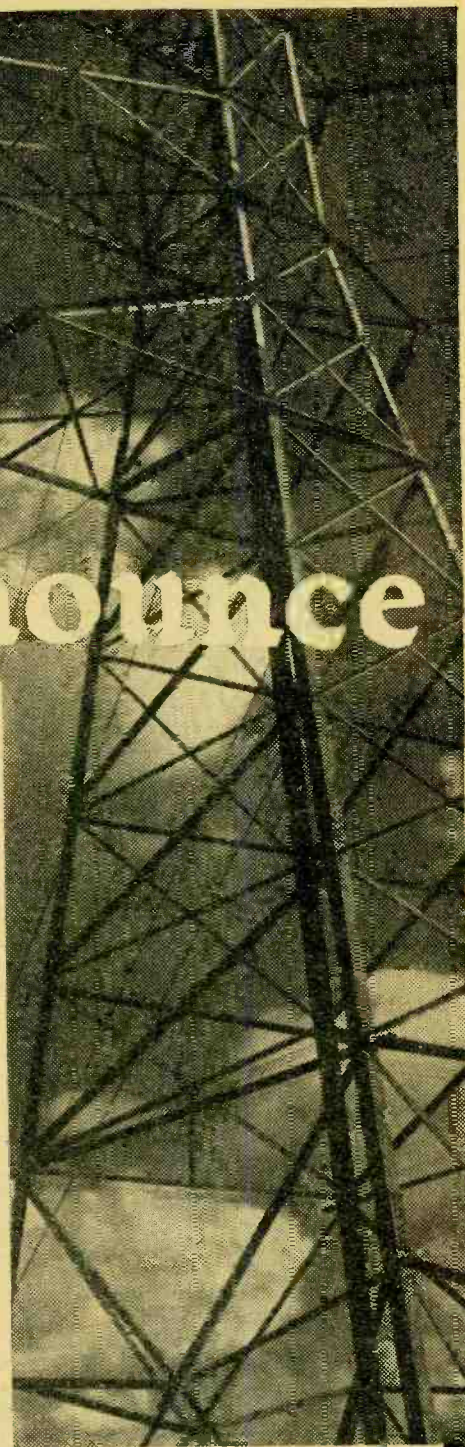
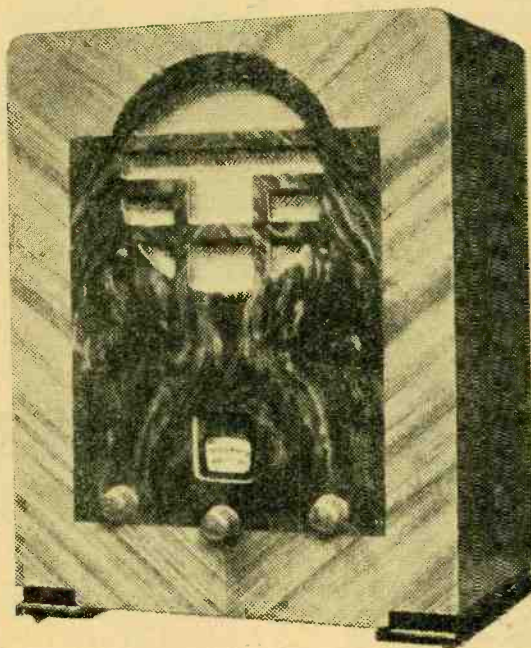
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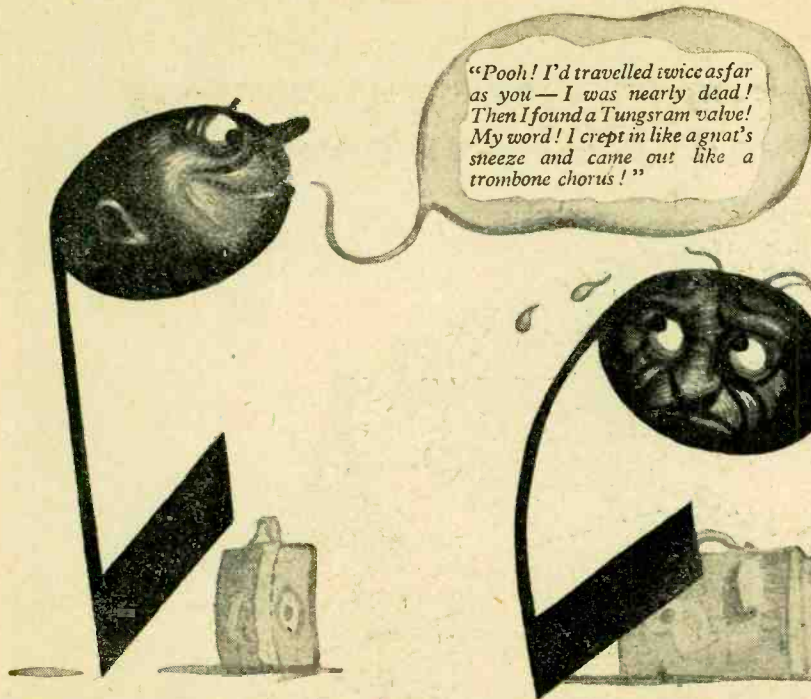
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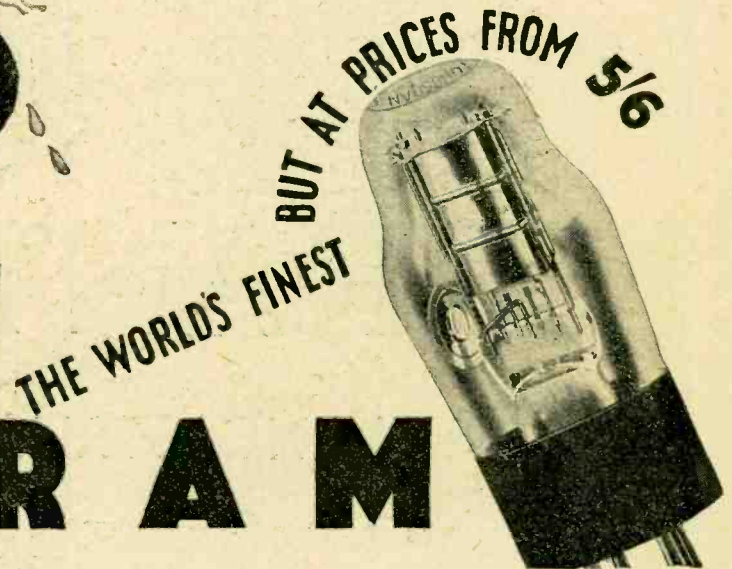


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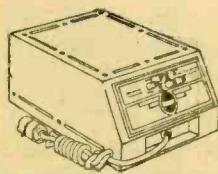
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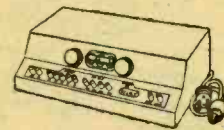


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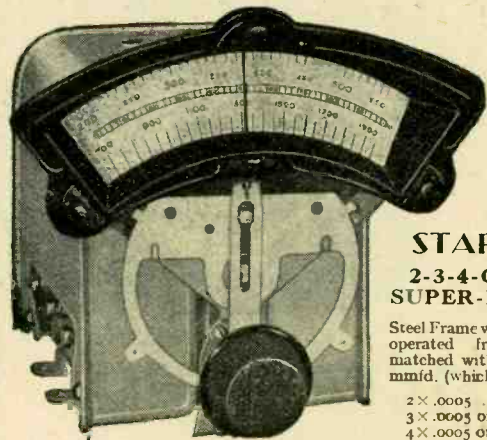
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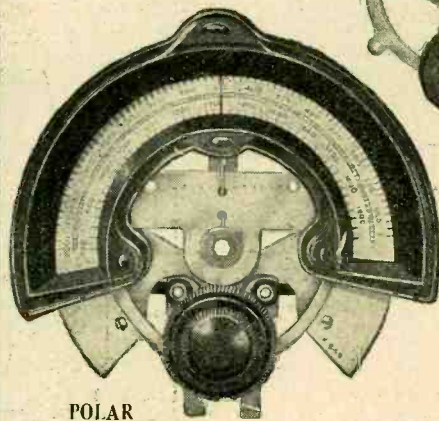
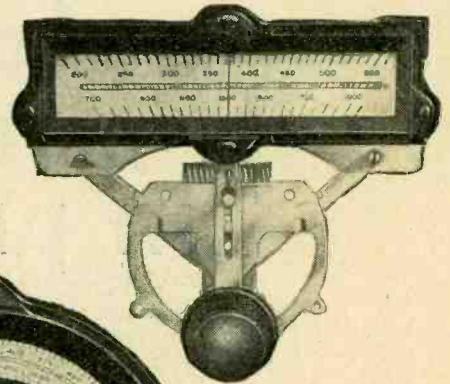
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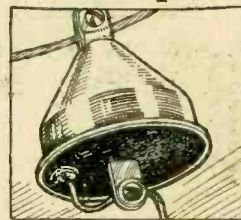
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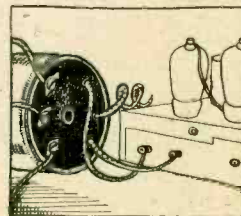
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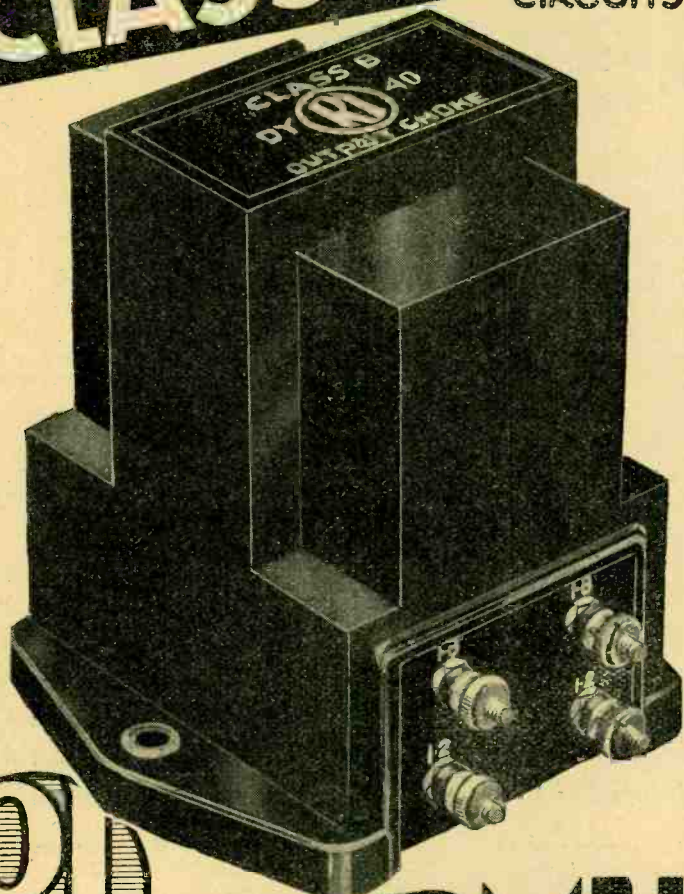
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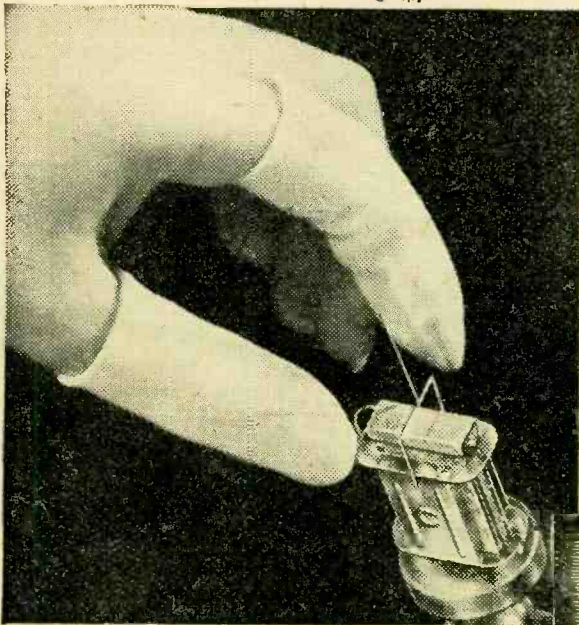
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The Wireless World

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23rd Year of Publication

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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EDITORIAL COMMENT

Electrical Interference

Progress Towards Suppression

IMPORTANT progress is being made in the crusade inaugurated by *The Wireless World* for the suppression of electrical interference with broadcast reception.

A report just issued from the Institution of Electrical Engineers advises us that the Committee on electrical interference with broadcasting, which the Institution set up some time ago as a direct result of a suggestion from *The Wireless World*, held its second meeting on Thursday, October 5th. Elsewhere in this issue we publish a report of the progress of this Committee.

It would seem that a real advance is being made not only on the general question of how to organise for the suppression of interference but also on the more detailed consideration of the technical means to be employed with specific types of electrical apparatus.

There is only one point in connection with the activities of the Institution Committee which we feel calls for criticism. In the report just issued it is stated that "The Committee reviewed various possibilities of bringing suppression devices into general use without having recourse to legislation." If by this statement it is intended to convey that the Institution Committee hopes to attain the desired result without legislation, then we feel obliged to express the view that this would be an unsatisfactory compromise not only in the interests of the broadcast listener but more especially from the point of view of the electrical industry itself. Unless legislation is introduced so as to give the Post Office the necessary authority to compel compliance with reasonable requirements, we are bound to have the unsatisfactory state of affairs resulting where individuals or certain sections of the electrical in-

dustry may be unwilling to co-operate for the suppression of interference. This would be a gross unfairness to those who voluntarily undertook, at some inconvenience and expense to themselves, to render their equipment innocuous. The purpose of legislation would surely not be to force upon the electrical industry irksome or unreasonable regulations, but to ensure that, having agreed upon fair and reasonable measures, these would be binding upon all parties on an equal footing, and without exceptions, whether the apparatus was manufactured here or imported from abroad.

G.P.O. Adopts "W.W." Suggestion

Another important step in connection with the interference crusade is one which has just been taken by the Post Office. For some considerable time past forms to be filled in by listeners suffering from interference have been available on application to the Post Office Engineering Department. *The Wireless World* has felt that this method of reporting was unnecessarily troublesome to the listener, and we therefore brought to the notice of the Post Office the desirability of having these forms more readily available.

In our issue of June 30th, 1933, we urged that "the Post Office should simplify matters by arranging for the distribution and collection of these forms by all head Post Offices." Now, interference forms are being made available so that any listener troubled with interference can obtain a form from his local Post Office, fill it in, and post it, the form being already addressed to the proper department. We hope that all listeners experiencing interference will make use of this form, for by so doing they will greatly facilitate the task of the Post Office in locating and suppressing interference.

Television Explained

I. The Principles of Scanning

TELEVISION is fast approaching the stage when it can take its place in broadcasting as a companion to the familiar sound transmissions. It has not yet reached this stage, but the indications are that it will have become of entertainment value sooner than many realise. The present article is, therefore, the first of a series intended to give an introduction to the theory and practice of television, and to illustrate some of the problems involved.

THE transmission and reception of moving pictures, which constitutes television, is a matter fraught with many theoretical and practical difficulties, and the art is hardly more advanced than that of wireless telephony in the pre-broadcasting era. This does not mean, however, that television is in any way impossible, and, indeed, it is at the present time possible to obtain extraordinarily good results in the laboratory. The apparatus employed, however, is too expensive and complicated for general use. The point of importance is neither the expense nor the complication of the equipment but the fact that good results are possible, for there is no doubt that development will in time result in a cheapening and a simplification of the apparatus, and high-quality television will then become a commercial possibility.

It may be said, therefore, that at long last television is becoming feasible and worth while for the amateur, and is opening out an entirely new field for the experimenter. The present tendencies in television lie in the employment of ultra-short

wavelengths for transmission and the use of cathode ray tubes, at least for reception. Before the benefits conferred by these can be fully appreciated, however, it is necessary to have a full understanding of the older systems upon which the latest



(b) In this picture a coarse screen has been employed with the result that much of the detail has been lost.



(c) Here the screen is so coarse that little resemblance to the original picture can be seen at first, but if examined from some distance the definition apparently improves.

developments are based. Let us therefore examine the requirements.

It is well known that in the cinema the picture thrown on the screen is not actually moving, but consists really of a series of still pictures, all very slightly different from one another, and succeeding one another so rapidly that the eye is deceived, and cannot distinguish them separately. Owing to the retentivity of the eye the impression produced by one picture persists for a fraction of a second, and before it has died away the next picture comes along.

It has been found that if not less than about ten pictures a second are thrown on the screen the impression of a moving picture is produced. With such a low picture frequency, however, there is a considerable amount of flicker, and it is now the standard practice in cinemas to



(a) In making this picture a block with a normal screen has been used.

use about twenty-four pictures a second.

Now, in television, the same requirement holds good, and it is necessary to transmit from ten to twenty-four pictures a second. The requirements, however, are made more difficult by the fact that it is impossible to transmit even one picture instantaneously, as in the cinema. Only a minute portion of the picture can be transmitted at a time, and it is necessary to break up the picture into a large number of small pieces, transmit these one after another, and then reassemble them at the receiver. When it is remembered that the whole of this process must be carried out in from one-tenth to one-twenty-fourth of a second, some idea of the speeds involved can be gained.

The Photo-Cell

The variations in light intensity in the picture are converted into variations of an electrical current with the aid of a photo-cell. Such a cell is analogous to a valve in that the light falling upon it varies a steady current through the cell in the same way that a change of grid voltage in a valve varies the steady anode current. Provided that the cell is correctly operated the change in output current is proportional to the change in light intensity, so that we have available a distortionless method of converting variations of light into variations of current which are electrically equivalent to an alternating current superimposed upon a direct current, just as in the output of any ordinary valve.

It will be obvious that if we focused the whole picture to be transmitted upon the photo-cell the current through the cell would change by an amount depending upon the total illumination

Television Explained—

of the picture, and would not depend at all upon the details of the picture. If we break the picture up into quarters, however, and let the light from each quarter fall upon the cell successively, we shall obtain a different value of photo-cell current for each quarter depending upon the total illumination of each quarter. We shall still be far from perfect, and shall obtain no intelligible picture, but the results will represent an advance on those obtained by focusing the whole picture upon the cell. Following the same argument, it will be seen that if we break the picture up into an infinite number of elements and let the light from each fall successively upon the cell, we shall obtain electrical variations of current which constitute a complete copy in the different medium of every detail of the picture.

A Method of Scanning

All printed pictures are made in a similar way from an extremely large number of elements, and if any half-tone illustration be examined under a magnifying glass it will be seen to consist of a large number of minute dots, and the greater the number of dots to the inch the better the picture. This is well brought out by the illustration, which shows the same picture printed with different numbers of dots to the inch, or different screens. At (a) a normal screen of about 85 dots per inch is used, whereas at (b) a much coarser screen has been employed. The picture shown at (c) is still coarser, and it is instructive to note how much detail has been lost. If the pictures be regarded from a distance, however, the differences appear far less, and the worst picture becomes intelligible.

The dot analogy is not strictly accurate in television, for the picture is normally broken up into a series of lines rather than distinct dots. The underlying principle,

nowever, is the same, and the differences are brought about chiefly by the methods involved. The process of breaking the picture up at the transmitter and reconstituting it at the receiver is called scanning, and in its simplest form this is carried out by means of a Nipkow disc.

upon the photo-cell. This process is illustrated in Fig. 3, in which the original picture is seen at (a); (b) shows the scanning strips into which it is divided, and (c) shows the sequence of these strips from the point of view of time. At (d) will be seen the corresponding electrical current in the photo-cell circuit, the variations of current during the interval (A) corresponding to the variations in light intensity along the strip (A) and so on.

It will be obvious that the narrower the width of the scanning strips the greater will be the picture detail, for, assuming a square hole in the disc, the smaller will be the average illumination at any given instant. In other words, the greater will be the number of elements, or, in terms of half-tone illustrations, the finer will be the screen. In the present B.B.C. transmissions by the Baird process 30 lines are used and 12½ pictures are transmitted a second. There are thus 375 lines transmitted a second.

It will be readily apparent that the breaking of the picture into such a small number of lines must lead to a poor quality image at the receiver, but before considering the number of lines which is necessary for a good picture, it will be as well to examine the other details of the transmitter and receiver, and these will be dealt with in the next article.

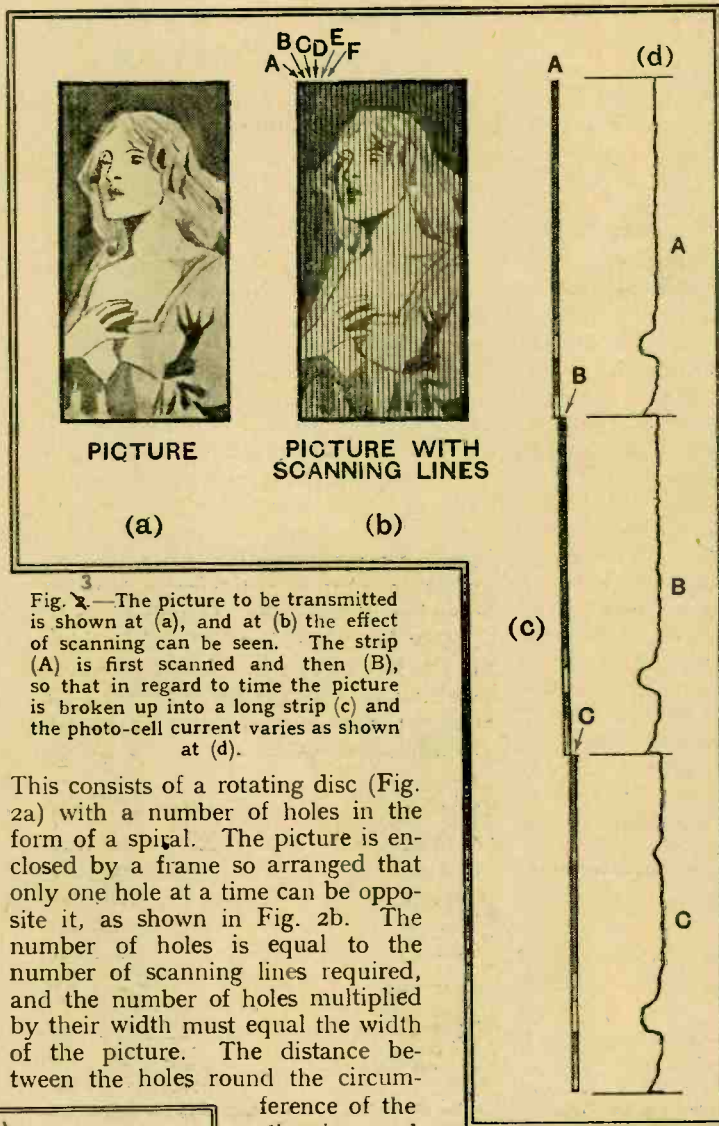


Fig. 3.—The picture to be transmitted is shown at (a), and at (b) the effect of scanning can be seen. The strip (A) is first scanned and then (B), so that in regard to time the picture is broken up into a long strip (c) and the photo-cell current varies as shown at (d).

This consists of a rotating disc (Fig. 2a) with a number of holes in the form of a spiral. The picture is enclosed by a frame so arranged that only one hole at a time can be opposite it, as shown in Fig. 2b. The number of holes is equal to the number of scanning lines required, and the number of holes multiplied by their width must equal the width of the picture. The distance between the holes round the circumference of the disc is equal to the height

of the picture. It will be seen, therefore, from Fig. 2b, that at the instant that hole (B) finishes its traverse of the picture, assuming the disc to be rotating in a clockwise direction, the hole (A) is just coming on to the picture, and will traverse a path immediately adjacent to it.

A set-up which could be used for transmitting a cinema film is shown in Fig. 2c, where the light from a lamp is directed through the film, and after being scanned by the disc falls

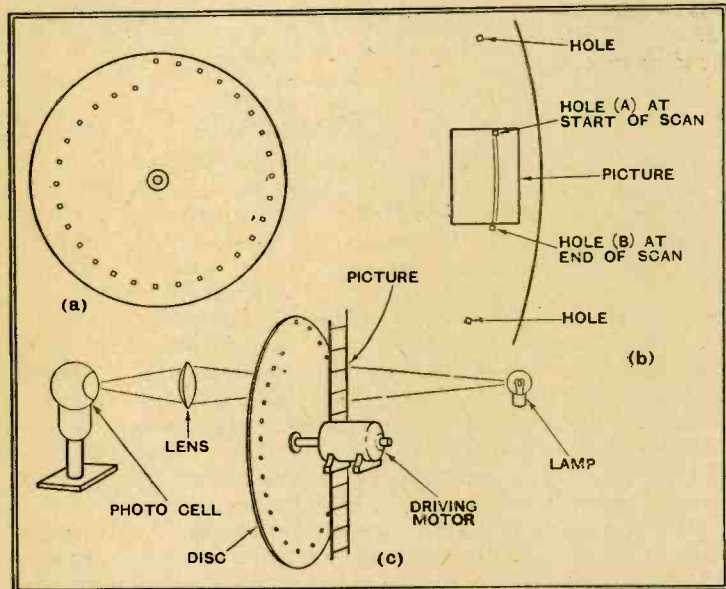


Fig. 2.—The scanning mechanism employed in simple television apparatus is shown diagrammatically. At (a) the arrangement of holes in the Nipkow disc can be seen, and (b) shows how the picture is traced by the successive holes. The complete arrangement for transmitting a picture from a cinema film is illustrated at (c).

NEXT WEEK'S ISSUE:

Valve Data Booklet

A Special Supplement giving full practical data on all types of valves. Invaluable to every serious reader.

The issue will also contain special articles on valves and their applications.

Practical HINTS and TIPS

AMONG those engaged in the heavier branches of electrical engineering, we wireless people have the reputation of being almost criminally negligent in the matter of providing safety fuses for our apparatus. Many of the criticisms which have been directed against us are not altogether deserved, but in one respect at least we should take care to put our house in order. This is with regard to the fusing of by-pass condensers used in connection with anti-interference mains filters.

Fuses for Mains Filters

As most readers are aware, the purpose of these filters is to deflect H.F. currents superimposed on the mains supply from the household wiring, whence this energy is likely to be radiated (as from an aerial) and to interfere with broadcast reception. The subject has been dealt with exhaustively from time to time in these pages, and the difficulty of using choke-capacity filters has been explained. It might be added to what has already been said that, according to the Post Office engineers, most types of interference are mitigated by plain by-pass condensers, which, provided they can withstand the applied voltage, may be fitted without introducing complications.

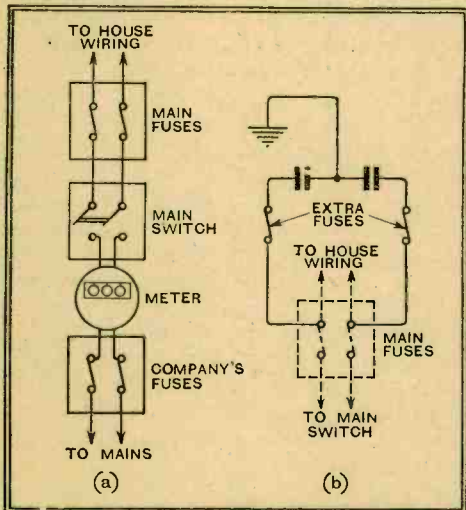


Fig. 1.—Usual method of installing a mains supply, and the safest position for an anti-interference filter.

In order that any type of mains filter may be thoroughly effective, it is essential that it should be connected as near as possible to the point of entry of the mains into the house. Those who are proposing to fit, or to instruct their electricians to fit, a filter will find it worth while to study the skeleton diagram given in Fig. 1. (a), which represents the ordinary sequence of connecting the various accessories employed in a domestic electrical installation. The mains are led directly to the company's fuse box, which is sealed and inaccessible; next comes the meter, and then

AIDS TO BETTER RECEPTION

the mains switch. For obvious reasons, no connection should be made to these points; anything that is added should be joined on the output side of the main fuses, which are connected to the on-off switch.

A little consideration will show that the result of a breakdown in a by-pass condenser connected either across the mains or between the "live" main and earth will be a direct short-circuit, which will blow the main fuses and put the whole house in darkness. Extra fuses of a much lighter gauge (capable of carrying, say, 1 amp.) should therefore be connected in series with the condensers, as in Fig. 1. (b), which represents the normal method of installing a plain capacity filter, and shows what is normally the correct point of attachment to the household wiring. Safety fuses are already fitted in this way in the Belling-Lee interference suppressor, which also comprises the necessary condensers, ready mounted, with terminals, in a moulded case.

IN designing an A.V.C. superheterodyne, it is quite usual to control the first detector as well as the signal-frequency H.F. stage and the I.F. amplifier. Anode-bend detection is almost universally employed for the first detector, and so it is practicable to decrease the sensitivity of the valve by applying an excess negative bias to its grid in just the same way as when dealing with an amplifying valve.

It should be made quite clear that, with ordinary valves, this form of control is applicable only when a two-valve frequency changer is employed. With a combined detector-oscillator the application of a high negative controlling voltage to the grid will prevent the generation of oscillations unless a Heptode is used.

The Pentagrid Oscillator

exception to this rule, in spite of the fact that it is a multiple-electrode valve, in which one of the grids acts, so far as its oscillator function is concerned, as an anode.

At first sight it might appear easy enough to apply a higher anode voltage, but in a mains-operated set it is seldom possible to do this directly. Similarly, it is not generally realised that the fairly obvious alternative of increasing the working anode voltage by reducing the value of feed resistance is likely to prove abortive.

The reason for this is shown diagrammatically in Fig. 2, which represents in

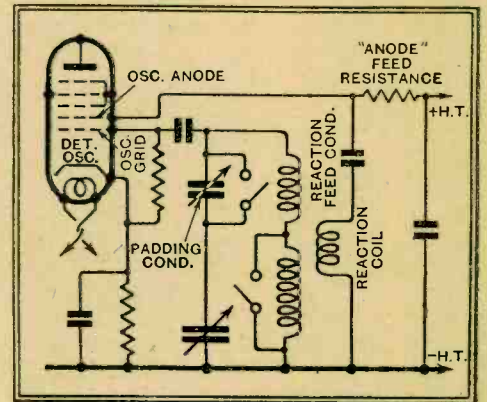


Fig. 2.—Showing that the feed resistance for the oscillator section of a Pentagrid valve is, in effect, in shunt with the reaction coil.

skeleton form the oscillator circuit of a superheterodyne using one of the new valves. The feed resistance through which voltage is applied to the oscillator "anode" is virtually in shunt with the reaction coil; any great reduction in the value of this resistance will impose a partial short-circuit across the reaction coil, and so, although the anode will be operating at a higher potential, it will generally be found no easier to obtain self-oscillation.

THEORETICALLY, the undistorted output obtainable from a pair of output valves connected in parallel should be just double that of a single valve of the same type. But in practice so great an increase is not always realised. Take the case of a D.C. receiver, where, due to a limited H.T. supply, the practice of fitting parallel valves is fairly common. The addition of a second valve may reduce the working anode voltage to a serious extent, due to the greater loss of voltage in the smoothing equipment and output transformer primary.

Parallel Output Valves

This is where the "D.C. Superhet" scores. In this receiver (recently described in *The Wireless World*) the total anode current consumption is unusually low for such an ambitious set, and moreover, the circuit arrangement is such that a very limited amount of smoothing is required. Consequently there is very little loss of H.T. voltage, and so exceptionally great volume is obtainable from a single output valve.

Design for a Scratch Filter

Constructional Details and Hints on Adjustment

IMPROVEMENTS in the manufacture of gramophone records in recent years have gone far to minimise the irritation of surface noise, and where trouble is experienced on this score it is safe to assume that a fairly considerable high-note resonance is present in the electrical pick-up.

Surface noise covers a wide band of frequencies and is thus able to stimulate the natural resonance of the pick-up at whatever frequency it may occur. It is, in fact, quite easy with a little experience to estimate the approximate frequency of the needle armature resonance from the character of the surface noise. It is for this reason that in modern pick-up designs every effort is made to reduce as far as possible the rise in output due to armature resonance, and in the majority of cases this rarely exceeds 5 db. A year or two ago it was by no means uncommon to find units with otherwise excellent characteristics producing armature resonance amounting to 10 or 15 db., and where one of these units is still in use the introduction of a scratch filter will result in a very marked reduction of background noise without appreciably affecting quality in the upper register.

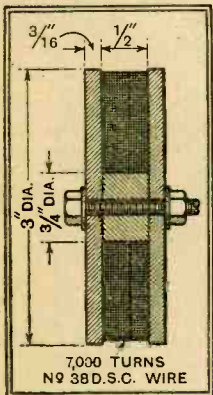


Fig. 2.—Essential dimensions of filter choke giving 1.8 henrys for a D.C. resistance of 1,000 ohms.

The characteristic of such a circuit is shown in Fig. 1, from which it will be seen that the impedance of the circuit reaches its lowest value at resonance. At this point the impedance is actually

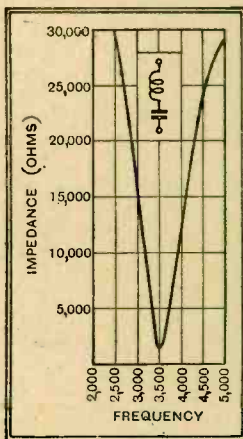


Fig. 1.—Impedance of acceptor circuit near resonance. Inductance 1.8 H., capacity 0.00117 mfd., D.C. resistance 1,050 ohms.

very little higher than the D.C. resistance of the coil, but at other points in the frequency range its impedance may easily rise to a hundred or more times this value.

In the majority of pick-ups the armature resonance lies between 2,500 and 5,000, and a suitable choke for this range is shown in cross-section in Fig. 2. The former consists of two 3in. discs cut from three-ply wood and spaced 1/2in. apart by a 3/4in. diameter centre boss. With 7,000 turns of No. 38 D.S.C. an inductance of 1.8 henrys is obtained for a D.C. resistance of 1,000 ohms. The tuning capacity consists of an 0.0005 mfd. variable in conjunction with two fixed mica condensers of 0.0005 and 0.001

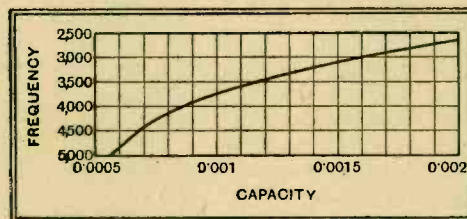


Fig. 3.—Tuning curve of acceptor circuit with an inductance of 1.8 H.

mfd. respectively. With this combination a continuously variable capacity from below 0.0005 to 0.002 is obtained, and in conjunction with the inductance already described gives the frequency range shown in Fig. 3.

The next step concerns the method of utilising the fall in impedance of the acceptor circuit to cancel the resonance peak in the output from the pick-up. Probably the best arrangement is that in which the acceptor forms the lower half of a potential divider connected across the pick-up terminals. In the circuit in Fig. 4 one half of the potential divider

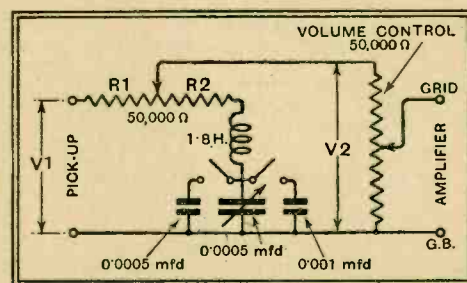
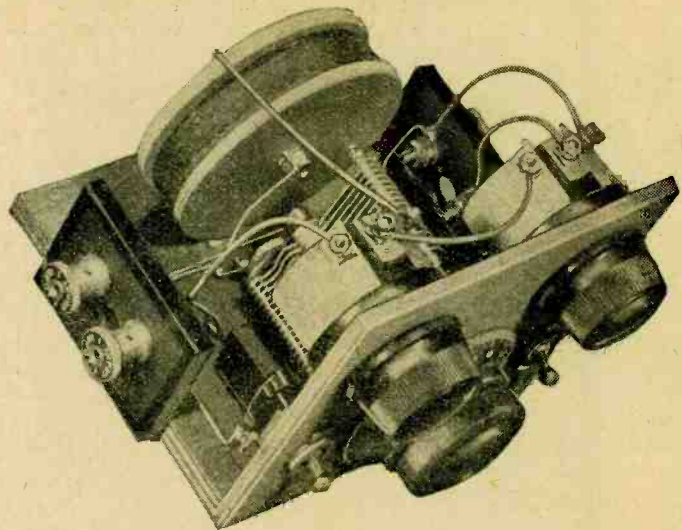


Fig. 4.—Complete circuit diagram of filter unit.



An experimental filter unit constructed on the lines advocated in this article

consists of R1, and the other of R2 in series with the tuned circuit. In order to obtain the required degree of correction at resonance it is necessary to adjust the slider so that the ratio of the impedance of the acceptor circuit in conjunction with R2, to the resistance of R1 (and, to a certain extent, the impedance of the pick-up itself) gives the required reduction in the ratio of V2 to V1. At frequencies other than resonance the volts passed on to the amplifier will be determined by the resistance of the volume control in relation to R1 and the pick-up impedance, since the impedance of the acceptor circuit will rise considerably above 50,000 ohms. In order to increase the correction the slider is moved to increase R1 and decrease R2, but this will also have the effect of reducing the general level of the output. This is unavoidable, but fortunately the reduction of the resonance peak progresses at a greater rate than the reduction in general level, and a satisfactory correction can be made in most cases without serious loss of volume. This point is brought out in the curves of Fig. 5, which are actual measurements of the output of a commercial pick-up in the region above 1,000 cycles. The ratios of R1 to R2 were as follows: In Curve I, 1 to 3; Curve II, 1 to 1; Curve III, 3 to 1. It will be seen that the latter ratio gives a slight over-correction of the peak, so that

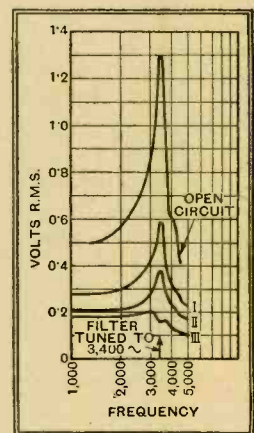


Fig. 5.—Pick-up characteristic in region of armature resonance, with and without filter. Curve III shows the effect of over-correction.

It will be seen that the latter ratio gives a slight over-correction of the peak, so that

$$\sqrt{1.050^2 + (2500 \times 6.28)^2} - \frac{10^6 \times 100}{2500 \times 6.28 \times 1170} = R + j\omega L + \frac{1}{j\omega C}$$

Design for a Scratch Filter—

the correct adjustment would have been given by a slightly higher value of R₂.

The preliminary adjustments of the filter should be made with R₁ at maximum and R₂ at zero. This gives the highest possible degree of correction and enables sharper definition to be obtained when tuning out the scratch. Having found the pick-up resonance, the next step is to increase R₂ and reduce R₁ as far as possible

without reintroducing the surface noise. This will avoid an unnecessary reduction in high frequency response.

In conclusion, it should be realised that the scratch filter of necessity causes a reduction of the average output, and that in some cases an extra stage of amplification may be called for. In general, the less the degree of correction required by the pick-up, the smaller will be the reduction in general volume.

DISTANT RECEPTION NOTES

Spanish Mystery : Stations that Lose Power

A NEW Spanish station was opened recently at Tarragona. This is EAJ33, which is working on a wavelength of 202 metres. I have not so far picked up its transmissions, but since on certain nights stations near the bottom of the medium waveband are wont to come through with almost uncanny strength I have no doubt that it will be received before long. Several of the Spanish stations used at one time to be amongst the best received of Continentals in this country. Old hands will remember Radio Iberica, which seven or eight years ago operated with an output power of not more than two kilowatts, but was heard night after night at enormous volume on the small "straight" sets that most of us used in those far-off days.

Then Madrid Union Radio had its day. It used to be received quite as powerfully as is Toulouse nowadays. The next Spanish station to come into prominence was Barcelona EAJ13, which was so easy to find that the veriest beginner could tune it in without difficulty, despite the many control knobs that receiving sets sported at that time.

Now, even with a super-heterodyne, it is difficult to receive any of the Spanish stations at all well. I have often wondered why it is that so many stations are magnificently received when they first come into operation, and for perhaps a year or more afterwards. Then a decline sets in, and the time comes eventually when the volume obtainable from them dwindles to a mere fraction of what it originally was.

Shrinking Volume

Motala is a case in point. When it began operations this station was as strong by day or by night as 5XX, though the latter is only forty-five miles distant. Now, though generally receivable at loud speaker strength, it is a mere shadow of its former self.

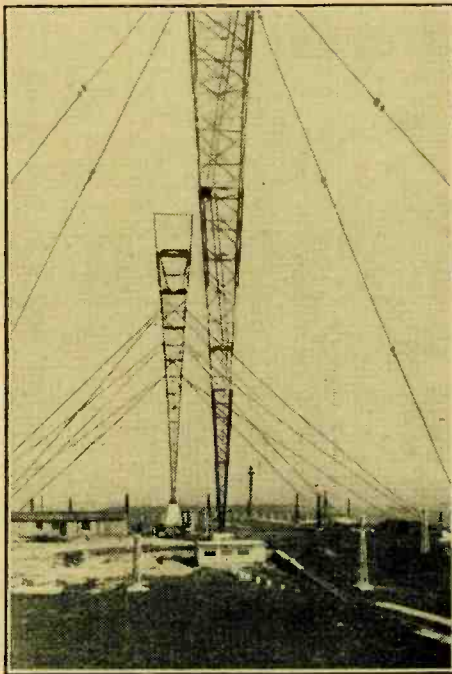
The old Vienna Rosenhügel station had a similar history; Lwow has behaved in much the same way, and other instances are to be found in Paris Ecole Supérieure, Berlin Witzleben, Lille PTT, Copenhagen, Hörby, and the old 8-kilowatt Kalundborg transmitter.

Though it was announced recently that the 60-kilowatt Munich station was closing down to enable work to go forward on the new aerial mast for the 100-kilowatt transmitter which will come into operation on January 15th, I can record quite good reception of this German station up to the evening before these notes were written. If it was the old 1.5 kilowatt plant that was responsible for the transmissions in question it is giving a very good account of itself. Munich should be a magnificent transmis-

sion after January 15th, though the new wavelength of 405.4 metres will not then be quite so favourable for long-range reception.

Reception on the long waves has not been too good of late. The reason is not that the field strength of stations is not adequate; it is that interference has been so rampant. Huizen still suffers from the attentions of Brasov, and, apparently, of a Russian station as well; Luxembourg has been badly heterodyned—apparently by Reykjavik—and Kalundborg is once more spoiled by Monte Ceneri. The long-wave stations most worthy of attention are Radio-Paris, Zeesen, and Motala.

There is also a great deal of interference



"NOT GOOD ENOUGH" has been the verdict of listeners to the new Vienna station at Bisamberg. A second mast is now being erected, as shown in this "snap," taken last week by a *Wireless World* correspondent.

on the medium waveband. Hilversum has occasionally been interfered with by a heterodyne which appears to be due to a harmonic of Luxembourg. Beromünster and Bari have also been sufferers from heterodynes.

Nevertheless, there are plenty of stations to be found quite clear of interference. The best at the present time are Budapest, Prague, Langenberg, Rome, Stockholm, Toulouse, Midi, Leipzig, Strasbourg, Brussels No. 2, Poste Parisien, Breslau, Göteborg, Heilsberg, Frankfurt, Trieste, and Nürnberg.

D. EXER.

CLUB NEWS

New Session

From all quarters we learn of the resumption of club meetings, and indications are that the 1933-34 session will be as busy and profitable as any in the history of the amateur radio movement.

One reason for this promising state of affairs is the ease with which the average wireless club can be organised and run to-day. Although it is not true to say that a club will run itself, every club secretary can now profit by the experience of other clubs throughout the last ten years, as reflected in the club reports published in *The Wireless World*.

Newcastle

The Newcastle-upon-Tyne Radio Society has arranged an attractive programme of lectures, demonstrations and visits to works during the coming session. All communications should be addressed to the Hon. Secretary, Mr. William W. Pope, 9, Kimberley Gardens, Jesmond, Newcastle.

Birmingham

Members of the Slade Radio (Birmingham) Society enjoyed a lecture on the "Cathode Ray Oscillograph and its Application to Radio Circuits," given by Mr. G. Parr, of the Edison Swan Electric Co., Ltd., recently. Various wave forms were demonstrated and could be seen quite clearly.

Hon. Secretary, 110, Hillaries Road, Gravelly Hill, Birmingham.

London, W.

The Radio, Physical and Television Society, thanks to the facilities accorded by Dr. C. G. Lemon, now has the use of 42- and 5-metre transmitters, together with various types of electrical apparatus, X-rays, etc. Television demonstrations are to be given by the President, Major Oates. The headquarters are at 72a, North End Road, West Kensington, London, W.14, and full particulars regarding the Society can be obtained from the Hon. Secretary, Mr. F. J. Bubear, 67, Nassau Road, Barnes, S.W.13.

Exeter

West of England amateurs are well catered for by the programme of the Exeter and District Wireless Society during the coming months, which will include lectures on short-wave work, modern radio practice, choosing a loud speaker, besides visits to places of interest.

Full particulars are obtainable from the Programme Secretary, Mr. E. H. Ware, "The Beeches," Woodbury, Exeter.

Croydon

The Croydon Radio Society can now accommodate fifty people at its meetings at the new headquarters, St. Peter's Hall, Ledbury Road, South Croydon. Full particulars regarding the new session can be obtained from the Hon. Secretary, Mr. E. L. Cumbers, 14, Campden Road, South Croydon.

Kettering

The Kettering Radio and Physical Society recently held a successful radio exhibition at which nearly 10,000 people paid for admission, the contingents coming from as far afield as Wellingborough and Bedford.

Full particulars of the coming session can be obtained from the Hon. Secretary, Mr. R. J. Pankhurst (G5YF), 9, Shakespeare Road, Kettering.

North Middlesex

The new Hon. Secretary of the North Middlesex Radio Society is Mr. J. G. Turner, 3, The Ridgeway, Old Southgate, N.14., to whom all enquiries should be addressed.

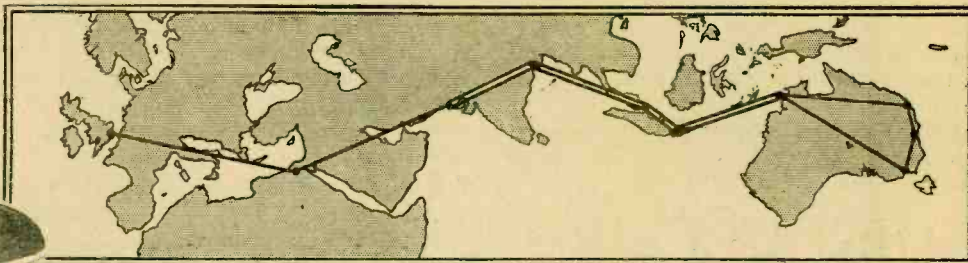
Cambridge University

The new Hon. Secretary of the Cambridge University Wireless Society is Mr. J. Forster Cooper (Gonville and Caius College, Cambridge).

By Air to the Antipodes

Radio Survey that Broke Records

By W. J. E. BROWN,
Marconi Operator

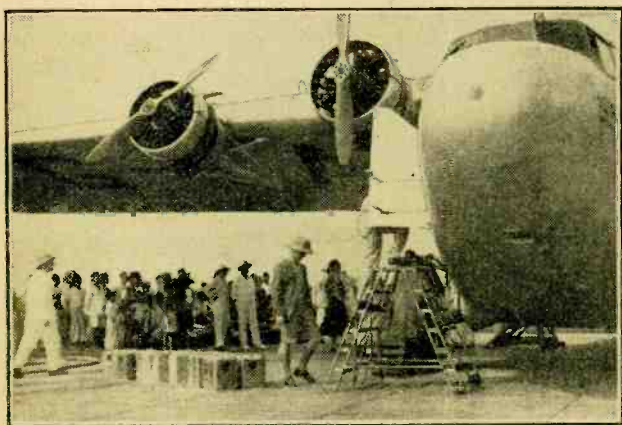


The flight covered half the world. On the left is an "Atalanta" class 'plane of the type used on the survey.

FOR the survey of the proposed England-Australia air route recently completed by Major H. G. Brackley, D.S.O., D.S.C., Air Superintendent of Imperial Airways, Limited, the choice of one of the "Atalanta" class aeroplanes—"Astraea" (G-ABTL)—was particularly appropriate from the wireless standpoint, because all the new fleet of eight "Atalantas" operated by Imperial Airways, Limited, are equipped with the latest type of Marconi aircraft equipment.

"Astraea" flew from the Air Port of London, Croydon, to Melbourne, Australia, and back to India, a distance of more than 23,000 miles, and, in Major Brackley's own words, "everything went like clockwork."

In addition to enabling us to defeat the heavy atmospherics encountered in the monsoon areas our combined medium and short-wave equipment achieved some interesting long-range ground-and-air communications (two-way), although our object was not to concentrate on distant communication, but rather to keep in constant touch with the ground through a series of stations in each territory covered by the flight.



The "Astraea" photographed while refuelling at Batavia on the homeward journey.

The wireless transmitter and receiver installed in "Astraea," as in all the "Atalanta" class aircraft, for Imperial Airways, Limited, is known as the Marconi Type A.D.37A/38A equipment.

The waveranges adopted as a result of extensive practical tests carried out over the African air route are 40-80 metres and 500-1,000 metres.

The transmitter is provided with the independent drive method of frequency control, the valves used comprising two magnifier valves connected in parallel, one independent drive and one modulator.

The receiver employs one screen grid high-frequency amplifier, one detector with adjustable reaction coupling, and one low-frequency magnifier.

Power for the anode and filament circuits of both transmitter and receiver valves, and also for aircraft lighting purposes, is derived from a generator fitted with a constant speed windmill and developing 200 milliamperes at 1,200 volts, and 15 amperes at 16 volts, for the high- and low-tension supplies respectively.

The Marconi-equipped "Atalanta" aircraft are also fitted with a wireless navigational aid in the form of the Marconi-Robinson directional receiving equipment.

The Marconi-Robinson system of direction finding provides what is essentially a "homing" device to enable the pilot to set his course on a known ground station. While the aircraft is on its correct course no signal will be heard from the direction finder when it is brought into operation with a special three-way switch in its central position. The alteration of the course will cause signals to be received, and by turning the switch first to one side and then to the other and listening to the relative strengths of the signal an indication is immediately obtained as to whether the aircraft is to starboard or port of its true course. The

correction in course can then be made until the strength of signals is unchanged, whether the switch be to the left or right, and the accuracy of the course so determined can be checked by putting the switch to the central position when, if the course is correct, no signal will be heard.

The first section of the flight, from Croydon to Karachi, followed the normal air route. The usual good service was obtained from Croydon, Le Bourget, Dijon, and Lyons, on 900 metres, the international aircraft waveband, and, on leaving Lyons, information regarding the weather and upper winds off Genoa and Pisa were obtained direct from Genoa.

After passing Antibes good two-way communication, both speech and telegraphy, was established with Croydon on 45.5 metres, and it seemed but a little later that, between Brindisi and Athens, Cairo was worked on the same wavelength.

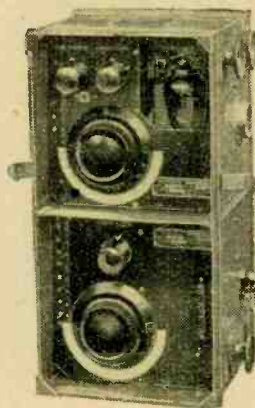
Regular communication with the ground was maintained throughout the Cairo-Karachi section of the flight, working on both medium and short waves with the stations at Cairo, Gaza, Rutbah Wells, Baghdad, Sharjah and Gwadir.

New Use for "Homing" Device

After leaving Karachi we had departed from the regular Imperial Airways routes, and between that station and Calcutta a good deal of direction-finding work and weather information was required. Calcutta also has a Marconi-Adcock direction-finding station, and several very good bearings were obtained from this station and checked with our own "homing" equipment.

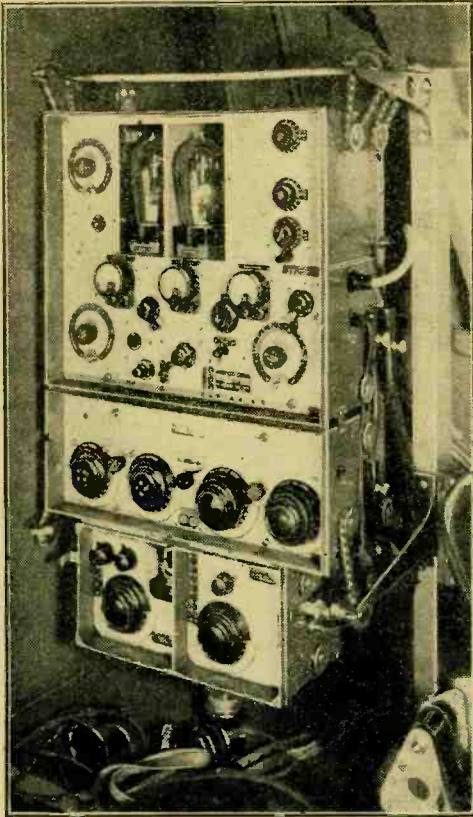
There was an incident of exceptional interest between Akyab and Rangoon, when communication was established with a homeward-bound Dutch machine belonging to the K.L.M. organisation. The Dutchman's course was checked with our "homing" device and was found to

The amplifier and three-way switch of the Marconi "homing" equipment.



By Air to the Antipodes—

be approximately the same as our own. I therefore asked at what height he was flying, and we altered our own height accordingly. It seems that this might be a very useful application of the "homing" device when flying in bad visibility and in the vicinity of other aircraft.



The "Astraea's" Type A.D.37a/38a Marconi equipment. On top is the transmitter and below it the receiver. The smaller instrument box contains the "homing" device.

The first communication with Darwin (North Australia) was made just after leaving Sourabaya (Java), G-ABTL transmitting on 45.5 metres and Darwin answering on 40 metres.

Crossing the Timor Sea (between Java and Australia) short-wave schedules had to be abandoned, as I was kept busy on 600-metre working with ships; we also had good service from Darwin on this wave-band, from whom particulars of the landing-ground on Bathurst Island were received. After landing on Bathurst Island an hourly watch was kept with Darwin on 600 metres, there being no regular channel of communication between the island and the mainland, and a large number of messages was sent and received.

On the Return Flight

The final "hop" between Sydney and Melbourne covers an area well known for poor reception, due to the mineral properties and screening of the Blue Mountains. No undue difficulty was, however, experienced by "Astraea," and although the maximum range with Sydney on 600 metres was only about 200 miles, Adelaide came in very well on the same wavelength.

The flight back across Australia was un-

eventful, Darwin and Sydney being held practically all the way until arriving at Darwin. For the Timor Sea crossing we "homed" on Koepang (600 metres). Leaving Koepang, Batavia "PMH" was heard sending high-speed traffic on about 44 metres. Suddenly, "PMH" began calling "G-ABTL," and we had excellent communication.

Singapore "GEO" was worked on short waves soon after leaving Sourabaya.

On the flight from Singapore we kept in touch with "GEO" and also Penang on short waves, atmospherics being very bad on long waves.

Atmospherics were extremely bad from Calcutta to Karachi, and the value of short-wave working in these circumstances was exemplified by good reception of a number of short-wave stations, including Berlin and Moscow.

Within a short time we were again at Karachi, and back on the regular air route, feeling that we were indeed Empire pioneers.

BOOKS RECEIVED

The Yorkshire Radio Book, by Leslie W. A. Baily, including the history of Broadcasting in the North from 1923 to 1933. Interesting notes concerning Northern stations, studios, and programmes of the personnel connected with them, a list of Yorkshire amateur transmitters and sundry useful data. Pp. 84, with numerous illustrations. Published by the Yorkshire Conservative Newspaper Co., Ltd., Change Court, Albion Street, Leeds. Price 6d.

Hints and Kinks for the Radio Amateur.—Compiled by the American Radio Relay League, Inc., West Hartford, Conn., and comprising many useful hints for use in the

FOREIGN BROADCAST GUIDE**BRESLAU**

(Germany).

Geographical position: 51° 5' N.; 17° E.

Approximate air line from London: 745 miles.

Wavelength: 325 m. Frequency: 923 kc/s.
Power: 60 kW.

Standard time: Central European (one hour ahead of G.M.T.).

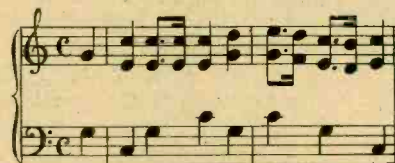
Standard Daily Transmissions

05.00 G.M.T., physical exercises from Berlin (except Sundays); 08.00 approx. (Sun.), sacred concert; 10.30, weather and news; 11.00, concert; 15.00-16.30, light concert (talk in interval); 19.00, news, followed by main evening programme; 21.15, time signal, weather and news; 21.30-23.00 (except Mondays), dance music.

Announcer: Man.

Call: *Achtung! Hier Schlesischer Rundfunk Breslau und Gleiwitz.*

Interval signal: Metronome (200 beats per minute) and/or opening bars of Hoheñfriedberger March, as under:



Closes down with good-night greetings, followed by *Deutschland Ueber Alles* and/or the *Nazi Horst Wessel* marching song.

Relay: Gleiwitz, 253 metres (1,184 kc/s.) 5 kW.

workshop, constructing receivers and transmitters, microphones, remote control, interference elimination, power supply, aerials, earths, etc. Pp. 80, with numerous illustrations and diagrams. Copies can be obtained in Great Britain from Mr. F. T. Carter, Flat A, Gleneagle Mansions, Streatham, for 2s. 9d., post free.

Les Récepteurs Radiophoniques Modernes à la portée de tous, by Franck Duroquier, giving constructional details of various receivers ranging from a simple crystal set to a six-valve superhet and a five-valve all-range set, with chapters on the upkeep, adjustment, and testing of these receivers. Pp. 191+viii, with 138 diagrams and illustrations. Published by Masson et Cie, Paris. Price 24 francs.

Electrical Interference**Questionnaire Now Available at Post Offices**

If you suffer from electrical interference you will now be able to obtain an interference form from your local Post Office. "The Wireless World" recommended this simplification of the former procedure of having to apply, in writing, to the Engineering Department of the Post Office or through the intermediary of the B.B.C.

The wording of the form is as follows:—

IF interference is experienced when stations of the British Broadcasting Corporation are being received and it has been ascertained that the receiving set is in no way faulty, this form should be completed and forwarded by post.

The interference will be investigated and particulars of the necessary suppression apparatus will be furnished without charge. The costs subsequently involved in the permanent installation of suppression apparatus cannot be borne by the Post Office.

1. Are you using a valve set or a crystal set? If valve, state number of H.F. and L.F.
2. Does your receiver draw any part of its H.T. or L.T. supply from the electric light mains?
3. Has your set or aerial, etc., been altered in any way prior to the commencement of the interference? (Please give particulars.)
4. (a) Are your neighbours simultaneously suffering the same interference as yourself?
(b) Is the proportion of interference to music the same in neighbours' receivers as in your own?
(c) To which British Broadcasting Station do you listen most frequently?
(d) Is this Station affected by the interference?
(e) Is the Daventry Long Wave Station (5XX) affected?
5. Do you know, and can you give the address of, any local listener who hears the interference at a greater strength (in proportion to the broadcast transmission) than yourself?
6. (a) Does the interference cease when you disconnect (1) your aerial, (2) your earth, or (3) both? (Please ensure that your set is not oscillating when the aerial or earth is removed.)
(b) Have you examined your aerial and earth wires and connections for frayed strands or bad joints?
7. State periods when interference is most pronounced.
8. If you are not a new listener, has the interference suddenly commenced?
9. Can you give date when interference first noticed?

Post Office Research

A Tour Round the New Experimental Station

TO provide facilities for the investigation of technical problems, which yearly increase in number, considerable extensions have recently been made to the Post Office Research Station at Dollis Hill, London, N.W. The new buildings, which were officially opened last Monday by the Prime Minister, are not, of course, devoted exclusively to radio, but a great deal of extra space has been allotted to that important section.

There are no secrets at Dollis Hill. As members of a Department of State devoted to public service, the engineers in charge—as keen and well-informed a body of men as any in the country—were willing to discuss freely all the aspects of their work, and to describe everything that was going forward during our visit.

One envies the Post Office its new screened room for testing high-gain receivers and for other work where the introduction of disturbing potentials from extraneous sources is likely to lead to inaccuracies. This laboratory is completely lined with steel plates $\frac{1}{4}$ in. thick, all joints being welded together; air is admitted through “baffled” ducts, and even these can be closed up. The steel door has a double seal, and in order that the room may be isolated from the

fier for modulation, while it is interesting to note that the corresponding receiver operates on the super-regenerative principle, with a separate generator for the quenching frequency.

Another interesting short-wave receiver of the “double superheterodyne” type, with triple detection, is being built for the Portishead station, which communicates with shipping. Directional reception is carried out, and as soon as the bearing

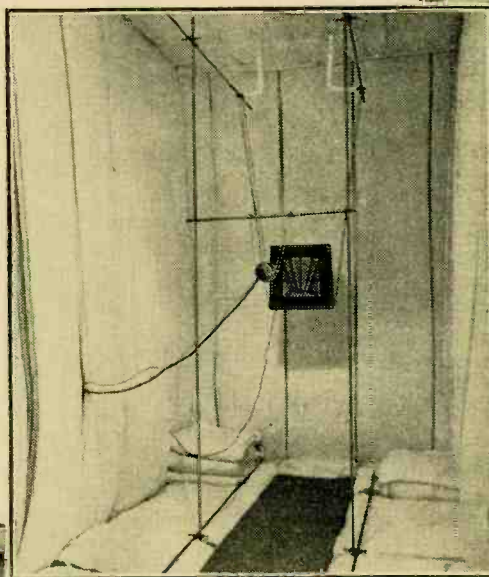


“To strive, to seek, to find.”

of the communicating ship has been ascertained, a corresponding adjustment of the transmitting beam is made from the receiver panel.

In the acoustic laboratory, apparatus is installed for taking the frequency characteristics of loud speakers and microphones. There is also an “artificial ear” employed mainly for rapid testing of telephone receivers, which imposes the same acoustic load on the diaphragm as does the human ear.

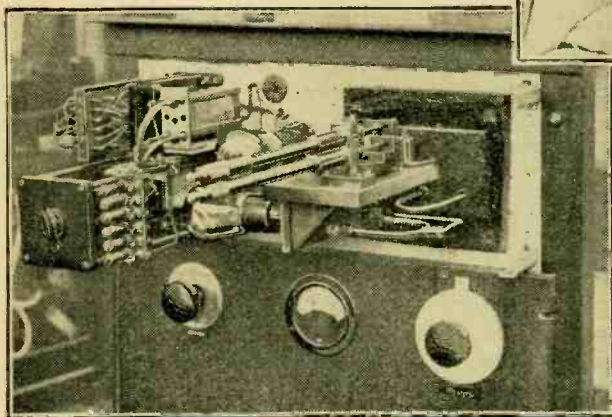
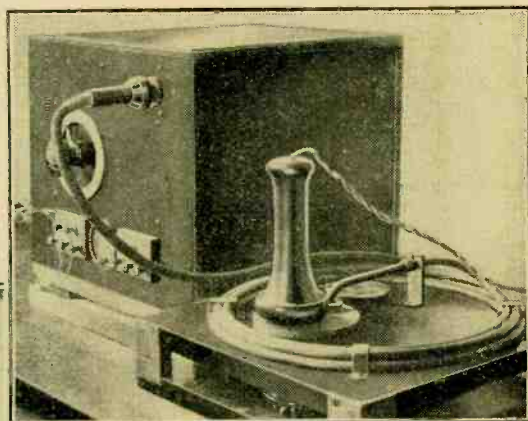
All aspects of low-frequency amplification which affect the Post Office can be investigated. A particularly interesting constant-volume L.F. amplifier has lately been developed; this piece of



(Above). The non-reverberant chamber for loud speaker tests is padded to a thickness of 18 ins.

(Left). A super-regenerative receiver for ultra-short waves.

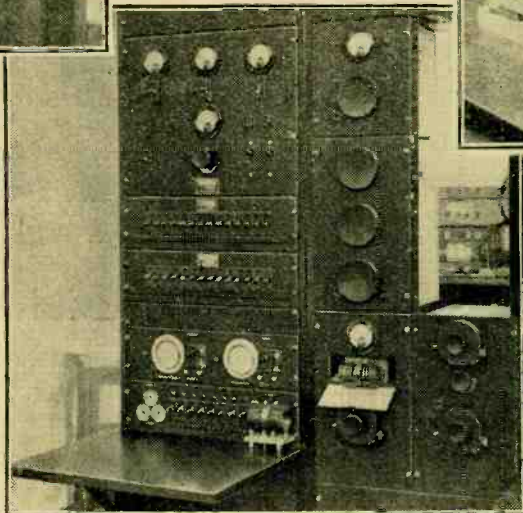
(Right). The “artificial ear” used in making graphical records of telephone characteristics.



mains a local lighting battery is installed.

Frequency measurements and standardisation, both at H.F. and L.F., are naturally of considerable importance. The main laboratory where this work is carried out derives its primary standard frequency from a valve-maintained 1,000-cycle tuning fork running at a constant temperature in a subterranean chamber; the accuracy is of the order of three parts in ten millions.

Short and ultra-short waves are occupying much of the attention of the staff. For the use of a radio link as a supplement to the land lines, new transmitters and receivers operating at between 4 and 6 metres are in course of development. The transmitter employs a Class “B” ampli-



The latest “double-beat” short-wave superheterodyne for communication with ships.

apparatus embodies what may be described as A.V.C., as the output remains sensibly constant in spite of input variations up to 40 decibels.

The laboratory which works on the elimination of electrical interference with broadcast reception is well equipped with the appliances which cause this interference—motors, flashing signs, vacuum cleaners, etc.—in order that experiments can be conducted on strictly practical lines. The design of “stopper” coils for tramways is being studied intensively.

NEWS of the WEEK

Current Events in Brief Review



[Photo: "Q.S.T."]

MORSE QUEEN. Jean Hudson, the nine-year-old who has won the world's championship, Class "E," at Chicago, by transmitting code at 20 words per minute.

Radio Conscious

"**BROADCASTING DAY**" is to be celebrated in Germany towards the end of November.

A Radio Curfew

TENANCY agreements for new workmen's flats at Seedley Road, Salford, stipulate that wireless sets must be switched off at 11 p.m.

Budapest's Interval Signal

UNTIL the new Budapest transmitter is ready, the Hungarian Radio Company will not alter the present interval signal, which consists of a nine-note melody produced by a musical box.

Crystal Users in Austria

NEARLY 17 per cent. of Austrian listeners still use crystal sets. The total number of registered licence holders is about 48,000. The Austrian Government has declined to increase the amount of the licence fee by 25 per cent. at the request of the broadcasting organisation, "Ravag."

A Spanish Duel

A BITTER duel is in progress between Barcelona Radio, EAJ1, and Radio Association of Catalonia, EAJ15, over the question of recognition as the official transmitting station for the new Catalan Regional Government. According to a correspondent, the situation is complicated by the fact that the Lucerne Plan assigns to Barcelona, capital of the region, only one exclusive wavelength, namely, 274 metres. The only other available wavelength will be the common wave of 207 metres, already used by some fifteen small stations in Spain. The indications are that Radio Barcelona EAJ1 will win the battle for this exclusive wavelength and the honour of representing the Government.

Rumours Denied

SINCE the Amsterdam Conference there have been persistent rumours of the forthcoming dissolution of the Union Internationale de Radiodiffusion. We have been asked to state that such rumours are entirely without foundation.

Running Commentaries on Films

AN interesting novelty is featuring in the programmes at Radio-Toulouse in the shape of the broadcasting of sound films. The films are run through the projector in the ordinary manner so that listeners hear the speech and music as at the cinema; simultaneously an observer gives a running commentary on what he sees on the screen.

Broadcasting Insect Notes

HIGH notes which confound the best of loud speakers are the medium of conversation in the insect world—a thought which has prompted Professor Larsen, of Oslo, to devise a special microphone which will make insect noises audible to human ears. A correspondent suggests that the Professor might invent a direction finder to locate and destroy a certain exceedingly elusive species.

U.S. Broadcasting Dilemma

A DILEMMA faces the American Federal Radio Commission. The Government has now granted ten new channels between 1,500 and 1,600 kc./s to the Commission, and it is assumed that these are available for broadcasting purposes. Consequently the Commission has been bombarded with requests for these wavelengths from various stations in the U.S. The Commission feels, however, that the best policy, in order to avoid interference from stations

I.E.E. Wireless Section

AT a meeting of the Wireless Section of the Institution of Electrical Engineers at 6 p.m. on Wednesday next, November 1st, Mr. G. Shearing, O.B.E., B.Sc., will give an inaugural address as Chairman of the section.

"Music from the Air"

ON Thursday next, November 2nd, Mr. Martin Taubmann will demonstrate the "Electronde" at a meeting of the Golders Green and Hendon Radio and Scientific Society at the Hampstead Public Library. The meeting will open at 8.15 p.m., when Mr. H. J. Barton Chapple, Wh.Sch., B.Sc., will give an introductory address. Readers of *The Wireless World* will be welcomed.

German Post Office and Television

INTERESTING plans for television are discussed in an official statement of the German Post Office. At a conference held on October 16th, between the German Ministry of Posts and the Broadcasting and Television Authorities, it was stated that research is now to be concentrated on 180-line images with the retention of the present number of frames per second, namely, twenty-five. The existing high-power ultra short wave transmitter at Berlin is to be adapted to the new system and the work should be completed within two or three months. In the meantime the television industry will produce a number of suitable new television receivers.

The second ultra short-wave transmitter is to be used for the transmission of sound as well as vision, and this will be completed by April next, when the transmission of sound films will be tried.

The German Post Office ex-

Bouquet from U.S.A.

AN indirect compliment is sometimes more satisfying than the most outspoken praise. We have reserved a special place in our scrap-book for the following graceful tribute from a correspondent of our contemporary, *Radio News*, New York: "I wish to express my appreciation of *Radio News*, which I have now taken for six months. While I consider *The Wireless World* is the best weekly from the point of view of an English book, there is no monthly magazine on the market that in any way approaches *Radio News* for value."

New Musical Instruments

A MICROPHONE class has been opened at the Paris Ecole Supérieure de Musique under the direction of M. Eric Sarnette.

An interesting by-product of recent tests at the School has been the invention of several new musical instruments which are stated to be specially suitable for the microphone.

It is surprising that inventors have not given more attention to the development of instruments favourable to modern electrical transmission. It has yet to be proved that the musical instruments now generally in use are the last word so far as broadcasting is concerned.

Wireless League Handbook

WHAT the Wireless League is and what it does is brightly set forth in the newly published handbook of the Wireless League, issued from the headquarters, 12, Grosvenor Crescent, London, S.W.1, price 6d. In addition to articles by the Hon. Sir Arthur Stanley and Captain Ian Fraser, M.P., the booklet includes some useful "don'ts" for the wireless user, hints on fault finding, and information on wireless law.

Interference to Order

SPECIALLY manufactured static is now applied to radio chassis on test at the Marconiphone factory at Hayes, Middlesex. For obvious reasons, the electric power mains at Hayes are steady and accurate, but it has been realised that a chassis which has been up to standard on works test might be very noisy on bad mains. So a certain section of the mains circuit, which has been isolated, is fed with interference of a particularly obnoxious kind from a 700-cycle oscillator with a heavy second harmonic. The engineers consider that this oscillator gives conditions equal to the worst kind of mains ever likely to be encountered.

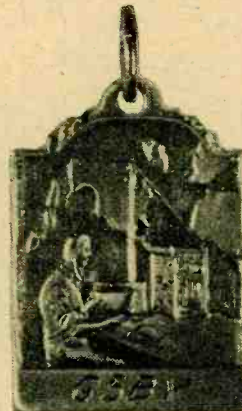
"The Wireless World"

A.V.C. Three

IN the table of Voltages and Currents for this receiver which appeared in *The Wireless World* for October 20th, 1933, the output valve was given as type Pen 4VA instead of AC/Pen; the figures, of course, are correct for the latter valve.



MIDNIGHT OIL was burned to secure for H. L. O'Heffernan (G5BY) this medallion issued in the recent International Relay Competition to entrants who were first in their respective countries. G5BY obtained 10,860 points and topped the British list for the fifth consecutive time.



in Mexico and Canada, will be to make a free gift of this frequency band to one or other of these countries.

If this course should be followed, American stations may allege unfair treatment, and the Commission is faced with an unpleasant dilemma. If in this case charity begins at home, interference may make itself felt from abroad.

plains that it is anxious to develop television so that it may become an integral part of the broadcasting programmes as soon as possible. Germany, it is explained, must retain the "advantage which it has at present gained in television technique over developments in other countries."

BROADCAST BREVITIES

By Our Special Correspondent

"House of Mystery" Broadcast To-morrow

IF the first vaudeville programme from the St. George's Hall studio to-morrow night (Saturday) sounds thin and sepulchral, do not put this down to the natural "spookiness" of the place; the hollow sound will be due partly to the fact that on this occasion there will be no audience.

The engineers are now experimenting with the acoustics of the hall, and already the stage has been somewhat extended to bring the performers outside the proscenium arch.

Studio Audiences of 600

In the fullness of time select audiences will be admitted to St. George's Hall just as they now attend vaudeville performances at Broadcasting House and "No. 10," but there will, of course, be no question of payment as the B.B.C. is not taking out a licence as in the case of the Concert Hall at headquarters.

St. George's Hall will comfortably contain at least 600 persons, so at this rate the B.B.C. should soon cut down the length of that waiting list.

Now is the time to apply for admission.

A Secret

Meantime, it is said that the B.B.C. chiefs are gazing longingly at the Queen's Hall itself! But perhaps on this point I had better say no more at the moment.

Filming Broadcasting House

MR. JOHN GRIERSON, the film producer, has wisely (I think) decided to omit the love element in his film of Broadcasting House, the scenario of which is now nearly ready. So certain writers who have tried to liken the new film to "Grand Hotel" are, in some respects, off the track.

"Grand Hotel"

The only real point of resemblance will be in the scenes of that impressive entrance hall with its ceaseless flow of visitors. But there again, if I remember rightly, nearly all the callers at Grand Hotel secured admission, but as anyone who has waited in the vestibule at Broadcasting House knows, not a few visitors there are turned empty away. Which, from the listener's point of view, is a good thing.

In this connection I sometimes think that those who condemn the B.B.C. programmes might soften their tone if they knew how many turns are not broadcast.

The Power of Droitwich

AS exclusively stated in these columns in the issue of September 28th last, the new Droitwich transmitter, it is now officially announced, will employ a power far in excess of the nominal 100 kW. Actually 150 kW will be employed in the aerial, although, as I have already said, it will be possible to secure an output of 200 kW.

Scrapping the Nationals

It is common knowledge, of course, that the opening of Droitwich will see the end of the London, West and North National stations. Because West and London National are already sharing a wavelength, this will mean that the closure of the three

Nationals releases two wavelengths, one of which will be allotted to the new North Eastern station at Newcastle and the other to the North Scottish at Culloden.

The scheme may look all right on paper, but I may, like a writer in *The Daily Telegraph*, "be permitted to entertain a doubt."

Doubtful Advantages

All along the South Coast listeners are even now complaining of poor reception of the National transmissions. Complaints are strongest in Kent, where people rely on the London National transmitter. Is it to be expected that they will secure happier results when restricted for their National programmes to the Droitwich transmitter?

Maybe, or maybe not.

High Power at the New Northern Stations

I hear that work on the new transmitters will be begun before the autumn of next year, when Droitwich enters into regular service, so that Scotland and the North generally may expect the new era of powerful reception by midsummer, 1935. Both North Eastern and North Scottish will have an aerial power of not less than 75 kW.

Their's But to Do or Die

THE spirit of the Inquisition is afoot in Broadcasting House. From personal friends among the staff, I learn that the utmost surprise has been occasioned by the circulation of a form requiring them to give a more or less complete record of their careers since leaving school.

What is the motive behind this?

And Across the Channel

Contact with wireless seems to stimulate this inquisitorial habit. A Paris friend tells me of the dissatisfaction among French listeners at the number of questions which have to be answered before a listener can secure the now necessary wireless licence.

Desperate Case

The other day a prospective French licensee, goaded to desperation, sent his local postmaster an application for a licence together with the following information: "I was born on the 31st July, 1899, at — I married my wife, who is a blonde, on the 30th September, 1920. Of my six children, the three first have had measles. My grandparents are dead, likewise my father, but my mother survives. My father-in-law was a Brussels sprouts merchant. I trust these particulars will be helpful in the collection of the radio tax."

Off to Canada

WITHIN a fortnight's time Mr. Malcolm Frost will start off for Canada to blaze the trail of Empire broadcasting over there. He will take with him copies of the eleven records which he has already successfully disposed of in South Africa, Australia, and other parts of the Empire.

More Canned Programmes

On his return from Canada, Mr. Frost will, I understand, superintend the production of more records. These "canned" programmes, representative of the best types of B.B.C. transmission and ranging from radio drama to vaudeville, have infused new blood into the Empire and Colonial programmes, and have actually helped to raise the standard of local production.

More "America Calling"

AS in the case of his previous effort, Eddie Pola's projected programme for November 16th and 17th, "America Calling Again," is a burlesque on American broadcasting. Dave Burns will impersonate Jack Pearl as "Baron Munchausen," America's foremost Dutch dialect comedian who created the expression, "Vass you dare, Sharlie?"

Other artistes who will be impersonated are Al Jolson, The Mills Brothers, and Bing Crosby. The Mills Brothers will be impersonated by the Moderniques and Bing Crosby by Al Bowley. Eddie Pola will again appear as the announcer.

Anyway, It Got There

A READER writes: "When Mr. Martin Hussingtree wrote 'The Wrong 'Bus,' the little thriller which the B.B.C. broadcast the other evening, did he intend that the omnibus should be gearless? Either the 'Effects' bus had no gears, or it made a marvellous getaway on top."

How do I know what was in Mr. Hussingtree's mind?



DISTINGUISHED VISITORS. "Radio City," New York, was recently visited by Marchese Marconi. This photograph, taken on the roof of the Rockefeller Building, shows (left to right): Mr. M. H. Aylesworth, President of the N.B.C., Mr. Hugh S. Robertson, Marchesa and Marchese Marconi, Mr. David Sarnoff, President of the R.C.A., and Col. Arthur Woods, President of the Rockefeller Centre.

UNBIASED

BY FREE GRID

Droll Remark

IN a recent case in America in which the finances of a small wireless firm were being investigated, it was stated by counsel that the company in question had been able to keep afloat in spite of a devastating fire which had occurred at the works.

We are accustomed to judicial humour, but, at the same time, I thought that it was in rather bad taste for the judge to suggest that learned counsel had been guilty of a slip of the tongue by using the words "in spite of" instead of "owing to."

Epoch-Making

SUCH remarkable progress has been made in radio-technique during the past few years that I hesitate to draw attention to any particular discovery and to apply the hackneyed but exceedingly expressive term "epoch-making" to it. However, common justice to an inventor demands that I must.

The discovery, which is truly breathtaking in its very audacity, is reported in one of the more progressive of our great newspapers, and is to the effect that a citizen of the no mean city in which this particular journal circulates made the remarkable discovery that a loud speaker could be "worked with a signal current passed through a human body." In other



Tears rolling down my bib.

words, by disconnecting one terminal of the loud speaker and grasping it with one hand and the wire with the other, signals could still be heard; and, just to show that there was no deception, this miracle was demonstrated to a reporter of the paper concerned.

Now, I have to confess that when I first read this account I nearly did a grave injustice to the inventor, for I erroneously thought that I had read something like it years before; indeed, I had a distinct recollection of the tears rolling down my bib when I first saw the stunt performed by my mother. But I was wrong, and humbly apologise for it.

My mother, ardent experimenter that she was, merely did it by clutching at one wire, but she has been left far behind, for, although it is admitted that it has been done previously with one wire, the epoch-making discovery has been made that it can still be done even if a number of wires are grasped in the hand.

My Distinguished Reader

JUDGES are notoriously conservative in their outlook, and are apt to look upon all the great discoveries of science with the codfish eye of suspicion, as witness their repeated and plaintive demands: "What is a double-diode-triode?"

It is quite evident, however, from recent evidence which has come to light that this attitude of mind is fast waning, and that judges are beginning to "take cognisance" of things outside their immediate ken, even to the extent of reading the few humble words which I pen every week in *The Wireless World*. The case in question was one in which a gentleman was accused by the police of breaking into a place of entertainment and rifling the safe, the sole evidence for this outrageous charge being that the police happened to discover a finger print which corresponded with that of the gentleman. The police alleged that the chances were four billion to one against anybody else possessing a similar finger print, and, since there were not four billion people in the world, they regarded the case as proved.

His Lordship, however, mindful of the great finger-print controversy which raged in my columns twelve months ago, thought otherwise, and said so in no uncertain terms in his summing-up, with the result that the gentleman was found guiltless and discharged.

It is truly astonishing and, indeed, somewhat terrifying to think that, had not the judge read the irrefutable evidence which appeared in *The Wireless World* last year to the effect that finger prints can be forged, a fellow-man would even at this moment have been enduring all the discomforts of sleeping without a mattress, which I can assure you from personal experience is no light matter.

Stock Replies

THERE are many queer ways in which ardent collectors indulge in their passion, and I suppose that the postage stamp malady is really the most common of them all.

But the most curious of all the collecting hobbies is that indulged in by a sturdy Lancastrian who was my stable companion when journeying down from Manchester to London the other day. Our conversation had passed naturally and easily from horse-racing to radio, and this led directly

to my friend telling me of his particular collecting mania, which was to acquire a complete set of the innumerable stock letters which the B.B.C. send out to all their correspondents. The Corporation has, so he alleged, a stock reply to suit every conceivable question under the sun, and it is his one ambition in life to frame a letter in such a manner that none of the stock replies will do, and a special letter will become necessary. So far, however, he has been baffled in all his efforts, with the result that he now has several trunk-loads of stock letters which, according to a direction in his will, shall pass to the nation on his demise. But he still has hopes of fulfilling his ambition to drag a special letter out of Portland Place before he passes finally into the hands of the mortician.



So far he has been baffled.

He has so fired my imagination that I am even tempted to have a go at the game myself. It must be far more exciting than collecting bookmakers' demand notes or publishers' "rejection slips," in which so many people wantonly indulge nowadays.

At present the gem of my companion's collection is a stock letter sent from Savoy Hill many years ago, and signed by my old friend Captain Eckersley at a time when he and I were in America together,

When Ignorance is

I SEE that a well-known scribe is urging his readers to take up the B.B.C.'s new German course on the grounds that the knowledge so obtained would be "particularly valuable in touring the Continent."

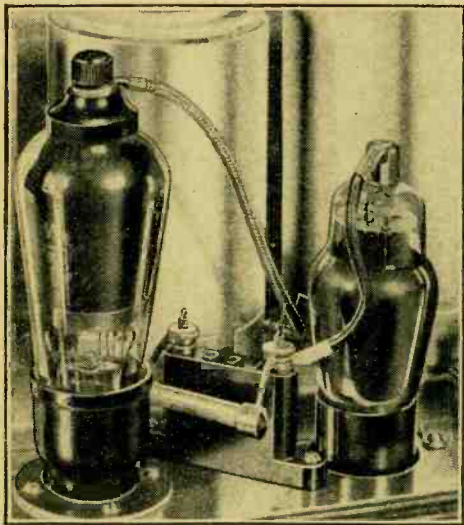
Speaking from a fairly wide experience of touring the Continent, I must say that, more often than not, a lack of linguistic knowledge has often been even more valuable to me. In particular, I have found, when travelling in a German Schnellzug without the necessary supplement, that a wooden expression and a bland "ignorance" on my part of any other language than Sanskrit has often reduced the ticket inspector to a nervous wreck and enabled me to get away with it, while others similarly situated but foolish enough to trot out a few halting phrases learned from the B.B.C. have been badly stung.

Further Notes on the New Monodial Super

The Alterations Needed for the British Heptode

WHEN the New Monodial Super was described in *The Wireless World* the only Pentagrid valve available was of American origin, and it was employed owing to the undoubted advantages of this type of valve over the only alternative—the conventional two-valve circuit. A British equivalent, the Ferranti VHT₄ Heptode, however, is now made, and many requests have been received from constructors for an indication as to its suitability. Tests have been carried out with many different specimens, therefore, and it may be said at once that it has been found to be an entirely satisfactory alternative to the 2A7.

Fortunately, the valve is designed to operate with the same applied voltages, except on the heater, which follows the standard British rating of one ampere at 4 volts, so that changes in the anode and screen supplies are unnecessary. The only alterations from the original specification which are required in order to use the new valve, therefore, are the omission of the 2-ohms heater resistance (R₃ on the original circuit diagram) and the replacement of the American valveholder by a 7-pin British type. If the Clix chassis mounting type be used, no change is needed in the size of the hole in the chassis.



The 2A7 valve originally used in the New Monodial Super is shown here. The employment of the Heptode involves little alteration.

The control grid of the tetrode portion of the valve is connected to the terminal on the top of the bulb, as in the American type, but the connections to the valveholder are arranged differently. In order to avoid any chance of error, therefore, a practical wiring diagram of the

By
W. T. COCKING

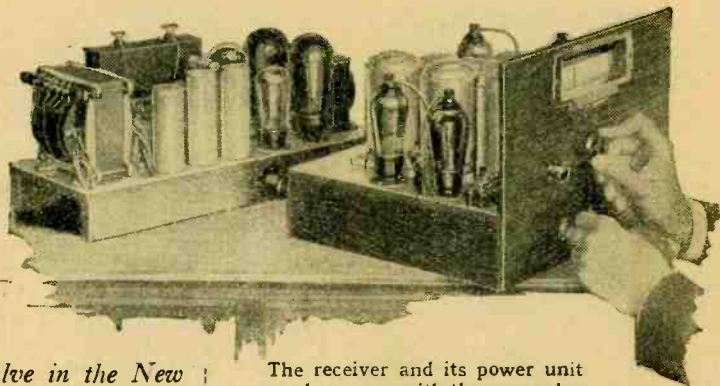
THE use of a British frequency-changer valve in the New Monodial Super is dealt with in this article, together with questions arising through the use of a different output stage. Indications as to testing procedure are also given.

appropriate portion of the receiver is included with this article. The performance of the receiver with the British valve is in no way different from that with the 2A7, and the instructions for ganging and operating the set which were given in the constructional articles still hold good, and without any amendment. It is felt, however, that some further general notes may prove helpful.

Alternative Output Stage

Many builders are desirous of using the new receiver chassis in conjunction with the 2½ watts or 5 watts power chassis of the original Monodial. So far as voltages and currents are concerned this is permissible, and no alteration is necessary either to the receiver or the power chassis. In order to maintain the correct loading on the low-pass filter, however, a 10,000 ohms 1 watt resistance should be connected across the L.F. transformer primary. As the output stage with one of these older power units is not of the push-pull type, the possibilities of L.F. feed-back are increased, and there is some risk of motor-boating. It is a wise plan, therefore, to increase the capacity of the second detector anode circuit decoupling condenser C₂₁ to 8μF; if an electrolytic condenser be used, ample space for mounting it on the chassis is available.

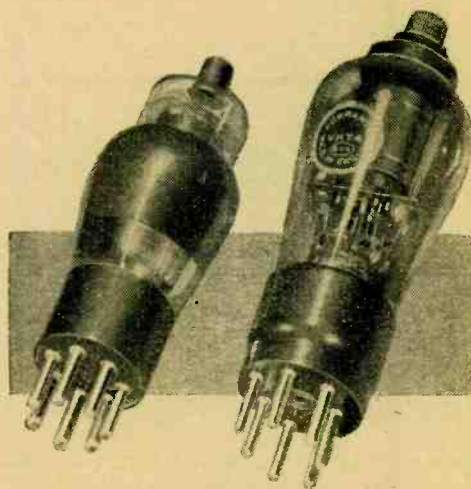
Should motor-boating occur when using the push-pull output stage it will be evident that it is a sign of an unusual amount of L.F. feed-back. It is, therefore, indicative that one of the output valves has become defective, and that the output stage is no longer correctly balanced. Some care in diagnosing the cause of the trouble should be taken, however, since an audible effect very similar to motor-boating, and thus likely to be mistaken for it, can occur through a very different cause.



The receiver and its power unit are here seen with the new valve in situation

Should H.F. or I.F. instability be present in any receiver fitted with A.V.C. the audible effect is almost indistinguishable from motor-boating. This is readily understandable when it is remembered that self-oscillation leads to a large detector input, and this in turn means a large bias on the controlled valves. As a result, these stages stop oscillating, the detector input drops, and the bias returns to its normal value, when instability once more sets in and the whole cycle is repeated.

Instability in a receiver such as the New Monodial, of course, is an unlikely event, but it may be useful to indicate the danger points which may be found not only in this set, but in any superheterodyne. The first is the gang condenser, for it is essential



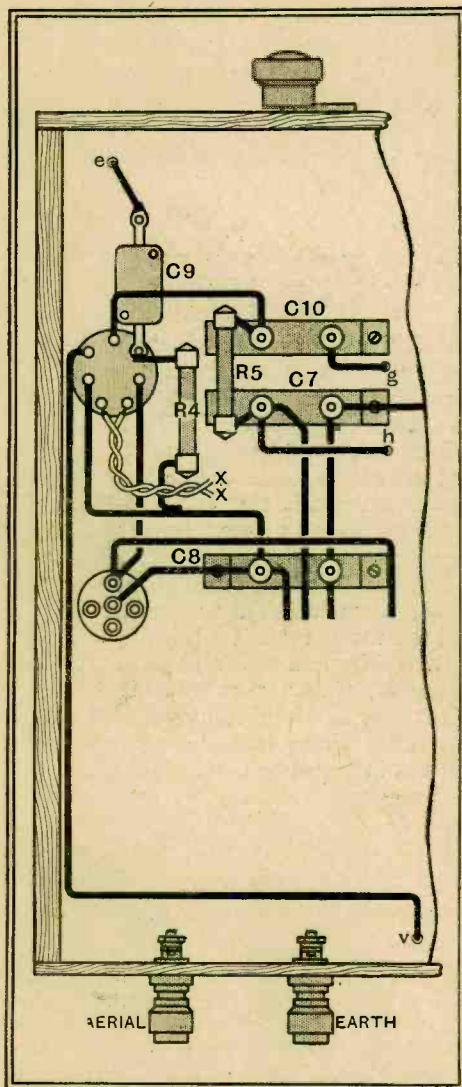
The 2A7 valve is shown on the left and the VHT₄ on the right; the different arrangement of the pins can clearly be seen.

that the frame of this component be earthed at each end. If it is not, the single earth connection will act as a common coupling to the signal frequency circuits, and instability, poor ganging, and a low degree of preselection will be found. The second danger point is the anode circuit of the frequency changer, for this lead must not be allowed to pass close to the H.F. valve or any of its grid circuit components. A spacing of at least two inches

Further Notes on the New Monodial Super—between the anode lead and the H.F. valve circuits must be allowed.

Testing and the A.V.C. System

Apart from such obvious errors as poor connections, no troubles are likely other than through the unfortunate event of one of the components proving defective. Should this occur its tracing may be hampered by the A.V.C. system, so that it is



The practical wiring diagram of the frequency changer portion of the set embodying the British valve.

a great help to be able to cut this out of circuit. This may readily be done by short-circuiting C15, and by placing the local-distance switch at local the noise suppressor resistance R9 may be used as a manual sensitivity control. The receiver then functions without A.V.C., and its performance may more easily be judged by those unaccustomed to handling a set fitted with automatic volume control.

A specimen receiver, with the necessary alterations from the original model for the inclusion of the Ferranti VHT4 Heptode, is available for inspection at 116, Fleet Street, London, E.C.4.

Interference

Progress of I.E.E. Committee's Investigation

The Committee on Electrical Interference with Broadcasting set up by the Institution of Electrical Engineers held its second meeting on Thursday, October 5th. This Committee, it will be remembered, was set up as a direct result of the recommendation put forward by "The Wireless World" in November last, that the I.E.E. was the proper body to undertake the task, as being truly representative of the electrical industry of this country.

SINCE the last meeting of the Main Committee, four sub-committees, we are informed, have been engaged on the consideration of means which might be adopted and the cost of such means to render future plant and appliances non-interfering. Consideration has also been given to possible methods for dealing with interference apart from suppression at the source.

The report of the sub-committees was considered in detail and accepted. The investigations have included such items as lifts, trolley omnibuses, domestic appliances, and other apparatus.

The work of the sub-committees indicates that devices for the suppression of interference from many items of electrical plant, particularly domestic appliances, could be incorporated in future designs at a reasonable cost. Further investigation is necessary on some of the larger items of plant, and tests of a quantitative nature are being carried out by the British Electrical and Allied Industries Research Association on such items.

The Committee reviewed various possibilities of bringing suppression devices into general use without having recourse to legislation.

It was emphasised that for the suppression of much of the electrical interference which exists at present, goodwill and co-operation will be necessary among a large number of interests.

Pending the result of the further investigations which are now being carried out, it was agreed that co-operation should be sought with the manufacturers and other interests affected on the basis of the interim report of the sub-committees, and efforts are being centred in this direction. Consideration was also given to the possibility of international action on the question of electrical equipment embodying suppression devices, and arrangements were made for a British National Committee to be set up to consider this question.

The Radio Industry

A USEFUL little accessory for use with Henley's Solon soldering-iron has just been introduced. Known as the Solon Solder Pot, it is intended for clamping on the body of the iron, where it will maintain a sufficient quantity of solder in a molten state for tinning the ends of wires, etc. It costs one shilling.

Mr. R. J. Durand, late of the B.B.C., who was in charge of the reproducing equipment at the Olympia, Manchester, and Glasgow exhibitions, has now joined the City Accumulator Company. He is to take charge of the C.A.C. showrooms at 4, Surrey Street, Strand, London, W.C.2.

Philips are now marketing a loud speaker and a pick-up; the former is of the permanent magnet type and is supplied with suitable transformers for pentode, triode, Class "B" and Q.P.P. output valves.

A newly formed company, the Marine Electrical Equipment Co., Ltd., Gambrell Works, Merton Road, Southfields, London, S.W.18, is producing a series of radio-telegraphic and telephonic transmitters for commercial service. The apparatus, which is fully described in a booklet just received, includes complete ship

sets, and also low-powered radio-telephone installations for fishing craft and yachts, as well as direction finders and lifeboat equipment.

It is significant that the firm of E. K. Cole, Ltd., which has always concentrated on mains-operated-receivers, are now producing a battery-operated version of their well-known seven-stage superheterodyne. Recent technical improvements in battery-fed output stages are responsible for this change of policy.

Ferranti's announce the introduction of a new superheterodyne—the Lancastria Magna at 15 guineas. The smaller original model is now known as the Lancastria Parva, and costs 13½ guineas.

Change of Address

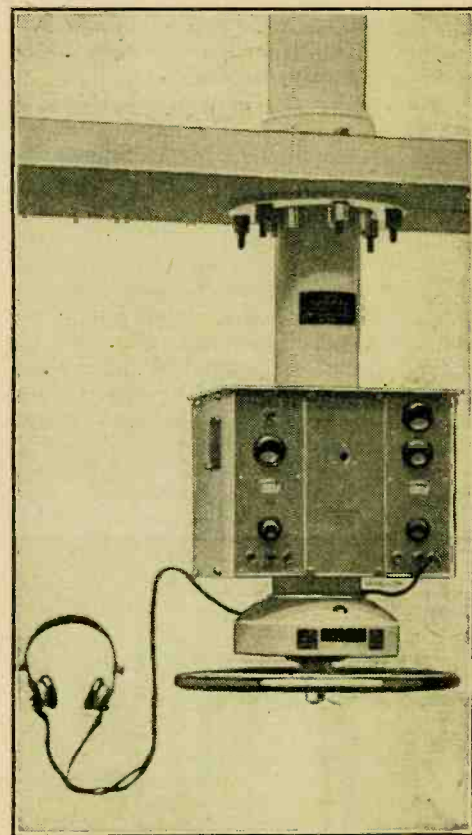
Mavox Radio, Ltd., from 17, Maddox Street, London, W.1, to 21, Store Street, Tottenham Court Road, London, W.1. (Museum 9228.)

Catalogues Received

British Insulated Cables, Ltd., Prescott, Lancs.—B.1 wireless condensers.

S. Smith and Sons (M.A.), Ltd., Cricklewood, London, N.W.2.—"Anodex" dry batteries.

Siemens Electric Lamps and Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—"Full-o-Power" radio batteries.



The Marine Electrical Equipment Company's direction finder, with receiver unit mounted on the column supporting the rotating loop.

Wilkins and Wright, Ltd., Holyhead Road, Birmingham.—"Utility" condensers and other wireless components.

British Ebonite Co., Ltd., Hanwell, London, W.7.—Price list of ebonite panels, rods, tubes, etc.; also "Handbook of Tuning Coils," with illustrations and winding data.

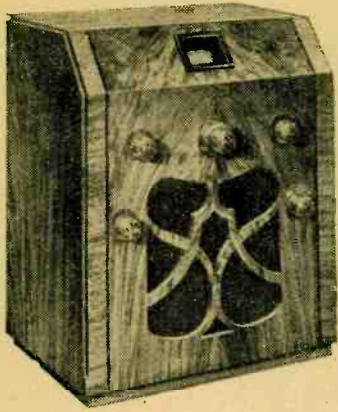
Amplion (1932), Ltd., 82-84, Rosoman Street, Rosebery Avenue, London, E.C.1.—Amplion loud speakers and components.

Trevor Pepper, 48, Wake Green Road, Moseley, Birmingham.—"Seradex" eliminators, battery chargers and rectifiers.

Chas. A. Osborn, 21, Essex Road, Islington, London, N.1.—Radio cabinets.

Webb Condenser Co., Ltd., 42, Hatton Garden, London, E.C.1.—Variable condensers and components.

Telsen "464" Receiver



FEATURES. Type.—Table model A.C. mains receiver for use on outdoor or mains aerial. **Circuit.**—H.F. pentode stage with iron-cored tuning coils—grid detector with reaction—power pentode. Full-wave valve rectifier. **Controls.**—(1) Main tuning (with trimmer). (2) Wave-range. (3) Reaction. (4) Selectivity control. (5) Tone control. **Price.**—9 guineas. **Makers.**—Telsen Electric Co., Ltd., Aston, Birmingham.

A Well-finished Receiver at a Low Price

ONE of the first things to attract attention in view of the very reasonable price of this receiver is the exceptionally good finish and clean workmanship. From this point of view it will bear the closest examination not only in the cabinet work, but in every detail of the chassis.

The bright-finished steel framework of the chassis is proportioned to give a neat and compact layout, and is unusually rigid, the edges of the metal having been turned up for strength in the bending process. The chassis is held in position in the cabinet by rubber-bushed screws in the base, and is pulled up to the front panel by additional bushed screws passing through extensions of the side members. A rubber ring makes an effective seal between the periphery of the moving-coil loud speaker and the cabinet.

The loud speaker is of slightly larger dimensions than usual, and the sound output, both from the point of view of volume and quality, would do credit to a set of far higher price. A tone control is fitted, and with this set towards the "high" position the reproduction is clear and crisp. There is very little background noise or mains hum, and this undoubtedly adds to the effect of realism.

A "straight" three-valve circuit has been adopted, and the H.F. stage includes iron-cored coils and one of the latest H.F. pentode valves. An all-metal "Catkin" valve is used in the detector stage, and is followed

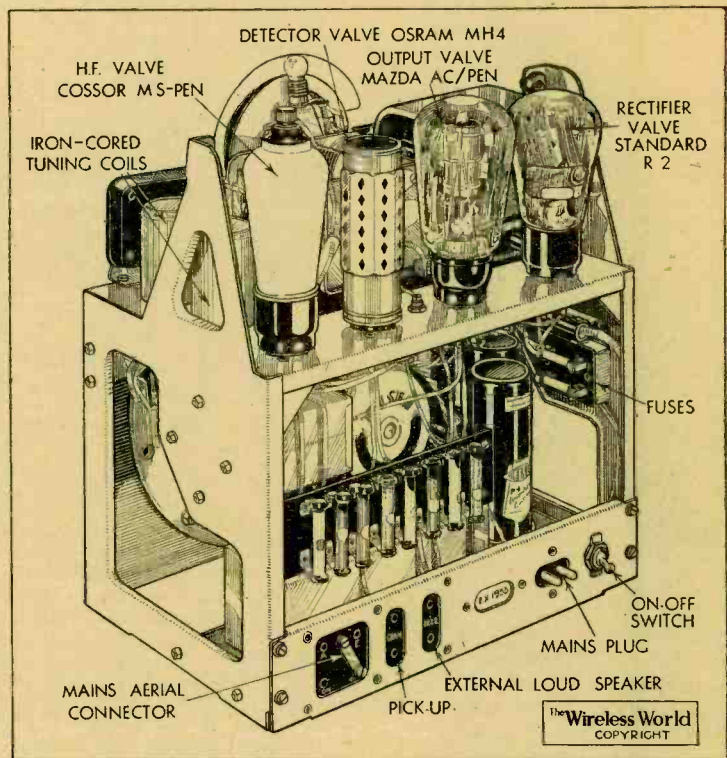
by a power pentode output valve. The rectifier is a full-wave standard valve of the "Micro-mesh" type.

There are two tuned circuits, and the ganged tuning condenser is provided with an auxiliary trimmer controlled by a spindle passing through the main control knob. Both tuned circuits are arranged as loose-coupled transformers, and reaction is applied to the intervalve circuit from the detector. To assist selectivity, a series variable condenser is connected in the aerial lead. This is automatically short-circuited in the maximum position in order that the full sensitivity of the set may be available under conditions which do not call for a higher degree of selectivity.

We were particularly impressed by the

sensitivity, and for a set of its type the range is definitely above the average. Many of the medium-wave stations, such as Brussels, Langenberg, and Fécamp, came through in daylight with as much volume as many three-valve sets give under night conditions.

As regards selectivity, care must be taken to see that the tuned circuits are accurately aligned, otherwise the performance in this respect might be easily misjudged. However, with due care in tuning and by close

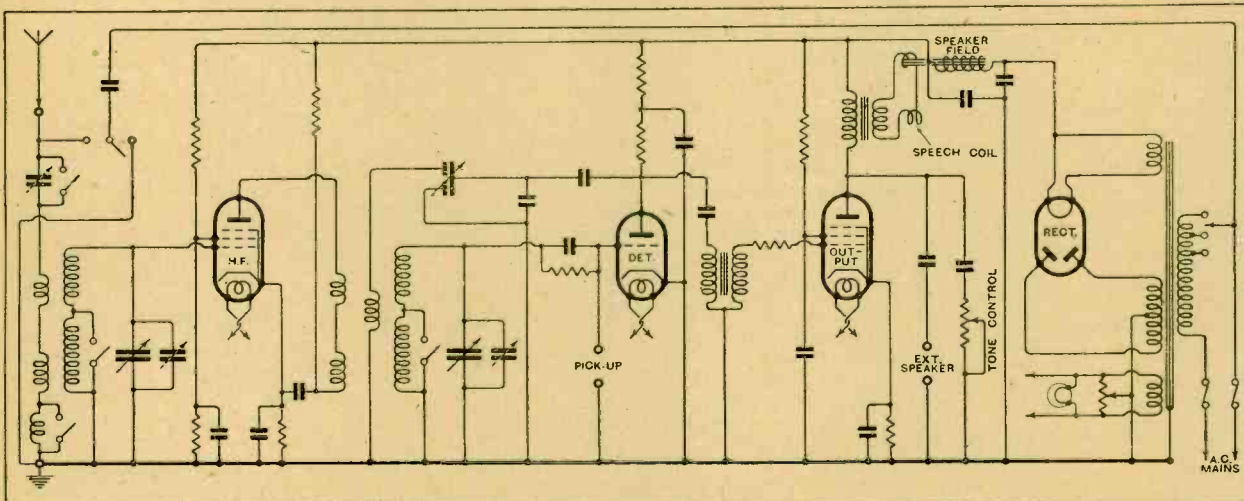


The pressed-steel chassis forms a compact and rigid unit.

attention to the adjustment of the "Separator" and reaction controls, the London National and Regional transmitters could be confined in central London to band widths of 230-280 and 300-390 metres respectively.

On long waves Daventry and Radio-Paris can be tuned in clear of each other.

There can be little doubt that this set will more than satisfy the requirements of the man of limited means, and from the point of view of quality of workmanship and material it is fit to be ranked with sets of much higher price.



Complete circuit diagram. The coil at the bottom of the aerial coupling circuit is inserted to prevent breakthrough of medium-wave stations on long waves.

NEXT WEEK'S SET REVIEW:
SUNBEAM MIDGET

Letters to the Editor:—

Valves or Stages ?

Electrostatic Speakers : Ohms per Volt : Output

The Editor does not hold himself responsible for the opinions of his correspondents

Valves or Stages ?

THE recent correspondence between Mr. Baggs and Mr. Barry Kay cannot be other than inconclusive if conducted on its present terms. Mr. Baggs maintains that, since nomenclature by both valves and stages must be misleading in respect of many details of design, it would be better to leave even the main framework of receivers altogether unspecified. Mr. Kay, on the other hand, apparently intoxicated with the ingenuity of the new designation, does not seem to envisage the fuller description of sets, but rests content with a considerable degree of vagueness.

A parallel may be drawn from the case of motoring. Those who held that cars should only be advertised on the basis of the number of their cylinders could never be made to agree with those who held the same view in respect of their horse-power. In either case it is clear that what is wanted is not alternative erroneous systems, but a fuller system which can give rise to no misapprehensions. The number of valves is necessary to give an estimate of costs of replacement; the number of stages, an estimate of performance.

But it is also clear that radio sets have now become such complex pieces of machinery that even the conjunction of valves and stages cannot adequately describe their abilities. If nothing were known about a certain car save that it had eight cylinders, it could not be positively affirmed that it was better than another car with two, for the relative efficiencies with which these cylinders were used might differ widely. Similarly, a four-stage set might be very inferior to a three-stage set if the first contained a detector and three low-frequency stages, and the second was a normal 1-V-1. The motoring public has set itself to master the intricacies of differing design, and is now well acquainted with fluid flywheels, automatic clutches, self-changing gear boxes, and so forth. There is no reason why the ignorance of the radio public, if such ignorance exists, should be pampered and encouraged. If it does not exist, there is still less reason.

There is no danger of misunderstanding in providing figures for the sensitivity, selectivity, and degree of automatic volume control, of all receivers. In America, the input-output ratio for the first figure has been related to a standard base; selectivity can be defined in terms of the detuning in kilocycles required to reduce a signal by a given proportion; while the effect of A.V.C. may be displayed by a simple graph. All these factors are within the understanding of the public, if they were carefully explained. Nothing but harm can arise from hazy and ill-defined statement. This type of error is well exemplified in the mention, criticised by "Free Grid," and made by Mr. Taylor, and no less an authority than Messrs. Ferranti, of "anode-to-cathode-streams." The reversal of these streams would, I feel sure, require the exercise of as great Authority as once reversed the waters of the Red Sea.

R. J. SPOTTISWOODE.

Oxford.

Electrostatic Speakers

MANY thanks to WIRELESS WORLD and Mr. Scroggie for the excellent articles on the electrostatic speaker; a device which until now, in my opinion, has not received the attention it deserves. Experience has shown me that there is one practical point which it is very easy to overlook when designing a dual speaker combining electrostatic and moving-coil speakers. It is that on no account should the distance between the two units be less than 24in. from edge to edge.

It will be readily appreciated that when the electrostatic unit is in close proximity to the moving coil, its diaphragm will be, in effect, part of the baffle board, and, in consequence, considerable differences of air pressure generated by the moving coil will be developed on either side of it, with the result that the distance between diaphragm and fixed plate will vary at low frequencies. At first sight it would appear that this movement will only result in loss of radiation by the moving-coil speaker and possible rattle; but further consideration shows that, since the capacity of the electrostatic unit will be varied at low frequency, any notes reproduced by it will have their intensity modulated by the bass—a distinctly unpleasant effect which is all too common in the reproduction given by cheap moving-coil speakers with speech coils of very short winding length concentrated in the magnet gap to extract the last decibel of noise with an inadequate field density. L. H. MOORE.

Liverpool.

Ohms per Volt

THE question of terminology is frequently raised in your columns, and, as far as I can see, the definitions and terms used by *The Wireless World* are those generally accepted by the Trade and the Technical Press.

Nevertheless, there is one expression used by yourselves and manufacturers to which a practical engineer may take exception; that is, the *ohms per volt* specification applied to voltmeters.

Taken literally, the description of a meter as 500 ohms per volt implies that a resistance of 5,000 ohms is in circuit at a reading of 10 volts, and of 50,000 ohms at 100 volts. Unfortunately, not all those connected with either the amateur or professional sides of wireless know how far this is from the truth, and that, provided the same meter or scale be in use, the resistance in circuit is the same in each case.

The vast majority of "voltmeters" are basically "current reading instruments," the internal resistance in series within the meter is determined by the maximum current reading and the maximum voltage to be measured. From this aspect the resistance as a specification would only be useful when coupled with the full-scale voltage reading. With it, a 100,000 ohms/500 meter would be equivalent to a "200 ohms per volt" meter. Though it would specify the

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Stamford Street, S.E.1, and must be accompanied by the writer's name and address

meter more definitely it would be clumsy, and would not immediately convey the information the engineer requires.

As both these terms depend entirely on the current taken by the meter at full-scale deflection the "goodness" of a voltmeter could be expressed much better by that current, and, so that there could be no misinterpretation, the fact that it is the *maximum* current could be added. What I suggest is that the above meter be specified as a "5 mA. max." meter.

The current taken at any voltage can be expressed by the formula:—

$$\text{Current} = \frac{\text{voltage reading}}{\text{full-scale reading}} \times \text{max. current.}$$

Thus, a reading of 50 volts on a "5 mA. max." meter with a full scale of 250 volts means that a current of 1 mA. is flowing.

The service engineer and the set constructor are often faced with the problem of the change in circuit conditions brought about by the insertion of a voltmeter into the circuit. As the estimation of the change is more easily calculated in terms of current flowing through the circuit resistances, the use of the above terminology would simplify matters considerably. The formula would be equally simple:—

$$\text{Voltage change} = \frac{\text{voltage reading}}{\text{full-scale reading}} \times \text{max. current} \times \text{resistance.}$$

This, of course, is neglecting any change brought about by the alteration of the D.C. resistance of the valve or valves in parallel with the meter.

I venture to suggest that the majority of engineers and constructors would welcome this simplification of our terminology, particularly when it also makes it more explicit.

London, S.W.5. W. MACLANACHAN.

Output

THE following apparent fallacy may be of some interest to readers. Assume a power valve capable of a maximum undistorted output of 4 watts, with grid bias = 50 volts. If two such valves are connected in parallel, the maximum undistorted output will be 8 watts, so that if an A.C. voltage of 25 volts (peak) at frequency f_1 be applied to the grids, the output will be 2 watts, since output is proportional to the square of the volts applied to the grid. Now apply another 25 volts (peak) at frequency f_2 at the same time as the first. There will be then 2 watts of f_1 and 2 watts of f_2 in the output, making 4 watts in all, and in addition the valve grids will be fully loaded with 50 volts peak. On the other hand, if the valves are operated separately with 50 volts of f_1 on one grid, and 50 volts of f_2 on the other, each valve will give its full 4 watts output, and if these are combined there will be a total of 8 watts.

Under both conditions the valves are fully loaded, yet by separating the frequency components double the output is obtainable. The fallacy is obvious, but the example given is a strong argument for the use of a double output stage when separate high or low note speakers are used, unless, of course, the transmission is heavily modulated with one frequency only.

Persia.

LEAD-IN.

New Apparatus Reviewed

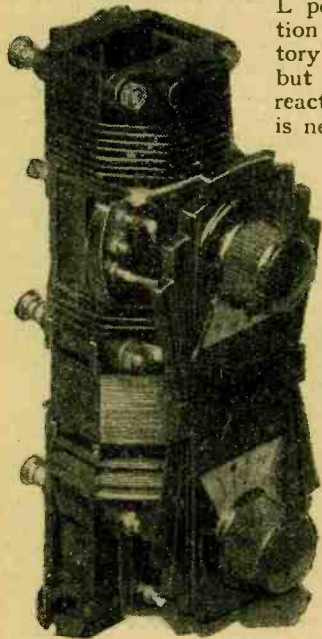
Latest Products of the Manufacturer

BRITISH GENERAL ALL-WAVE TUNER

THE British General Manufacturing Co., Ltd., Brockley Works, Brockley, London, S.E.4, who for long past have included an aerial unit giving continuous tuning from 200 to 2,000 metres in their range of components, have now further extended the idea and introduced an all-wave model covering the short, the medium and the long wavebands. The new tuner consists of a moulded former $6\frac{1}{2}$ in. long with the various windings spaced sufficiently far apart to ensure that the idle sections have very little effect on the portions in use.

Two switches are included; the upper one is the wave selector and has four positions, two being for the short waves and one each for the medium and the long waves. Below this is a selectivity switch which changes over the aerial to different tapings on the coil; it also has four positions.

The ranges covered by a 0.0005 mfd. tuning condenser are from just below 15 metres to 29 metres with the switch on S1; 26 metres to 76 metres on S2; 195 metres to 550 metres on M, and 835 to 2,220 in the L position. Reaction was satisfactory throughout, but a 0.0005 mfd. reaction condenser is necessary.



British General all-wave tuner covering short, medium and long waves.

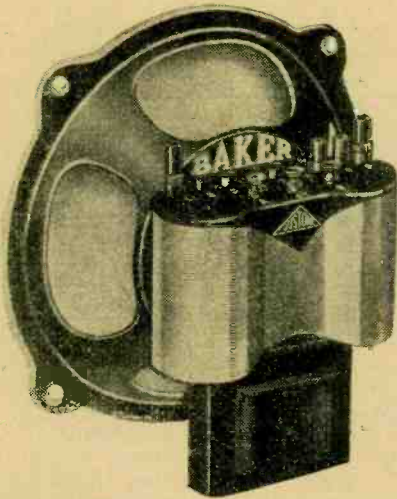
An H.L. two-volt type valve gives good results as a detector and enables smooth regeneration to be obtained. Only at the higher condenser settings on the short waves was reaction uncertain. There is, however, an adequate overlap. The price is 9s. 6d.

A NEW BAKER UNIT

BAKER SELHURST RADIO have added to their range of moving-coil units a new model which will be known under the name of "Justone." It is constructed on the lines of the well-known "Permag" unit, and is fitted with a multilayer speech coil, which enables comparatively lower transformer ratios to be employed. This results in less leakage inductance, and a consequent improvement in high-frequency response.

The most important feature of the new unit is, however, the multi-ratio output transformer, which gives twenty ratios for

single-output valves and four for push-pull combinations, including Class "B" and



The new Baker Selhurst "Justone" loud speaker with 24-ratio output transformer.

Q.P.P. Alteration of the ratio gives a wide variety of frequency responses, and the user can readily modify the quality.

The price of the unit in chassis form is 45s., and cabinet models are also available.

The makers are Baker's "Selhurst" Radio, 75-77, Sussex Road, Croydon.

R. I. MICRION COIL

THIS new coil recently introduced by Radio Instruments, Ltd., Purley Way, Croydon, embodies a core of a specially prepared iron-dust alloy described as "Micrion." It is a screened dual-range coil intended to serve for aerial or H.F. coupling, and is provided with a tapping on the medium wave section for the aerial lead and a separate reaction winding. Waveband switching is not included.

The special feature of the coil is that the inductance of each section can be varied within certain limits by altering the position of the cores within their respective bobbins. This adjustment, effected by two small screws protruding through the side of the screen, gave an inductance variation of 160 to 180 microhenrys approximately for the medium wave coil and from 1,570 to 1,930 microhenrys for the long wave section in the case of the specimen tested.

This permeability adjustment affords a ready means for accurately matching the coils in the set under working conditions, and, furthermore, enables air and Micrion



R.I. Micrion coil embodying permeability adjustment of inductance.

coils to be used in the same circuit and their inductances matched for single dial tuning.

Our tests show the coil to be a particularly efficient one, and definitely better than a first-grade air coil of the familiar screened pattern. Compared on a basis of dynamic

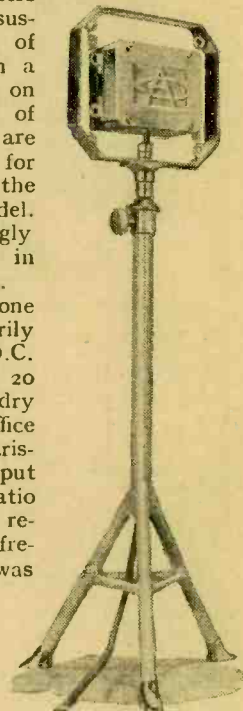
resistance values, the Micrion coil is about 40 per cent. better on the medium waveband and of the order of 30 per cent. on the long waves.

It should prove very convenient as a replacement coil where an air type one with external switching is now used, for the change-over can be effected with little trouble, and a worth-while improvement in selectivity and sensitivity will follow. The price is 12s. 6d.

CORREX MICROPHONE

A MICROPHONE that is particularly well suited for use with public address amplifiers is the model HB, introduced by the Correx Amplifiers, 21, Marmora Road, East Dulwich, London, S.E.22. It is of the carbon pattern mounted in a strong rectangular metal case measuring $3\frac{1}{2}$ in. x 3in. x $1\frac{1}{2}$ in. and being of a sensitive type requires to be mounted in a vibration free holder. The makers have adopted a suspension consisting of four coil springs in a metal frame carried on a telescopic stand of which two kinds are available; one is for table use and the other a floor model. These are strongly made and finished in grey and chromium.

The microphone operates satisfactorily with four volts D.C. and passes about 20 mA., thus a small dry battery will suffice to supply the polarising voltage. An input transformer with a ratio of 1 to 30 is required. On test the frequency response was



Correx carbon microphone and adjustable table-type stand.

found to be very good indeed, speech is clear and crisp and voices are easily recognisable. Although the microphone is quite sensitive it does not give a large output, the mean level being somewhat lower than that of an average pick-up. We found one additional stage of amplification desirable.

It is a particularly good example of the high standard now attained by the carbon microphone, and in view of its efficiency is not expensive at £6 10s. The stands cost £3 15s. in table form and £4 10s. for the floor model, while the input transformer costs 18s. 6d.

RONNIE SCIENTIFIC EARTH TUBE

IT would seem hardly necessary to point out that the mineral compound used in this tube, reviewed in these columns last week, is not injurious to metal, as the acid content of the copper sulphate preparation has been neutralised by a chemical process.

READERS' PROBLEMS

An Eleven-stage Set

THERE is a tendency to classify receivers by "stages" rather than by the number of valves: a querist asks how the New Monodial should be described under this rating.

In this receiver there are a total of six amplifying stages, but if the expression "stage" be interpreted as an electron stream in a valve in the accepted way, there are eleven stages.

Another recent question with regard to the New Monodial relates to the fixed condensers. All these of a capacity of 0.02 mfd. or less are of the mica-dielectric type.

Tuning Indicators

ALTHOUGH a milliammeter is perhaps too scientific a device to appeal to the general public, it is probable that it makes the best possible tuning indicator for the more knowledgeable enthusiast. At any rate, a number of readers have lately written to us on the use of a meter in this way; of course, the general adoption of A.V.C. has led to increased interest in visual tuning devices.

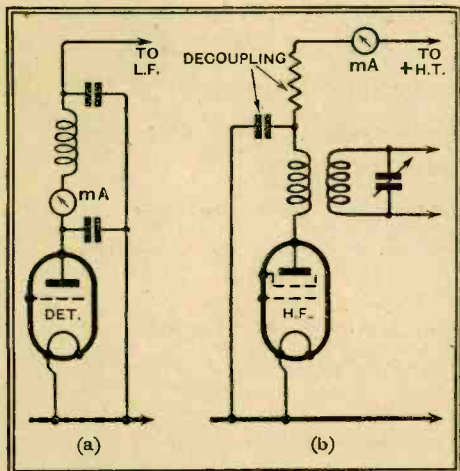


Fig. 1—Although often convenient, it is risky to join a milliammeter directly to the anode of a detector, H.F., or I.F. valve, as in diagram (a). The correct position is indicated in diagram (b).

One or two correspondents seem to have met with difficulties when adding a milliammeter to an existing receiver, but in every case their troubles may be ascribed to incorrect connections. The meter in question may be inserted in the anode circuit of the detector valve, or, more generally nowadays, in the anode circuit of one or more of the controlled valves. It should be emphasised that as a general rule it is dangerous to join the meter directly to the anode of the valve, as this course will very probably be productive of instability, or else it may upset ganging.

Connected as in Fig. 1 (a), in the anode circuit of a detector, the meter and its wiring will be at a high oscillating potential, and may cause excessive interaction with earlier stages. Again, it is often tempting to join the instrument directly to the anode cap of an S.G. valve acting as an H.F. or I.F. amplifier; here the risk of causing instability will be even more pronounced, and the capacity of the meter and its extra leads to earth will be additive to that already existing across the circuit.

THESE columns are reserved for the publication of matter of general interest arising out of problems submitted by our readers. Readers requiring an individual reply to their technical questions by post are referred to "The Wireless World" Information Bureau, of which brief particulars, with the fee charged, are to be found at the foot of this page.

The right position for the indicating meter is always at the low-potential end of the anode circuit (that nearest to the source of H.T. supply), as indicated in Fig. 1 (b).

Proportional Amplification

IT is asked whether the lower audible frequencies may be over-accentuated in a resistance-coupled gramophone amplifier by employing a larger coupling condenser than usual between the stages.

We are afraid that nothing can be done in a pure resistance-coupled amplifier to strengthen the relative amplification of low notes. Even if a coupling condenser of infinite capacity were employed, the bass register would not be amplified to a greater extent than the high notes.

But, although nothing we can do will strengthen the low notes, a similar result can be achieved by weakening the upper frequencies by fitting by-pass condensers in either the grid or anode circuits.

25-cycle Hum

EVERYONE expects to find it easier to smooth rectified current derived from a standard 50-cycle A.C. supply than that obtained from 25-cycle mains. This is due mainly to the fact that the ordinary smoothing choke is much more effective at the higher frequency.

But in actual practice things do not always work out entirely according to plan. For instance, we hear from a reader whose supply has just been changed from 25 to 50 cycles that hum is now very much worse than before, in spite of the fact that his mains transformer has been tested, and is found to deliver the correct voltages under the new operating conditions.

His difficulty is most probably caused by a loud speaker resonance at 100 cycles (which will be the principal hum frequency at the new periodicity), but there is a possibility that the noisier background is merely due to the fact that all loud speakers have a much better response at 100 than at 50 cycles.

The Wireless World INFORMATION BUREAU

THE service is intended primarily for readers meeting with difficulties in the construction, adjustment, operation, or maintenance of wireless receivers described in *The Wireless World*, or those of commercial design which from time to time are reviewed in the pages of *The Wireless World*. Every endeavour will be made to deal with queries on all wireless matters, provided that they are of such a nature that they can be dealt with satisfactorily in a letter.

Communications should be addressed to *The Wireless World* Information Bureau, Dorset House, Stamford Street, London, S.E.1, and must be accompanied by a remittance of 5s. to cover the cost of the service. The enquirer's name and address should be written in block letters at the top of all communications.

Repeating a Warning

THE difficulties described by a constructor of a superheterodyne receiver, in which an unconventional layout is employed, may almost certainly be ascribed to the use of unsuitable screened wire, with too much self-capacity, in the anode circuit of the first detector valve. The symptoms point to the existence of an excessive stray capacity in the first I.F. transformer.

According to our experience, difficulties in ganging and trimming are often due to the fact that high-potential H.F. or I.F. leads are run in ordinary commercial metal-braided cable of the type sold for motor-car wiring, etc. It is wise to make it a rule never to use this wire in any H.F. or I.F. circuit; the safest type of screened conductor to use consists of metal-braided sleeving of large diameter, the internal wire being as thin as possible consistent with mechanical strength.

The Loading Resistance

ONE or two readers are puzzled by the fact that, in the Ferrocart III receiver, a resistance which apparently serves no useful purpose is shunted across the smoothed output of the H.T. supply system; the resistance in question is marked R₁₅ in the original diagrams.

This is a loading resistance pure and simple. It happens that the anode circuits of the valves in this receiver require rather less than the full rated output of the eliminator, and the shunt resistance is therefore added in order to bring up the total load to that figure. It also serves another purpose; without it the energising current flowing through the speaker field which may be used as a smoothing choke would be less than is desirable for best results. As shown in Fig. 2, the resistance is so connected that current flowing through it, as well as the anode current for the valves, will also flow through the speaker field.

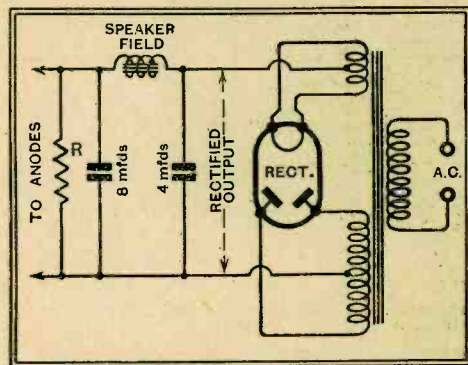


Fig. 2.—The artificial load resistance R prevents an undue rise in voltage and also ensures a sufficient flow of current through the speaker field.

It is often convenient to connect a load resistance in this way in order to prevent a rise in voltage. The necessary ohmic value is easily ascertained by dividing the desired output voltage of the rectifying equipment by "surplus current" (expressed as a fraction of an ampere). Surplus current is the difference between the estimated anode consumption of the valves, and the current at which the desired H.T. voltage will be maintained. The latter may be obtained from the valve maker's data.

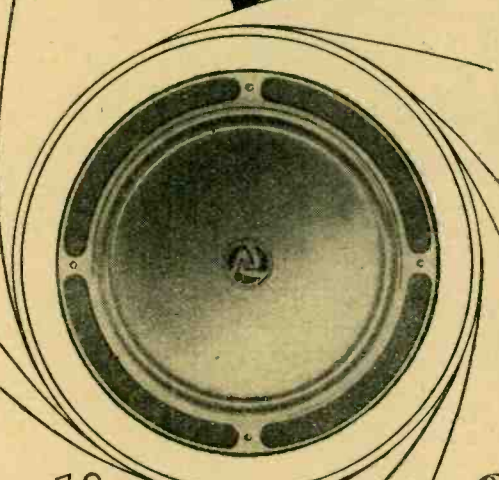
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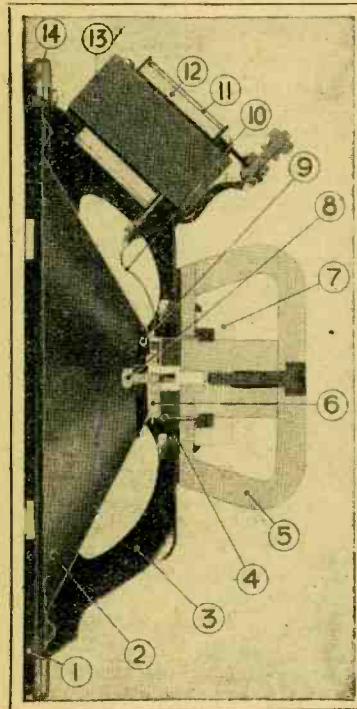
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B.T.H. Universal on Stainless Table, with 2 B.T.H. pick-ups, 70/-; B.T.H. R.K., 15/-.—"Hollinercroft," Garden Suburb, Oldham. [3830]

LOUD-SPEAKERS.

FERRANTI A1 Speaker, perfect; offer nearest £5 secures.—Thornton, Rossetti Av., Burnley. [3808] **B.T.H. RK** Moving Coil Speakers, guaranteed new, unused, manufacturers' surplus, original price. 6 Guineas, highly sensitive and wonderful tone response, will handle up to 10 watts output, available for 6v., 100v., 200v. D.C., 30/-, also A.C. models. £2/10; carriage paid, c.o.d. or cash with order; the best value in speakers obtainable to-day.—O. H. Seekamp, First Avenue House, High Holborn, London, W.C.1. Phone No.: Holborn 6609. [1425] **MAGNAVOX** Moving Coil Loud-speaker. D.C.143, 7,500 ohms, 3-ratio transformer, 10in. diaphragm; £1/10.—Box 8304, c/o The Wireless World. [3787] **ALL** Steel Speaker Pots are 50% More Efficient; made in all sizes up to 6in. dia., 10in. long; also field windings for same up to 100 watts; prices and particulars by return.—H. Crompton, Woodfield Terrace, Bury. [3831]

30/-—111—B.T.H. R.K. moving coil speakers, 6in. cone, new and unused, guaranteed; these speakers are the type as used in cinema sound equipment; suitable for public address work; weight 30lb., and vastly superior to the cheap speakers now on the market, 100 volts, 150 volts, and 200 volts D.C. **27/6**—111—6-volt D.C. speakers, as above; £2/7/6 speaker as above for 100-250 volts A.C., complete with field rectifier.

B.T.H. Transformer, brand new, ratios 1-1, 2-1, 20-1, and 30-1 microphone; 7/- each. **CARRIAGE** Paid, cash with order, or c.o.d.—Ward, 12, Tredegar Rd., Bow, E.3. Tel.: Advance 3668. [3771]

H.D. RADIO ELECTRICAL SERVICE Offers Surplus of a Set Manufacturer, every article guaranteed new, moving coil speakers, Magnavox type D.C. 144, 2,500 or 7,500 ohms resistance, with multi-ratio transformer, at 18/-; type D.C. 142, same voltages, at 25/-; all goods carriage paid; cash with order or c.o.d.—No. 9, Kingsly St., Regent St., London, W.1. [3848]

CHAL-ELECTRIC Offer New Boxed Set Manufacturers' Surplus Rola Speakers, all fitted humbuckers, state if power or pentode required; F6, following voltages, 2,000 ohms, 2,500 ohms, 4,700 ohms, 6,500 ohms, list 35/-, at 18/-; F7, voltages as in F6s, list 47/6, at 25/-; permanent magnets, F6 P.M., list 49/6, at 28/-; F7 P.M., list £3, at 33/-; all goods carriage paid; cash with order or c.o.d.—Chal-Electric, No. 6, Conduit St., London, W.1. [3846]

VALVES.

EPTON Leads Again!—Lissen P625a, 4/3; Triotron S431N, 5/6; American valves, all types.—Epton, 93, New Rd., Chingford, E.4. [3836]

ROLA

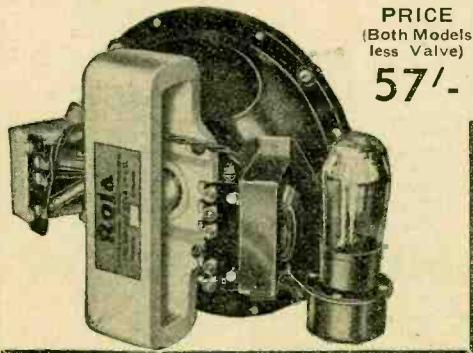
the World's Finest Reproducers

QUALITY Class B for Every Battery Set Owner

No battery set owner need be without the advantages of Class B Amplification. By using a Rola Class B Speaker Amplifier Unit, which takes only 5 seconds to connect, the volume of the set is instantly increased about 5 times.

Model A—For MULLARD P.M. 2B, B.T.H. PD 220, COSSOR 220B, STANDARD 13B1, HIVAC B220, MARCONIPHONE B21, G.E.C. B21, CLARION B22. Model B—For COSSOR 240B, FERRANTI HP2, CLARION B 24.

PRICE (Both Models less Valve) **57/-**



ROLA CLASS B SPEAKERS

No matter what class B Valve you are using there is a Rola Class B Speaker to match its characteristics. Like all Rola speakers these Class B Units are unrivalled for realistic reproduction. For MULLARD P.M. 2B, B.T.H. PD220 COSSOR 220B, STANDARD 13B1, HIVAC B220, MARCONIPHONE B21, G.E.C. B21, CLARION B22.

ROLA FR5—PM—33	Class B	29/6
ROLA FR6—PM—23	Class B	39/6
ROLA F6—PM—23	Class B	49/6
ROLA F7—PM—23	Class B	60/-

For COSSOR 240B, FERRANTI HP2, CLARION B24.

ROLA FR5—PM—32	Class B	29/6
ROLA FR6—PM—22	Class B	39/6
ROLA F6—PM—22	Class B	49/6
ROLA F7—PM—22	Class B	60/-

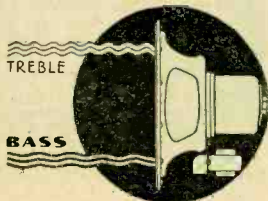
EXTENSION SPEAKERS.

There is a correct Rola Extension Speaker for practically all British Radio Receivers. Rola Speakers are used by the large majority of British Radio Manufacturers. As it is highly desirable to have the speech coil impedance of the Extension Speaker suited to that of the speaker in the receiver the advantages of using Rola Extension Speakers are manifest.

The British Rola Co. Ltd., Minerva Road, Park Royal, N.W.10. Phone: Willesden 4322-3-4-5.

ROLA SPEAKERS

for better Radio Reception



Valves.—Contd.

THE M.R.D. Co's Own New British Valves, guaranteed 6 months, carriage paid; we invite tests against any other make.

2-VOLT Range—V.M./S.G., S.G.2, 7/6; L.F.2, H.F.2, H.L.2, R.C.2, 3/6; driver, 4/-; P2, 4/6; Pen. 2, 10/-; class B, 1 1/2 watts, 9/-; 3 watts, 9/-; also A.C. range; any details and characteristics on request.—Mains Radio Development Co., 4-6, Muswell Hill Rd., London, N.6. [3839]

8/9—Ostar Ganz valves, any type; buy a spare set while our stocks last, state type and voltage required; c.o.d., postage paid.—Kay, 167, City Rd., London, E.C.1. [3814]

THE Following English, American and Continental valves in stock; Philco, Triotron, Tungram, Hivac, and 323 valves; prompt attention.—Newman, 309, Roman Rd., Bow, E.3. [3699]

ALL Latest Types of Brand New American Valves, first class makes: 247s, 235s, 224s, 236s, 237s, 233s, 245s, 244s, 12/-; 227s, 226s, 280s, 245s, 9/6; 242s, 232s, 11/-; U.X.210s, 15/-; U.X.250s, 7 watts output, 16/-; 281s, 14/6; post paid, cash with order or c.o.d.—Ward, 12, Tredegar Rd., Bow, E.3. Tel.: Advance 3668. [3772]

SPECIAL Offer.—Valves by world-famous Continental manufacturers, fully guaranteed, screen grid, variable mu screen grid, high magnification screen grid, low magnification screen grid, H, HL, L, RC, power, super power, directly heated pentode, directly heated power pentode; all the above standard mains type, 4/6 each; 200v. 60 milli-amp. rectifier 5/6, 350v. 120 ma. 6/6, 500v. 125 ma. 7/6; the following 4 volt battery valves at 2/- each, H, HL, L, power, screen grid—Premier Supply Stores, 20-22, High St., Clapham, S.W.4. Macaulay 2188. [3795]

COMPONENTS, ETC., FOR SALE.

PREMIER. **PREMIER SUPPLY STORES** Offer the following Set Manufacturers' Surplus New Goods at a fraction of the Original Cost, all goods guaranteed perfect, carriage paid over 5/-, under 5/- postage 6d. extra (Ireland, carriage forward).

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, T.C.C. condensers, resistances and diagram, 120v. 20 m.a., 20/-; trickle charger 8/- extra; 150v. 30 milliamps. with 4v. 2-4 amps. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v. 60 milliamps. with 4v. 3-5 amps. C.T., L.T., 30/-; 200v. 100 milliamps. with 4v. 3-5 amps. C.T., L.T., 49/6; 300v. 60 milliamps. with 4v. 3-5 amps. C.T., L.T., 37/6.

T.C.C. Condensers, 750v. working, 2 mf. 3/6, 4 mf. 6/-; 4 mf. 450v. working 4/-, 250v. working 1 mf. 1/-, 2 mf. 1/9, 4 mf. 2/6, 1,500v. working Standoff insulators 0.5 mfd. 1/6, 2 mfd. 6/-, aqueous electrolytic 440v. working, 4 mf. 3/-, 8 mf. 3/6.

ALL the Following Lines 6d. each or 5/- per dozen: 4- and 5-pin chassis mounting valve holders; shielded screen grid or pentode leads 1-watt wire end resistances, any value; 0.1 condensers; on-off switches push-pull; polar ganging devices; 0.02 condensers, 0.5 condensers.

POLAR 3-gang 0.0005 Condensers, split end vanes, all totally screened slide drive; 6/11.

MSCO Triple-gang 0.0005 Condensers, with trimmers, 4/11.

T.C.C. Electrolytic Condensers, 100 volts working, 15 mfd., 1/3.

PREMIER Chokes, 40 m.a., 25 hys., 4/-; 65 m.a., 30 hys., 6/-; 150 m.a., 30 hys., 10/6.

PYE Chokes 20 or 32 hys., 4/-; Premier multi-ratio output transformers, giving 15 different ratios, 7/6.

AMPLION High Inductance Chokes, resistance 2,500 ohms, 80 henrys, 60 m.a.; 5/6.

WESTINGHOUSE Metal Rectifiers: 120v. at 20 m.a., 6/6; 180v. at 30 m.a., 8/6; 8v. at 1/2 amp., 6/6; 6v. at 1 amp., 9/6.

HARLEY Pick-up, complete with arm and volume control; 12/6.

BRITISH Radiophone Wire Wound Potentiometers, with mains switch incorporated, 5,000 ohms, 10,000 ohms, 50,000 ohms, 100,000 ohms, 250,000 ohms, any value; 3/6.

KOLSTER BRANDES Gramophone Motors, dual type, can be worked by clockwork or mains, No. 1 induction type 100-250 volts, 27/6; No. 2, A.C. and D.C. 100-250 volts, 27/6; both the above complete with all fittings and turntable.

SPECIAL Offer.—Microphones by prominent manufacturer, high sensitivity, uniform response, complete with stand, transformer and battery; listed £3/15, our price 18/6.

DUBILIER Condenser, 300v. working, 4+4+2+2+2+0.1 +0.1+0.1, 6/-; 1,000v. working 1 mf., 1/6.

PREMIER British Made Meters, moving iron, flush mounting, accurate; 0-15, 0-50, 0-100, 0-250 milli-amps. 0-1, 0-5 amps., all at 6/-.

ORMOND Condensers, 2-gang, semi shielded; 2/6.

SPECIAL Offer of Mains Transformers, manufactured by Philips, input 120-115v. or 200-250v., output 180-0-180 volts, 40 m.a., 4v. 1a., and 4v. 3a., 4/6; 200-0-200v., 4v. 1a., 4v. 3a., 4/6.

ALL Premier Guaranteed Mains Transformers have engraved terminal strips with terminal connections, input 20-250 volts, 40-100 cycles, all windings paper interleaved.

PREMIER H.T.8 Transformers, 250v. 60 m.a., rectified, with 4v. 3-5a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 25/-.

2,000+2,000 Electrolytic, 12 volts working; listed 27/6, at 10/-.

PREMIER H.T.9 Transformer, 300v. 60 m.a., rectified, with 4v. 3-5a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 25/-.

PREMIER H.T.10 Transformer, 200v. 100 m.a., rectified, with 4v. 3-5a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 26/-.

MAGNAVOX, D.C.144, 2,500 ohms field, with hum-bucking coil, Pentode transformer, 17/6; complete with A.C. conversion kit, 27/6.

DOUBLE Spring Motors, made by Garrard, play five sides of 10in. record, complete with turntable and all fittings; 17/6.

MICHAEL 2-screen Grid Pentode Transportable 4, complete; gets many stations; £6/15.

SPECIAL Offer.—Accumulator chargers, input 200-250v. A.C. to charge 2- and 4-volt accumulators at 1/2 amp.; owing to the high efficiency of the silver oxide rectifier employed charge may be used during broadcast; 9/6 each.

(This advertisement continued on next page.)

Components, etc., for Sale.—Contd.

(This advertisement continued from previous page.)

RELIABLE Canned Coils with circuit; 3/-, accurately matched; dual range.

PREMIER L.T. Supply Units consisting of Premier Transformer and Westinghouse rectifier, inputs 200-250 A.C. output, 8v. 1/2 amp., 11/6; 8v. 1 amp., 14/6; 15v. 1 amp., 19/-; 6v. 2 amp., 27/6; 30v. 1 a., 37/6.

PREMIER Mains Transformer, output 135v. 80 m.a., for voltage doubling, 8/6; 4v. 3.4a., c.t. L.T., 2/- extra; Westinghouse rectifier for above, giving 180v. 30 m.a., 8/6.

PREMIER Mains Transformers, output 250-0-250 volts 90 m.a., 4v. 3.5a., 4v. 2.3a. (both c.t.), with screened screened primary, 15/-.

PREMIER Mains Transformers, output 350-0-350 volts, 90 m.a., 4v. 3.5a., 4v. 2.3a. (both c.t.), with screened primary; 15/-.

PREMIER Mains Transformers, output 400-0-400 volts, 100 m.a., 4v. 4.5a., 4v. 2.3a., with screened primary; 15/-.

PREMIER Auto Transformers, 100-110/200-250 volts or vice versa, 60-watt, 7/9; 100-watt, 10/-.

SPECIAL Offer of Manufacturers' Type Transformers, any input, output 250-0-250 volts, 60 m.a., 4v. 1a., 4v. 3a. (both c.t.), 8/6; H.T.B. transformer, with 4v. 3.4a. (c.t.), 8/6; with rectifier, 18/6.

AMPLION Mains Transformers, input 100-250 volts, output 350-0-350 volts, 120 m.a., 4v. 5a., 4v. 2a., 6v. 1a. (all c.t.); 17/6.

FILAMENT Transformers, polished and engraved terminal boards, N.P. terminals, 4v. 3.4a., 5/-; 10v. 3a., 6/6; 12v. 1a., 5/-; 4v. 4.6a., 6/6; 14v. 4a., 6/6; 22v. 1a., 6/6; 6v. 2a., 5/-; 9v. 1a., 5/-; 35v. 3a., 15/-.

PREMIER Eliminators, input 200-250 volts, 40-100 cycles, A.C. incorporating Westinghouse metal rectifiers, output 250v. 60 m.a., S.G. and 120v. taps, 42/6; with 4v. 4a. c.t. L.T., 7/6 extra.

PREMIER Eliminators, output 150v. at 30 m.a., S.G., and 100v. tap, with 4v. 3.4a. c.t. L.T., 37/6; or with trickle charger, 42/6.

PREMIER Eliminators, output 120v. at 20 m.a., S.G. and 100v. taps, 27/6; with L.T. trickle charger incorporated, 35/-.

PREMIER D.C. Eliminators, output 120v. at 20 m.a., S.G. and 100v. taps; 15/-.

ACUMULATOR Chargers, 200-250 volts A.C., all incorporating Westinghouse metal rectifiers; 2, 4, and 6v. at 1/2 amp., 2/-; 2, 4, and 6v. at 1 amp., 17/6; 12v. 1a., 27/6; 6v. 2a., 35/-; 12 v. 1.5a., 30/-; 6v. 3a., 39/6; 30v. 1a., 42/6; 50v. 1a., 62/6.

BT.H. Induction Typ. (A.C. only) Electric Gramophone Motors, 100-250 v., 30/- complete.

AMPLION Moving Coil Speakers, type E.M.644, dual fields 2,500 and 5,000 ohms (100 and 200v.), with output transformer, 12/6; A.C. conversion kit for this speaker, 10/- extra.

WESTERN ELECTRIC Condensers, 250v. working, 1 mid. 6d., 2 mid. 1/-; 500v. working, 1 mid. 1/-.

TC.C. Condensers, 250v. working, 4x4x1 mid., 3/6; 6x4x2x2 mid., 37s. working, 6/11; 4x4x1, 6/-.

SPECIAL Offer of Wire Wound Resistances—4 watts, any value up to 10,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6; 50 watts, any value up to 50,000 ohms, 3/6.

WIRE Wound Potentiometers, 15,000 ohms, 1/6; Centralab Potentiometer controls, 50,000 ohms, 2/-.

FOR CALLS ONLY.—The following valves, guaranteed new

PHILIPS 328 Valves for L.T. Charging, 5/6; 329 Barretter lamps, 2/-.

PREMIER SUPPLY STORES, 20-22, High St., Clapham, S.W.4. Macaulay 2188. Closed 1 o'clock Wednesdays, open to 9 o'clock Saturdays. Nearest Station, Clapham North Underground.

PREMIER. [3778]

AMATEUR'S Surplus for Sale; stamp for list.—Iles, 25, York Rd., Swindon. [3784]

MILDMAY RADIO EXCHANGE Offers the Following, sound and perfect:—

COLVERN, K.B.I.C. pair, and K.S.R., 17/6; C.A.I. triple tuning unit, 30/-; Ready Radio S.T.400 or S.T.500 coils, 6/6 pair; Lotus L.F. transformers, listed 10/8, 5/6 each; Ready Radio Instamat output transformers, 10/- each.

WEARITE G.L.32 Superhet Chassis, 25/-; Lewcos or Wearite superhet coils, 4/6 each; J.B. 4-gang chassis mount condenser, 17/6; J.B. 4-gang, fully screened, 20/-.

EKCO Radiocorders, with pick-ups, 30/- each; Marconi Senior speaker magnets 15/- each; Ferranti S.D. D.C. moving coil speaker, 50/-; Ferranti A.F.4, 8/-; A.F.3, 11/-; A.F.5, 17/-; A.F.5C, 19/-; A.F.5C.C., 21/-; O.P.M.I.C., 14/-; O.P.1, 1-1, 7/6; O.P.2, 25-1, 8/-; O.P.M.8, 10/-; R.J. 100 m.a. choke, 10/-; Pye tapped output transformers, 6/6 each; Lotus mains chokes, 5/- each; Climax H.F. chokes, 3/- each.

COLLARO Type 32 Combined A.C. Motors and Pick-up, fully automatic, 59/6; Collaro Empire model, less pick-up, 37/6; Garrard A.C.4 motors, with fully automatic plate, 32/6.

ALL Post Paid.

PHONE: Clissold 5001.

OPEN Thursday, closed Saturday all day.

24, Mildmay Grove, London, N.1. [3799]

WOBURN RADIO Offer Following Set Manufacturers' Clearance Lines:—

BAKER Selhurst "Motor" P.M. Speakers, 21/-; Clix valve holders, 2/6 per dozen; fixed condensers, Polymet and Dubilier, all sizes, 3/6 per dozen; Siemens 4 mid. 500v., 2/3; 0.01x0.01 mfd. 3,500 v., 1/7; Hydra 2 mid. 500 v., 1/3; Ready Radio short wave coils, 2/- each; Class B driver and choke, 9/6 per pair; Erie and Dubilier resistances, 1/2 watt 4/6, 1 watt 6/6 dozen, 4 watt 50,000 and 100,000 9d.; B.T.H. R.K. Junior, 6/12v., 17/6 (carriage forward); Amplion, 0.0005 mica condensers, 9d.; 0.0003 differentials 10d.; British Radiophone output transformers, ratio 32-1, 18-1, 23-1, 4/11 each; K.B. output transformers, 33-1, 2/6 each; H.F. Binocular choke, 1/3; H.F. chokes, 10d.; Edison R.C.C. units, 1/6; Dur-Amansco 3 gangs, with trimmers and drum drive, 7/11; 2 gangs, with trimmers, 4/11; Spaghetti resistances, 3/- dozen; Ready Radio extensor condensers, 0.0005, 2/6; Simpsons electric turntable, 17/6; we supply any make of set on terms, also make up Monodials to your own requirements.—Woburn Radio Co., 7, Woburn Buildings, W.C.1. Euston 1571. [3841]

IS YOURS A LOUDOSCOPE ?

A witty customer of ours, after coming to the conclusion that: "the average loud speaker is only useful as an indicator that the set is working or not," suggests that loud speakers can be classified as—

HARTLEY-TURNERS and Loudoscopes.

Perhaps his enthusiasm has carried him away, but it is a fact that our customers are very enthusiastic. If you are getting tired of "the same old thing" in your radio programmes why not "rub it out and start again."

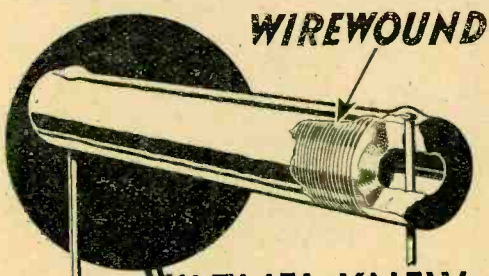
There is a HARTLEY-TURNER Speaker waiting to give YOU new thrills.

D.C. MODEL A.C. MODEL
7 Gns. 8 Gns.

Our 32-page booklet "New Notes in Radio," sent for a 1d. stamp, will tell you all about it.

A new model now in stock for the new "Wireless World" Monodial Super.

HARTLEY TURNER RADIO LTD.,
THORNBURY ROAD, ISLEWORTH, MIDDLESEX.
Telephone: Hounslow 1854.



WATMEL KNEW WHAT YOU WANTED SO HERE IS THE HYWATT

A resistance that will not break down. one that will stand high overloading. is moisture-proof and noiseless.
The Hywatt is a definite advance in Resistance manufacture.
Due to its wire element it is unchangeable in operation, has a much closer tolerance than the carbon type and a fixed resistance value.
This is why so many set manufacturers have chosen the Hywatt for their 1934 sets.

Made in all values from 1-50,000 ohms.
For full details please write to
WATMEL WIRELESS CO. LTD.,
Imperial Works, High Street, Edgware, London.
Telephone: Edgware 0323.



Components, etc., for Sale.—Contd.

R. SELECTED Parts for Sale, as new; c.o.d. or "Wireless World" deposit system, which we recommend if in doubt as to the splendid value offered; we take risk of damage in transit to our customers; goods tested for callers and guaranteed.

TO Clear.—Igranic mains transformers, half wave, 550v. 60 m.a., 7.5v. 7.5v. new, 6/- ditto, 250 250, 100 m.a., 4v. 1 amp., 10/6; Varley 250/250, 75 m.a., 3.4v. 6v., 17/6; Parmeko 250/250, 60 m.a., 2.4v., 6v., 20/-; Vortexton 250/250, 120 m.a., 2.4v., 6v., 15/-; H.T.7 with R.I. transformer and 4v. 6 amp., 20/-; all with 200/250v. input.

TO Clear.—Brown Vee cone units, new, 9/6; R.I. 7/14H. chokes, second-hand, 10/-; Magnavox D.C.144 2,500 ohm speakers, 18/6; British Radiophone 3-gang condensers, 0.0005, new, with trimmers, proper cover and disc drive, all fittings, 15/9; Triotron 8 mf. wet electrolytic, 440v., 3/6; Polar 2-gang tubs, 6/6; Polar 3-gang tubs, with trimmers, 10/-.

CLARKE'S 4v. 5-amp. Transformer, 240/50v., 6/6; Philips ditto, for 200v., 6/6; Heyberd tapped input, 4v. 3 amp., 6/-; Gambrell Senior Nivokone, for medium resistance pick-ups, 50/-; Varley 300H. choke, 10/-; Varley dual S.P. choke, 10/-; Telsen 350v. 60 m.a. x 2 4v. windings, 9/-; Savage 400v. 90 m.a., 3 4v. windings, 16/-.

TRANSFORMERS.—Ferranti A.F.5, 18/6; A.F.6, 15/6; O.P.M.I.C., 16/6; O.P.M.6, 14/-; O.P.M.2, 14/-; B.I. choke, new, 13/-; B.5, new, 17/6; Lissen Super, 7/6; R.I. straight line tapped secondary, second-hand, 7/6; Lissen 23-1 output, 6/-; Lissen 1-1 output, 5/6; Lissen large G.P. choke, 18H. at 60 m.a., 6/6; Ryall's 350v. transformer, 3 4v. windings, 120 m.a., to clear, 15/6; solder strips.

TO Clear.—Mullard H.T. unit, 150v. 30 m.a., 240v. input, 25/-; Six Sixty 200v. 30 m.a., 4v. 5 amp., input 200v., 25/-; Philips' 150v. 25 m.a., input 200v., 25/-; with rectifier, valve; Ekco A.C.25, 40/-; Amplion P.A. microphone, 23.

RYALL'S RADIO Offer Reliable Resistances, suitable for all sets where a 1-watt resistance is specified, in values 100, 250, 500, 1,000, 2,000, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 40,000, 50,000, 75,000, 100,000, 150,000, 250,000, 1/2 meg., 2 meg., all values stated in ohms, 6d. each; also 2-3-watt type, 1,000, 10,000, 9d.

NEW Output Transformers similar to R. and A., ratio 18/23/32, 6/-; Telsen 0.05 mica condensers, 2/3; T.C.C. 0.01 mica type M., 1/-; new Paxolin formers, 1in. slotted, with guides, 8d.; T.C.C. 2 ml., 350v. working, 1/6; ditto, 1 ml., 1/3, new; T.C.C. 4x4, 250v. working, 4/9.

PAIRS New Polar Twin S.M. Thumb Drive, 0.0005, complete, 12/6; Telsen 100h. chokes, 3/-; Westinghouse H.T.4 and A.4 rectifiers, with Varley transformers, 22/-; Cyldon 0.0005 double thumb twin extender, 15/6; Cyldon single 0.0005 extender, 7/6; Ready Radio 0.0005 extensor condensers, new, 3/6.

RADIOPHONE Pots with Switch, 5,000, 10,000, 25,000, and 50,000 ohm, 2/6 each; new type Magna speaker, 2,500 ohm and 5,000 ohm, 42/6 each complete.

EDISON BELL 10,000 Eureka, wire wound, with holders, 1/-; Edison Bell 0.0005 universal log all-metal condensers, 1/6, new.

SPECIAL Offer of Pye 20h. Chokes, 40 m.a., 130 m.a. maximum, D.C. resistance 300 ohms, in brown crystalline finish, new, unused, Pye 321i, chokes, D.C. resistance 750 ohms, 30 m.a., 80 m.a. maximum, ditto, 6/3 each, post free.

WEARITE and Lewcos Superhet. Coils, 5/-; 3-range W oscillators, 1/6; T.C.C. 2,000 mf. electrolytic, 9/-; T.C.C. ditto, 250 mf., 100v., 8/6; Igranic L.F. choke coupling units, 3/9; Lotus new 4-gangs, 15/9.

RYALL'S Mains Condensers, 4 mf., 250v. working, 2/6; 4 mf., 500v. working, 4/6; 4 mf., 750v., 6/6; 2,000v., 17/6; Ryall's condenser blocks, 2.4 mf., 2.2 mf., 500v. working, 8/6; Dubilier 2x2, 500v. working, 2/6.

RYALL'S Mains Transformers, 250v. 60 m.a., 4v. 1 amp., 4v. 3 amp., 10/6; 350v., 12/9; H.T.7, with 4v. 4 amp., 10/6; 4v. 3 amp. only, 6/9; chokes, 25h. at 60 m.a., resistance 260 ohms, 6/9; 20h. at 100 m.a., 8/9; 10h., 8/9, for Monodial; 40h. at 100 m.a., 10/6.

METERS, moving coil, made for Ryall's Radio, guaranteed one year, and to B.E.S. first grade specification, all panel flush type, bakelite case, 0.5 m.a., 0.20 m.a., 0-50 m.a., 21/- each; 0-250v., 32/6; 0-300v., 35/-; 1,000 ohm per volt, zero adjuster, size 3 1/4in.

METERS, as above, moving iron, first grade, air damped, zero adjuster, 0-250v. A.C., 18/-; 0-50 m.a. A.C. and D.C., 15/-; non damped, without zero, 0-12v. D.C., 10/-; 0-50, 12/-; 0-3 amps., 10/-; 0-20 m.a. A.C. and D.C., 10/-, ditto.

WE Hold a Large Stock of First Class Radio Apparatus, meters, resistances, condensers, heavy chokes, and all set requirements, at bargain prices, all modern goods.

RYALL'S RADIO, 33, Chancery Lane, London, W.C.2 (nearest Tube Chancery Lane; bus 67 passes door, or tram to Savoy St.), Holborn 3529. Open Saturday afternoon. Close 7 p.m., Thursdays 1 o'clock, Saturday 6 p.m.

R. [3805]

SURPLUS RADIO Offer the Following at Ridiculous Prices:—

WIRE Wound Potential Dividers, 4,500, 3,000, 2,000 ohms, and 15,000, 12,000, 8,000 ohms, both 60 watt, at 1/6 each; postage 3d.

DITTO, 5 watt, 4,000 and 23,000 ohms, 40,000 and 80,000 ohms, 40,000 and 100,000 ohms, 30,000 and 50,000 ohms, 20,000, 20,000 and 20,000 ohms; all at 1/- each; postage 3d.

TWO Resistances on 1 Tube, 4,500 and 500 ohms, 60 watt; at 1/6 each; 3d. postage.

THREE Resistances on 1 Tube, 2,500, 1,000 and 80 ohms, 5 watt; at 1/- each; postage 3d.

SINGLE Resistances, 5 watt, 8,000 and 65,000 ohms; at 6d. each; postage 3d.

14 Mid. Block Condensers, 2 types, 750v. D.C. test, tapped 4-6-2-1-1 and 3-9-2; at 4/- each; postage 6d.

ONE Mid. Condensers, 750v. D.C. test, at 6d. each, postage 2d.; 4 mid. condensers, 750v. D.C. test, at 1/6 each, postage 4d.

DDOUBLE Smoothing Chokes, mounted, sound, robust job, 120 m.a., 14-28 henries each, usual price 35/-, our price 6/8 each, 9d. postage; single ditto, 4/6 each.

EACH Article is Tested Before Despatch, and guaranteed first class manufacture.

CASH with Order; all goods despatched same day.—The above from Surplus Radio, 32, Queensway, Ponders End, Middlesex. [3845]

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To obtain the highest possible efficiency from any receiver, reliable and silent contact at every point is essential. That is THE reason why experienced designers of sets described in the radio publications use and recommend CLIX.



CLIX "MASTER" PLUG

Positive METAL to METAL wiring. Firm grip and full contact with ALL sockets with internal diameters from $\frac{1}{16}$ to $\frac{1}{8}$ in. Curved ends for easy insertion. Price 1 1/2d.

Non-Corrosive SPADE TERMINALS
Large --- 2d.
Small --- 1 1/2d.

PANEL TERMINALS

Type B, with Hexagonal Shoulder for easy mounting 4d.
Type A - 2 1/2d.

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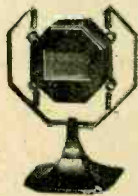
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Genuine Eisel-Reisz Microphones at Bargain prices. A £25 Microphone of incomparable quality and wide frequency response range at sacrifice price of 55/-.



EISEL REISZ 55/- ONLY.

Handsome stand for table P.A., 15/-.



LAFONE REISZ HAND MIKE, 52/6

Complete Microphones for all purposes in stock. 25 models.

Electradix are always in front with the latest and best. Send for our Complete Catalogue "W", 4d.; or, Bargain Sale List post free and you will save money.

THE DIX-ONEMETER. The ideal of multi-range, moving coil meters. Built to first-grade British Engineering Standard. 50 ranges on one meter. Measures Microamps to 20 amps, millivolts to 1,000 volts, 50 ohms to megohms. Six Terminals. Two clear scales, mirror, and knife-edge pointer for accurate reading. Complete in case, 60/-.

THE DIX-MIPANTA VEST POCKET TESTER. A wonderfully versatile moving-iron multi-range meter for service on A.C. jobs. No projecting terminals. THREE ranges of volts: 0-7.5, 0-150, 0-300. Used for MILLIAMPS reads: 0-12 1/2 mA., and 0-75 mA. In black bakelite case. Measures only 2 1/2 in. by 2 1/2 in.

Complete in case with pair of test leads and plugs. Leaflet "W" gives full information. 19/6.

S. G. BROWN'S BATTERY SUPERSEDER makes H.T. from your L.T. 2-volt battery, rectified and smoothed. 3 tappings. A boon to those who are not on the mains. Reduced from £3/15/-.

LESIDX CHARGERS. We have 25 models to offer and build special types to special requirements. Three popular sizes are the AC109A for 36 cells at £10/9/-; the AC106 for 108 cells at £12/10/-; and the Lesidx Super Six for 200 cells at £32/7/6. Ask for Charger Leaflet "W".

ELECTRADIX RADIOS, 218, UPPER THAMES STREET, E.C.4. Phone: City 0191.

Components, etc., for Sale.—Contd.

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

MAINS Transformers.—250-0-250 volts 60 m.a., 4v. 1a., 4v. 2-4a., 11/-; 250-0-250 volts 60 m.a., 4v. 1a., 4v. 2-3a., 4v. 1a., 12/-; 350-0-350 volts 60 m.a., 4v. 2-2 1/2 a., 4v. 2-4a., 13/6; 350-0-350 volts 120 m.a., 4v. 2-2 1/2 a., 4v. 3-5a., 4v. 1a., 16/-; 500-0-500 100 m.a., 4v. 2 1/2 a., 4v. 3-5a., 4v. 2a., 19/-; step-up or step-down transformers, 0, 100, 110, 200, 230 and 250 volts, 60 watt output 12/6, 100 watt output 14/9.

SMOOTHING Chokes.—20 henrys, 120 m.a., 320 ohms, 8/9; 50 henrys, 60 m.a., 500 ohms, 7/8; 40 henrys, 40 m.a., 700 ohms, 6/6.

ALL Mains Transformers and Chokes Guaranteed for 12 Months, specials quoted for and delivery given within 3 days of order.

VARIABLE Condensers.—Polar 3-gang 0.0005, complete with dial, knob, escutcheon, 11/- (list 35/-); Lotus 2-gang 0.0005, complete with dial, knob, escutcheon, 8/6; all ganged condensers are fully screened, with trimmers, and boxed; Hydra block condensers, new, 16 mid., 2+2+8+2+1+1, 1,000 volt test, 7/- each; 4 mid., 2/6; 2 mid., 1/9; 1 mid., 1/-.

SPEAKERS.—Rola F6 permanent magnet, 28/- (listed 49/6); D.C. mains energised, 2,500 to 6,500 ohms, complete with humbucking coils and transformers, 16/6 (list 39/6); G.E.C. Stork speakers, complete in magnificent cabinets, 19/6 (listed 35/15); Ormond speakers, complete in cabinets, 10/- (listed 25/-); Blue Spot, 100U, 13/6 (list 37/6).

CONSTRUCTORS' Kits.—Ready Radio "303" battery 3-valve kits, less valves, 18/- each; complete with 3 Mullard valves (P.M.1L.F., P.M.2, 2D.X.), 33/- each (list 70/-); Ready Radio Meteor screen grid, 3-valve kit, less valves, 26/-; with 3 Mullard valves (P.M.12a, P.M.2D.X., P.M.2a), 49/- (list 45/7/6); Universal Radio 3-valve kits, ready assembled on chassis, 12/6 (listed 45/-).

READY Radio "303" A Kits, complete with cabinet, M.C. speaker, less valves, £2/5; with 3 Mullard valves (P.M.1L.F., P.M.2D.X., P.M.2), £3/5 (list £6/17/6).

READY Radio Meteor "A" 3-valve Screen Grid Kit, complete with cabinet, M.C. speaker, less valves, £3/7/6; with 3 Mullard valves (P.M.12a, P.M.2D.X., P.M.2A), £4/10 (list £8/7/6).

READY Radio S.T.400 Kits, as specified by Scott Taggart, £2/19/6 (list £4/17/6); Mullard Radio for Million 3-valve A.C. kit, complete with 3 Mullard A.C. valves (Pen4V, 354V, 84V), £3/10 (list £6/10); Mullard Radio for Million 3-valve battery kits, complete with 3 Mullard valves, £3/3 (list £6/2/6), all kits brand new, in original sealed cartons.

B.T.H. Senior Pick-ups, 1934 model with volume control, 28/- each (list 37/6); 6 only, B.T.H. Junior pick-ups, 17/6 (list 25/-); H.M.V. volume controls, 1/6 each (list 12/6).

RECEIVERS.—Burgoyne 3-valve battery transportable sets, complete with valves, batteries, accumulator and speaker, £3/2/6 (list £7/19/6), new, in cartons.

ALL Goods Guaranteed New and Perfect and Sent Carriage Paid.

BRANCHES at 271-275, High Rd., Willesden Green, N.W.10, and at 48, Lisle St., W.C.2, where callers are cordially invited to inspect our large stocks of wireless bargains. Please send all post orders to 323, Euston Rd., N.W.1.

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

EXPERIMENTER'S Surplus for Sale; write for list, stamp.—White, Bucknill's Close, Epsom. [3819] [3793]

CHAL-ELECTRIC Offers Set Manufacturers' New Surplus, all carriage paid, cash with order or c.o.d.

VARIABLE Condensers.—Polar Star, 1933, complete with disc drive, dial light covers, trimmers, etc., list 30/6, at 18/-; J.B. Nu Gang, complete as above, at 17/6; Polar Uniknob, fitted complete as above, 10/-.

COILS (6 sets only).—Colvern Ferrocart, F1, F2, and F3, with switching, ganged on base, 32/-; new Midget type (3 set), 3-ganged, 32/6.

CONDENSERS.—C.E.C. Murphy, etc., 800 D.C. test, 250 A.C. working, 1 mid. 1/1, 2 mid. 1/9, 4 mid. 2/6; all the following are 1,500 D.C. test, 500 A.C. working, 800 peak: 1 mid. 1/9, 2 mid. 2/4, 4 mid. 4/-; multiple banks, all separate tappings: 20 mid., 4+4+2+2+2+2+2+1+1 mid., 11/-; 9 mid., 4+2+2+2+1 mid., 6/9; 5 mid., 2+2+1 mid., 4/-.

MAINS Transformers and Chokes.—Tapped and screened primary, Phillips, 500-0-500 at 120 m.a., 4v. 2.5 amps., 4v. 2amps., 4v. 5 amps., 250-0-250 at 60 m.a., 4v. 1 amp., 4v. 1 amp., 4v. 3 amps., 12/-; 250-0-250 at 75 m.a., 4v. 1 amp., 4v. 5 amps., 13/-; chokes, 30 henry, 75 m.a. (500 ohms), 6/9; 30 henry, 60 m.a. (500 ohms), 6/6; 20 henry, 120 m.a. (350 ohms), at 9/6.

ASK for Special Quotation for Anything You May Need.—Chal-Electric, No. 6, Conduit St., London, W.1. [3847]

1/6, post free; wonderful bargain; Centralab variable resistances and potentiometers, in maker's boxes.

POTENTIOMETERS.—Power, 15 ohm, 175 ohm, 1,000 ohm, 2,000 ohm, 5,000 ohm; great power, 400 ohm, 500 ohm, 1,000 ohm; standard, 6,000 ohm, 20,000 ohm, 50,000 ohm.

VARIABLE Resistances.—Power, 6 ohm; standard, 6 ohm, 2,000 ohm, 5,000 ohm, 8,000 ohm, 25,000 ohm, 50,000 ohm, 200,000 ohm.

J. D. WIRELESS Co., 195, Breck Rd., Liverpool. Phone: Anfield 1078. [3801]

METERS Moving Coil, Weston 301; 10 m.a. and upwards, 22/6; Galvos 30-0-30, 27/6.

NEW British Made, 1 m.a., 27/6; 250 volts (1,000 w. per volt), 32/6; Turners 20 m.a. upwards, 17/6; thermo ammeters, 1.5a, 22/6; French 3-range, 3 m.a., 6v., 240v., 22/6, 2-range, 2 m.a., 240v., 20/-; German 2 m.a., 25/-; 2,000 volts, 32/6; assorted makers, 25 m.a. and upwards, 10/6; laboratory apparatus in stock; meter repairs a speciality.—The Victoria Electrical Co., 47, High St., Battersea, S.W.11. Phone: Batt, 0780. [0355]

GILBERT INDUSTRIES Parcels and Components.—"A," "B" and "D" parcels still available by return (see issue October 6th).

OUR Famous 30 m.a. 180v. A.C. Eliminator Kit, complete in every detail, has now been redesigned for a still smarter case and heavier rectifier; price remains at 30/- post paid while supplies last.

GILBERT INDUSTRIES, Ltd., 619, London Rd., West-cliff, Essex. Phone: Southend 492071. "Come and see us Sunday morning." [0402]

AMP METERS, hot wire 1/2 amp. Johnson, Phillips, new, 2/9, postage 3d.; tester cell, precision M.C., 3-0-3. Eversheds, 10/-, postage 6d.—Beaton, Chalk Farm Rd., N.W. [3809]

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COMPLETE CONFIDENCE

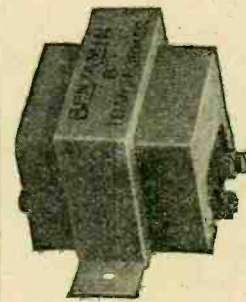
Do not risk disappointment by using cheap components, you may be lucky, but most probably you won't. Make quite certain of success by using Benjamin Proved Radio Products: each individual component is perfectly made, and may be employed with complete confidence in whatever set you construct.



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The Transfeeda used in the L.F. Stage will result in improved quality with full amplification. Suitable for following all types of valves.

Price - - 11/6

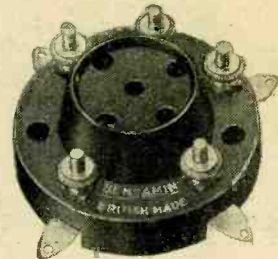


"B" DRIVER

Class "B" input Driver transformer for use with all types of circuits and valves. Tapped to give choice of over all ratios 1 1/2:1, 1:1.

Price - - 10/6

Benjamin 4-pin valveholders with self-aligning positive-grip sockets and solder tags integral with springs.



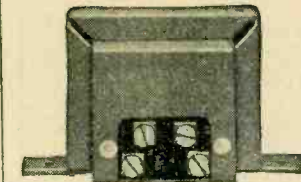
FIVE-PIN

Clearertone 1/6
Vibrolder 10d.

Benjamin 5-pin and 7-pin valveholders are fitted with easy wiring reversible terminals and special self-cleaning contacts.

5-pin, 10d.

7-pin, 2/-.



OUTPUT CHOKE

Class "B" universal output choke for matching all Class "B" valves to existing loudspeakers. Tappings enable suitable ratios to be obtained for all working conditions.

1:2:1, 1:1, 1:1.9 etc.

Price - - 11/-

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THE BENJAMIN ELECTRIC Ltd., Tariff Rd., Tottenham, N17.

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Components, etc., for Sale.—Contd.

EBURY BRIDGE RADIO Offer the Following Stupendous Bankrupt and Set Manufacturer's Surplus Bargains.

A.C. High Tension Eliminators, input 200/50 volts, output 150 volts 30 m.a., 3 pos. tappings, one fixed, one continuously variable, Westinghouse rectified, finest components, guaranteed, 25/-; 3 pos. tappings, for S.G., 28/6; post 1/3; also in 100/110 volts input.

D.C. Eliminators, 200-250 volts input, output 150v. 30 m.a., one fixed, one continuously variable tappings, 10/-; 3 pos. tappings for S.G., 12/6; post 9d.

GENUINE Reisz P.A. Microphones for all Speech Amplifying, 55/-; nickel plated stand, with rubber suspension, 15/-; special matched transformer, 5/-; all post free.

EX Manufacturer's Mains Transformers, suitable Ferrocart III, tapped 200/50v. input, outputs 350-0-350v. 70 m.a., 4v. 2a., 4v. 3-4a., C.T., 9/6; post 9d., a real snip.

EX Manufacturer's Heavy Duty Smoothing Chokes, 50h. at 50 m.a., 5/6; post 6d.

SPECIAL Offer—Utility 0.0005 condensers, with S.M. drum dial and escutcheon plate, new, boxed; 5/6; post 6d.; dial alone listed, 10/-.

PYE Mains Transformers, 200/50v. input, outputs 135v. 80/100 m.a., 4v. 4a., C.T., 6/6, post 9d.; smoothing chokes, 30h. at 30 m.a. C.I., 600 ohms, 3/9, post 9d.

SPECIAL Offer—Ebury synchronous electric clock movements, robust, reliable, 200-250v. 50c.; 16/6; post 6d.; write for full details.

CONDENSER Bargains—All working voltages, T.C.C. 3 m.f., 800v. 5/-, post 6d.; 9 m.f. (4-4-1) 250v., 3/6, post 6d.; 15 m.f., dry electrolytic, 100v. for auto G.B. decoupling, 1/3, post 2/4d.; all as new; Siemens 4 m.f., 250v., 2/-; Hydra 2 m.f., 250v., 1/6, all post 4d.

LAMPLUGH Silver Ghost Moving Coil Speakers, 6,500 ohms, new, boxed, 12/6, post 1/-.

FINAL Clearance Offer—Blue Spot 100U inductor speakers, new, boxed; listed 35/-, 14/6; post 1/-.

HEYBERD Mains Transformers, 200/250v. input, outputs 100v. tapped 80v. 70 m.a., 4v. 4a. C.T.; 10/6; post 9d.

CHASSIS Mounting Valve Holders, 4-5 pin, 3d each, post 1/4d.; 2/6 doz., post 3d.; Lueve 4 Watt vacuum resistances, 50,000 and 100,000 ohm, 9d. each, post 1/4d. bargain; manufacturer's parallel feed intervalve transformers, 2/6, post 3d.; toggle switches, 6d., post 1/4d.

ALL Goods 3 Days Approval Against Cash, or c.o.d.

EBURY BRIDGE RADIO Co., 33, Ebury Bridge Rd., S.W.1, near Victoria Station (No. 11 bus to Ebury Bridge). Sloane 8407. [3849]

MICROPHONE and Transformer, Philips; cost 60/-, accept 30/-—Miles, 10, Edgar Rd., Sanderstead, South Croydon. [3813]

MAINS Transformers, new.—For H.T.5 rectifier, 6/6; ditto, with 4v. 4a. C.T., 8/6; for H.T.8, with I.T. 4v. 4a. C.T., 12/6; others in stock.

MOVING Coil Speakers, new.—200 to 250 volt field windings, 10/-; output transformer, 6/-; postage 9d.—63, Abbots Drive, North Wembley, Middlesex. [3843]

MODERN RADIO Again Present the Most Stupendous Bargains of Set Manufacturers' Surplus Yet Offered; all goods offered are post free except I.F.S.

PHILIPS Mains Transformers, 100-240 volts input, output 250-0-250 volts, 60 m.a., 4 volts 4 amps. C.T., 4 volts 1 amp., 5/-; eliminator transformer, input 210 volts, output 200-0-200 volts, 30 m.a., 4v. 1 amp., 2/6.

PHILIPS Block Condensers, 300 volts working, 4x3x1.5 x0.5x0.5x0.2; 2/9 each.

PHILIPS 6,000 ohm Volume Controls, with mains switch, 3/6; Kolster Branded loud-speakers, in solid oak cabinet, model 295, new and boxed, 10/11; model 287, in solid oak cabinet with sloping sides, 12/6, a superior model.

PAXOLIN Panels, 18x7 1/2, 1/- each, 9/- per dozen; 14x7 1/2, 9d. each, 7/6 per dozen.

A.C. Ammeter, reading 0.15 amperes, 3/6 each; Erie 1 watt resistors, 350, 15,000, 20,000, 25,000, 100,000, and 250,000 ohms, 8d. each, 6/9 per dozen.

WHITE 1,000 ohm Wire Wound Resistances, 6d. each, 4/- per dozen; Philips mains transformers, 210 volt input, output 200-0-200 volts, 30 m.a., 4 volts 3 amp., C.T., 4 volts 1 amp., with screened primary, 4/6.

LOEWE Vacuum Resistances, with wire ends for soldering, 3,000, 10,000, 15,000, 25,000, 50,000, 100,000, 1/4, 1/2, and 1 meg., and 0.005 condensers 3d. each, 2/- per dozen; special price for quantity.

LOEWE Vacuum Type Resistances, 2 watt type, 50,000 and 100,000 ohms; 8d. each, 6/9 per dozen.

EX-MARCONI Shrouded Smoothing Chokes, 590 ohms, 30 m.a., 30 henry, nice clean job; 3/- each.

PHILIPS Tapped Smoothing Chokes, 1,200 ohms, tapped at 800, 40 m.a., 20 henry.

FARRAND Inductor Speakers, absolutely new and boxed; listed at £3/10, our price 25/-.

WE Have an Excellent Stock of All the Above Goods, but we advise all our customers to send early as goods will be cleared very quickly; all orders received are despatched as quickly as possible, in many cases per return.

MODERN RADIO, 25, York Terrace, Clapham, S.W.4. Callers only to Modern Radio, 37, Lisle St., near Leicester Sq. [3851]

TWO Complete Portable Talkie Outfits, made by Associated Sound Equipments, sound on film, can be seen and heard working at the below address.

FOR Further Particulars of the Above Equipments, also variety of pull-through and driven soundheads, first stage amplifiers, main amplifiers, P.A. amplifiers, photo cells, etc., apply for lists.

H. FRANKS, 42a, St. George St., Commercial Rd., London, E.1. Phone: Royal 8546. [3746]

CINEMATOGRAPH Projectors, optical lanterns, films, slides, projection bulbs, lenses, spotlights; your inspection invited of big selection of bargains too numerous to list.

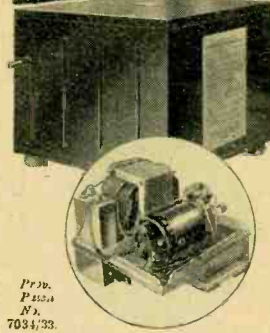
ILLUSTRATED ENTERPRISES, 159, Wardour St. (facing Film House), London, W.1. Phone: Gerrard 6889. [3750]

ROTARY Converter, 6-12v. D.C. input, 500v. 50 m.a. D.C. output, brush gear in complete, 10/-; ditto, complete with brush gear, 17/6; rotary converter, 12v. input, 750v. 75 m.a. output, complete, 25/-—Below.

MOTOR Generator, motor 220v., 50 cycles, 1 ph., "Century," repulsion induction, dynamo, 720v., 150 m.a. D.C., complete with shunt regulator, bedplate, and mounted in sheet steel case; £7—Below.

GALPIN, 31, Bonfield Rd., Lewisham, London, S.E.13. Send for descriptive list of a large selection of electrical goods for all practical electrical purposes. [3818]

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BIRMINGHAM

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Cash with order. Money refunded if not satisfied after 14 days. Trade enquiries invited, invaluable to dealers on D.C. mains.

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Exclusively specified by the Designers of

"THE D.C. SUPER-HET"

Kit of 11 Resistors, 9/- Post Free.

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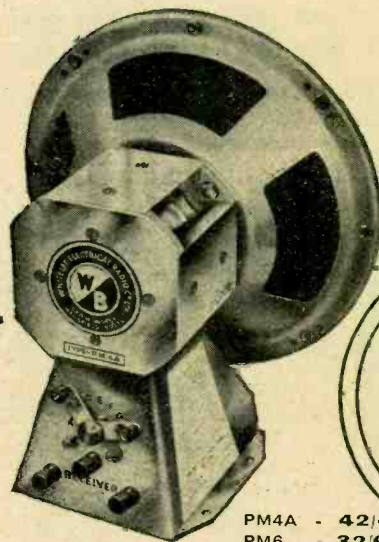
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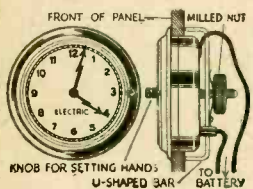
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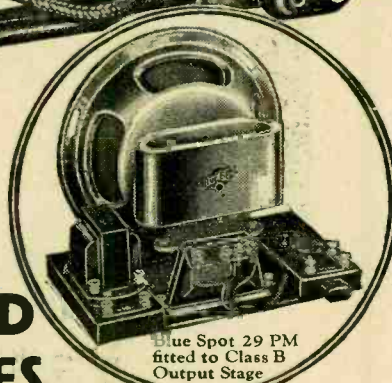
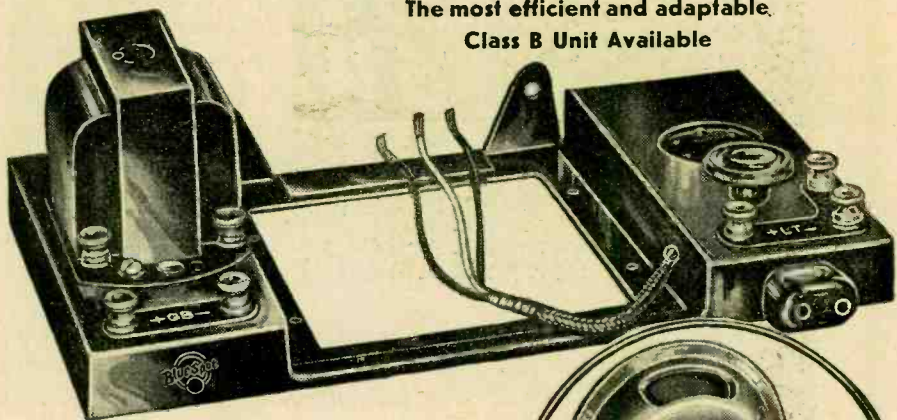
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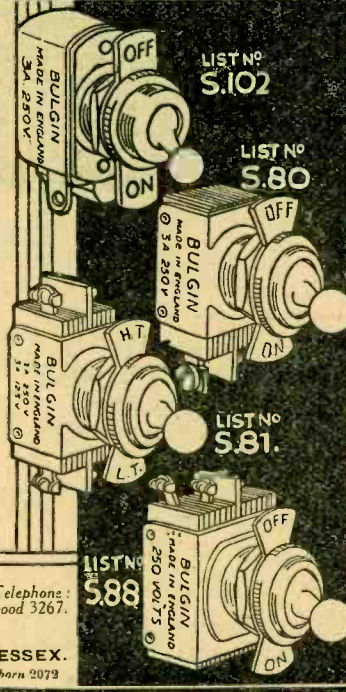
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Converts D.C. to A.C. with smallest loss. Complete with efficient filter and screen. Requires no attention. Guaranteed 12 months. Standard models 100/110 and 200 250 D.C. input to 200/250 A.C. output at 50 cycles.
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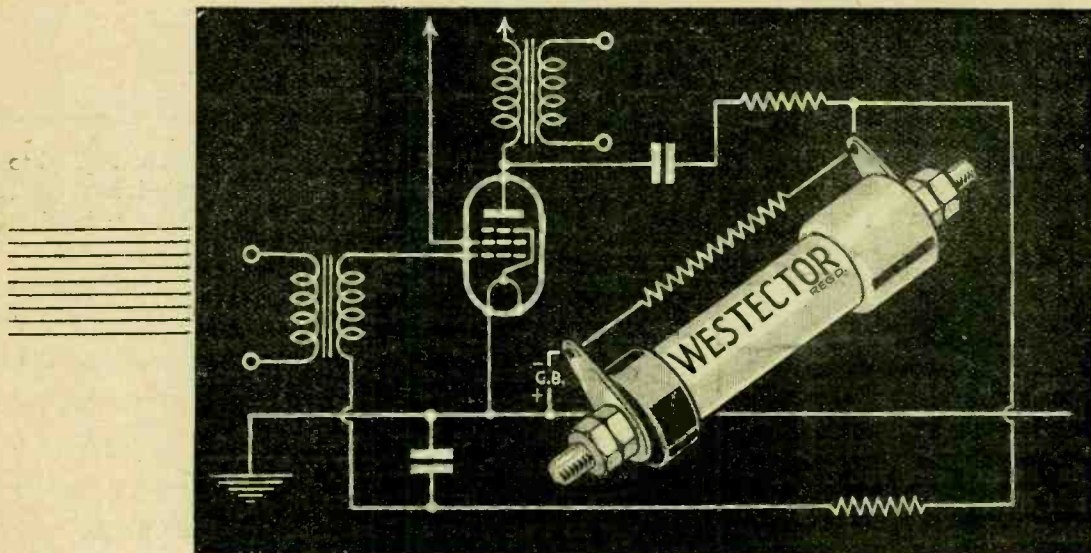
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For technical men only

The MAZDA L.2/DD



We are directing this advertisement at you because we should like you to know more about our valves than can be expressed non-technically. This week we want to talk about our L.2/DD because we think it is of topical interest.

If you own a Battery set so much the better. If not, there must be a friend of yours who often envies the advantage of A.V.C. in

Mains operated sets. This particular valve is mainly designed for providing A.V.C. in battery sets and for the elimination of detector loads and distortion in any battery receivers. The valve is a double-diode-triode and consists of two separate diodes and a triode working on a common filament. (By the way, the filament consumption is only 0.1 amp.). It is fitted with a standard five-pin base, and the input grid to the triode section is connected to a top cap.

The Use of the L.2/DD as a Detector Amplifier in Normal Sets.

As you know, the majority of battery receivers using triode valves as detectors suffer from overloading which results in distortion and elimination of output on a strongly modulated station unless excessive anode currents are employed.

The use of this valve will have the following advantages:

- (a) The detector cannot be overloaded, and the larger the input signal the smaller will be the distortion present.

- (b) Due to the fact that the H.F. Signals are not applied to the triode section, and also because the grid is not biased back by the rectified voltage, and may thus be biased at its optimum point, a much larger output can be obtained.
- (c) As a result of the advantage shown in (b) foregoing, resistance coupling may be employed in the triode section. This means anode current economy, and is very desirable from quality considerations in receivers employing Class "B" output stages.
- (d) By allocating the function of detection and amplification to separate electrodes, H.F. Voltages may be eliminated from the low frequency amplifying section and troubles due to instability and overloading will be avoided.
- (e) On the case of sets not employing reaction, damping due to anode feed back is removed (in the case of power grid detectors, this damping is far greater than that introduced by grid current).

TENTATIVE RATING. Triode Section.

Filament Volts	-	-	-	2.0
Filament Current (amps.)	-	-	-	0.1
Maximum Anode Volts	-	-	-	150
†Mutual A.C. Conductance m/a	-	-	-	1.6
†Amplification Factor	-	-	-	16
†Anode A.C. Resistance (ohms)	-	-	-	10,000
	†Taken at Ea 100, Eg 0.			

INTER-ELECTRODE CAPACITIES

Anode to Grid	-	-	-	4.0
Anode to Cathode	-	-	-	4.0
Grid to Cathode	-	-	-	3.25

You can always obtain further details from your dealer but we hope that what we have said has been of interest to you.

Some take chances . . .

Others buy

MAZDA

The Safety Valve

Mazda Radio Valves are manufactured in Great Britain for The British Thomson-Houston Co., Ltd., London & Rugby.



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