

The Wireless World

THE
PRACTICAL RADIO
JOURNAL
23rd Year of Publication

No. 714.

FRIDAY, MAY 5TH, 1933.

VOL. XXXII. No. 18.

Proprietors: ILIFFE & SONS LTD.

Editor:
HUGH S. POCOCK.

Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1.

Telephone: Hop 3333 (50 lines).
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.
Telegrams: "Cyclist, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:
Guildhall Buildings, Navigation Street, 2.
Telegrams: "Autopress, Birmingham." Telephone: 2970 Midland (3 lines).

MANCHESTER: 260, Deansgate, 3.
Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Rensfield Street, C.2.
Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND
CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:
Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other
countries abroad, £1 3s. 10d. per annum.

*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.*

CONTENTS

	Page
PROGRAMMES FROM	
<i>ABROAD, pp. I—XXIV</i>	
Editorial Comment	315
Practical Short-wave Reception ..	316
Unbiased	320
Tone Control Output Unit	321
News of the Week	323
The Pentode Output Valves	324
Practical Hints and Tips	326
Broadcast Brevities	327
R.G.D. Supersonic Radio Gramo- phone	328
Letters to the Editor	330
Laboratory Tests on New Appara- tus	331
Readers' Problems	332

EDITORIAL COMMENT

Keep Politics Out of Lucerne

THE Lucerne Conference has before it a difficult task—that goes without saying—but whether or not the task which the Conference has set itself is an impossible one, remains to be seen. More than any of its predecessors, this Conference will find itself confronted not with a purely technical problem, but with questions of international politics so involved that the technical considerations may seem subsidiary by comparison.

The nations of Europe tend to become more national in character and to attach greater importance than ever before to broadcasting as a means of national, and perhaps extra-national, propaganda.

The Madrid Conference had broadcast interests represented, although Madrid was concerned with communications as a whole, broadcasting forming only a part of the deliberations. At the Madrid Conference, however, the question of power and range of broadcasting stations was discussed, and provision was made for limitations of power and the choice of the sites remote from frontiers for high power stations, with the object of restricting broadcasting within the limits of a national service, and so meeting the objections which have been put forward against the trespass of high-power transmitting stations over the frontiers and into the service areas of the transmitters of neighbouring nations.

But surely the delegates at Madrid cannot, even at the best, have left the Conference with more than a pious hope that their deliberations on this subject might tend to delay increases of power and trespass over frontiers. It is inevitable that if stations in

Europe are put up with the intention that they should give a service area in their own countries for reception with simple sets, then those same transmissions will be receivable at much greater distances with sets of a more sensitive character.

The task at Lucerne should be, we believe, to take whatever steps are possible to prevent interference with the reception of national stations by the transmitters of other nations, but beyond this we do not consider the Lucerne Conference should venture to dictate.

A Clearly Defined Task

It should not be the concern of a technical broadcasting conference to try to contrive, by technical adjustment of power and location of transmitters, to overcome a menace which some nations see in propaganda transmitted by their neighbours. If this problem has to be tackled it should not be left to technical or administrative representatives of broadcasting organisations to deal with it. Their task should be confined to giving us the best possible plan for distribution of broadcasting stations in Europe, so that transmissions can take place with the minimum of mutual interference and provide the widest choice of stations from which listeners can select programmes.

Interest in wireless reception is bound to grow in proportion as the variety of programmes increases. Broadcasting is dependent for its popularity upon music, and music is international, so that an increase in the number of transmitters of high power can have no other effect than to increase the popularity of listening.

The delegates to Lucerne should devote their energies solely to devising the best means of increasing the efficiency of the broadcasting services of Europe.

Practical Short-wave Reception

Receiving Circuits for Wavelengths Down to 2 Metres

By C. C. WHITEHEAD

*I*N last week's issue the author discussed the various circuits which had been evolved for transmitting at a wavelength as short as 5 centimetres, and in this article practical data are given for reception on ultra-short waves. Although many complicated circuits have been tried, it is interesting to note that some of the simple arrangements such as the reacting detector and the Hartley circuit prove to be among the most efficient.

THERE has been for a few years now a growing interest in work with short and ultra-short wavelengths. The characteristics of waves of the order of 15 metres and upwards are by now well known, and these waves are in extensive use commercially, and fairly popular in amateur circles.

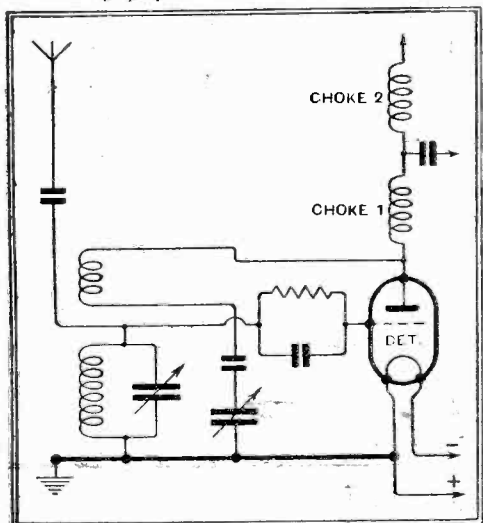


Fig. 1.—For the reception of short waves the simple reacting detector is a satisfactory arrangement.

A firm favourite for many years for reception on these wavelengths was the simple reacting detector circuit shown in Fig. 1 (the choke CH2 being replaced in this case by the primary winding of an L.F. transformer).

If well designed, this circuit was quite sensitive, the great point being the attainment of very smooth reaction. In this latter connection trouble was very often experienced with "blind spots." If the coils and reaction couplings had been set to give smooth reaction at one part of the tuning scale, it would be found impossible to obtain oscillation over some other part of the tuning condenser scale (the "blind spot"), whilst reaction would become fierce and uncontrollable at some other point again (which one might with equal propriety term a "sensitive spot").

This trouble is due to the changing position of current and voltage nodes in the aerial system at different wavelengths. The reaction coupling is normally *via* the interlinked magnetic fields of the aerial and reaction coils, the amount of H.F.

current in the latter coil being regulated by the reaction condenser. Now the magnetic field in each coil is necessarily associated with the *current* in that coil. In the short length of wire contained in the reaction coil, owing to the fact that it is a closed or "lumped" circuit, nodes are not likely to occur, or if they do they do not give rise to trouble. It is otherwise in the aerial circuit. The aerial coil forms part of the (usually) extensive aerial system, and a node in this may involve the whole of the coil.

Nodes and Antinodes

Consider Fig. 2 (a), (b) and (c). The aerial system, including the coil, is in this case approximately three-eighths of a wavelength long, with the tuning condenser set at the middle of its scale. This condition is represented at (a), the reaction coupling being set for smooth reaction; note that the amount of current in the aerial coil (assuming normal aerial current distribution) is a mean value. Diagram (b) represents the conditions at the lower end of the tuning scale. Now the aerial system is something over half a wavelength in length (since the working wavelength has been decreased) and a node appears at the position of the tuning coil. Since the reaction is dependent upon the current in the coil, and owing to the new distribution of current in the

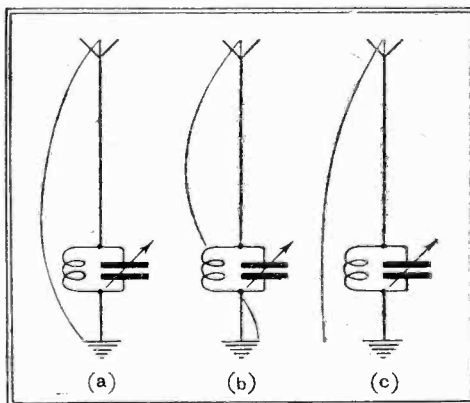


Fig. 2.—An aerial system three-eighths of a wavelength long. Diagram (a) represents the conditions when the tuning condenser is set at the middle of its scale; (b) represents the lower end of the tuning scale; whilst (c) constitutes a blind spot at the top of the tuning scale.

aerial circuit the current in the coil is almost zero, a great increase in the reaction condenser setting is necessary in order to compensate and produce sufficient reaction. This constitutes a "blind spot"; (c) represents the conditions at the top of

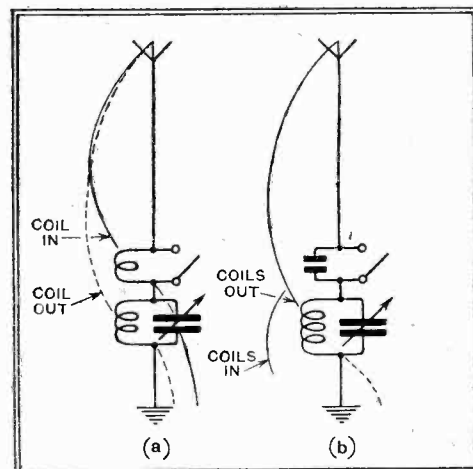


Fig. 3.—By including a series aerial inductance (a) or a condenser (b) the current node may be shifted and blind spots avoided.

the tuning scale. Now, owing to the increased working wavelength, the length of the aerial system is about quarter wavelength, producing an antinode (position of maximum current) at the position of the aerial coil. Here the setting of the reaction condenser will have to be reduced. This may constitute a "sensitive spot."

Avoiding Blind Spots

There are two cures in vogue for this trouble. The first is the provision of a series aerial inductance or condenser as shown in Fig. 3 (a) and (b). By switching these in or out of circuit the position of the current node may be shifted, since these devices have the effect of altering the electrical length of the aerial circuit by their inclusion. A single small (0.0001 mfd.) series variable condenser will perform the same function. The second is the use of H.F. stage.

The latter brings us to the discussion of another type of receiving circuit. The screen-grid valve, now almost universally used for H.F. amplification, has made feasible the attainment of a certain degree of amplification on very short wavelengths. Even so, the "stage gain" available on these short waves becomes very small as the wavelength is reduced. At the shorter wavelengths (round about 15 metres) a stage gain of very little if anything may be expected, even with an efficient tuned circuit on each side of the valve. But the arrangement (Fig. 4) by separating the aerial and detector grid circuits does away to a great extent with the "blind spot" trouble. So useful has this feature been found that this arrangement

Practical Short-wave Reception—

has been used with an aperiodic aerial circuit consisting merely of an H.F. choke between grid and filament of the S.G. valve. This arrangement, of course, simplifies tuning at the sacrifice of some efficiency in amplification on the longer waves (above 60 m.).

Lately there has been a tendency to use the supersonic-heterodyne type of circuit, especially in connection with broadcast receivers using powerful H.F. amplifiers, on the long-wave side, the latter being used for intermediate-frequency amplification, it merely being necessary to "tack on" a frequency-changer circuit.

First attempts at application of the superhet principle to the reception of very short waves involved the use of the low intermediate frequencies (below 100 kc.) then in common use. These attempts were not successful owing to the relatively small difference between the signal and oscillator frequencies necessary in order to produce "beats" at the intermediate frequency. The tendency was for the oscillator to pull the signal into synchronism with it before the frequencies had ap-

proached sufficiently closely in value to allow the formation of beats of the correct intermediate frequency. The use of higher intermediate frequencies (above 150 kc.) practised in this connection now

does away with the trouble (admittedly at some sacrifice of gain) and the combined autodyne oscillator-detector is usually employed.

The simplest form is that shown in Fig. 1. In this case CH2 is an I.F. choke

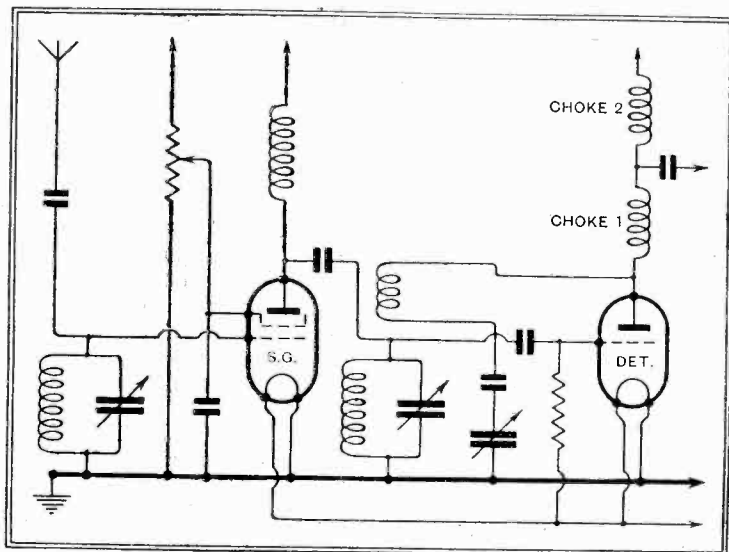


Fig. 4.—Trouble with blind spots can be avoided by separating the aerial and detector grid circuits.

and CH1 a short-wave choke, the condenser coupling the detector-oscillator to the I.F. amplifier. The operation of this circuit, except for the fact that it is used in an oscillating condition, does not differ much from that of the plain detector. There is, of course, the "second-

or, to avoid reacting into the aerial, be preceded by a H.F. stage (Fig. 6). A complete receiver, with I.F. and L.F. amplifying stages (but without an H.F. stage), is depicted in Fig. 7. The I.F. suggested is 150 kc., with band-pass couplings.

So much for current practice on wavelengths of about 10 metres and upwards. Recently, the use of waves shorter than 10 metres in length has received considerable attention. Round about wavelengths of 8-10 metres the propagation characteristics of radio waves change greatly. The frequency is too high to permit of refraction back from the ionosphere, so there is no "skip distance" and return zone. Also, owing to the fact that the length of the waves is comparable with the dimensions of natural ground features and buildings, these obstacles cause pronounced "shadows." The "ground wave," which is alone effective, is subject to rapid attenuation under these conditions.

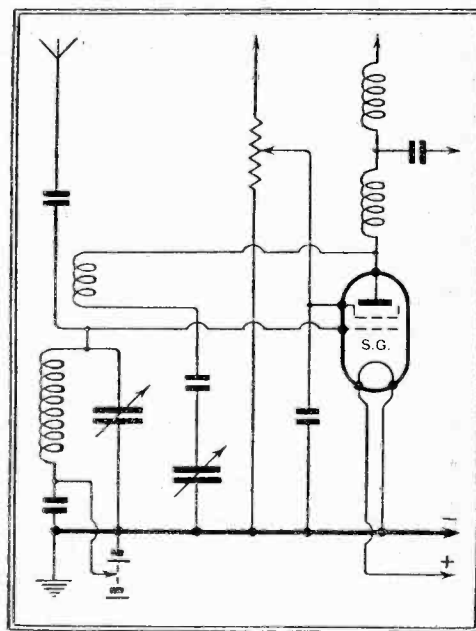
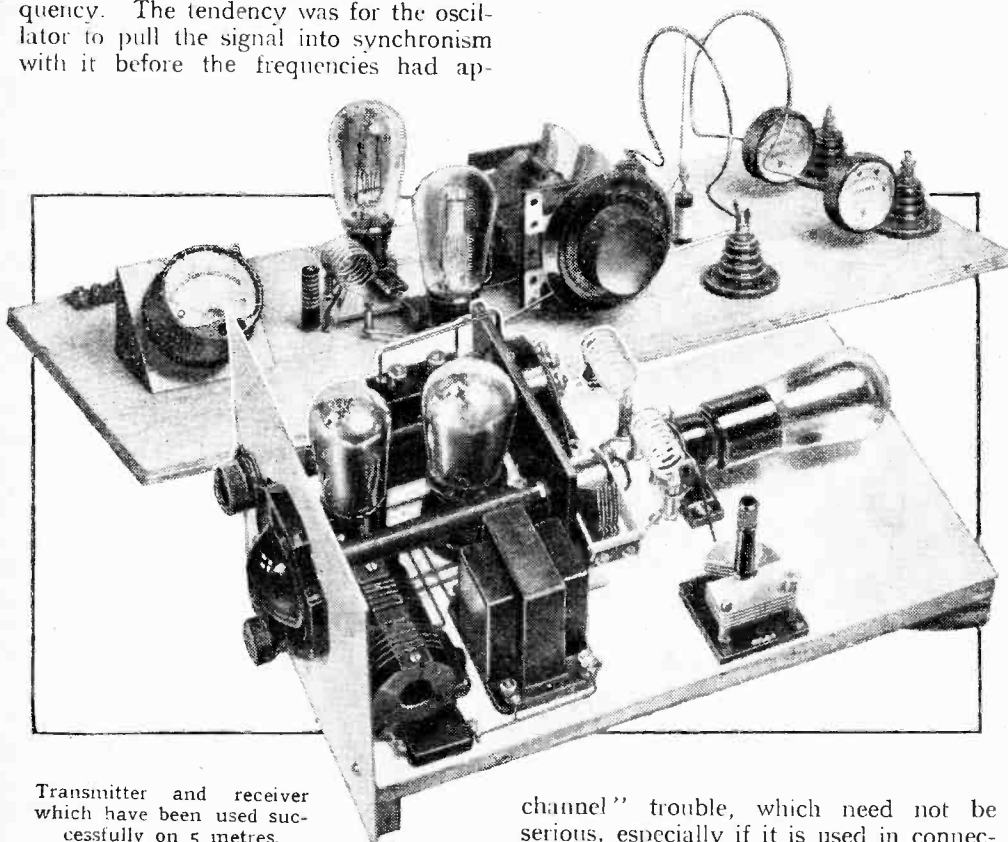


Fig. 5.—The circuit of a screen-grid valve used as a detector-oscillator.

But their employment seems, under proper conditions, to offer some marked advantages. Owing to the enormously high frequencies involved, a very great number of stations could be accommodated in the same "service area," without danger of mutual interference. For the same reason, the side bands could be extended to accommodate frequencies up to, say, 100 kc., for television purposes. The use of multiple modulation has been suggested, and tried with some success. Furthermore, by suitable choice of site, power, and aerial system, such a station can be designed to cover a definite area with sharply defined limits. This still further helps in the problem of providing additional services, making these waves ideal for local work. If the aerial system is elevated considerably, very long ranges can be obtained with extremely low power, and the shortness of the waves renders the design of sharply directive aerial ("beam") systems easy and convenient.

The methods of reception used for the



Transmitter and receiver which have been used successfully on 5 metres.

channel" trouble, which need not be serious, especially if it is used in connection with a broadcast H.F. amplifier, since the I.F. can be changed at will should second-channel interference make its appearance.

A screen-grid valve may be used with advantage as a detector-oscillator (Fig. 5),

Practical Short-wave Reception— ordinary short waves may, with care, be extended for wavelengths down to about 7 metres. For shorter wavelengths than

where quality reception is not of paramount importance, the super-regenerative receiver more than holds its own.

The essential part of each of these systems is, of course, the reacting detector or detector-oscillator. There is not space in this contribution to discuss fully the principles of design and construction of these circuits; it must be sufficient to say that all parts must be kept to the smallest convenient mechanical dimensions, as much stray capacity as possible avoided, and all parts not forming an essential part of the oscillatory circuits must be connected to the latter at points of low or

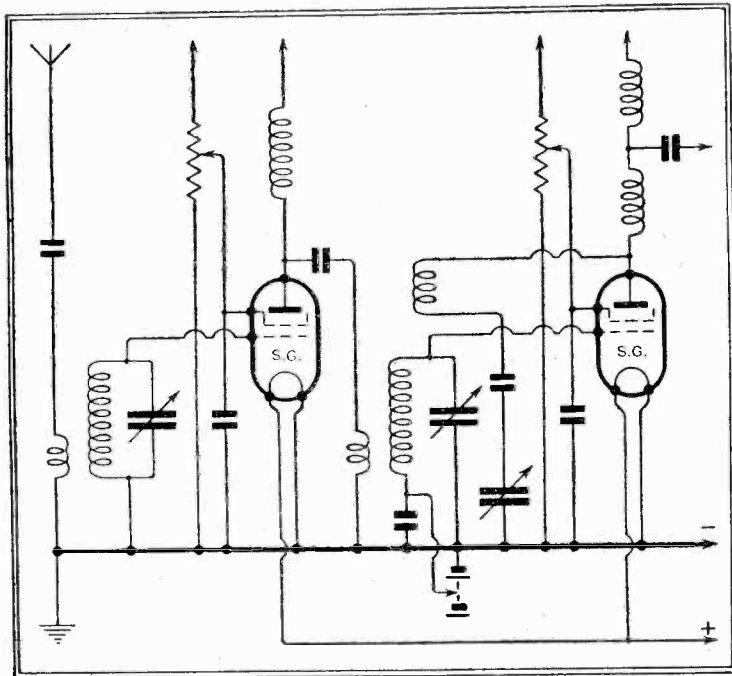


Fig. 6.—To avoid reacting into the aerial circuit the detector should be preceded by an H.F. stage.

this special circuits are desirable, and, for wavelengths shorter than 4 metres, necessary.

For wavelengths shorter than 4 metres circuits of the "Hartley" type, and push-pull circuits, have been advocated, but the writer's experience has led him to the opinion that they are of doubtful value, equally good, or even better, results being attainable with single-valve circuits.

On these wavelengths direct H.F. amplification is, of course, quite out of the question, the choice in receiving equipment lying between the reacting detector and the superheterodyne principle, whilst, for a simple and highly efficient equipment

zero H.F. potential.

It is possible to work on wavelengths down to about 3 metres with circuits of the type shown in Fig. 8 (of the Hartley and "Ultraudion" type).

For wavelengths between 1½ and 3 metres the type of circuit shown in Fig. 9 seems to be best. It has several

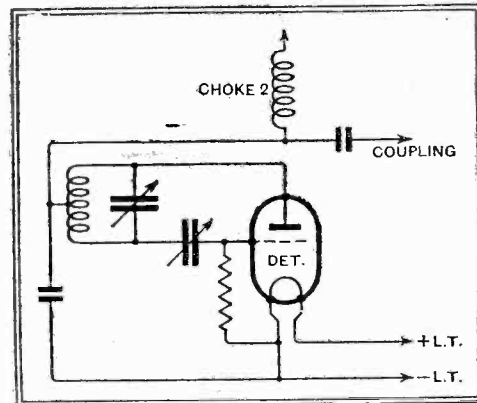


Fig. 8.—Wavelengths as short as 3 metres can be received with the Hartley circuit.

special advantages, but has the disadvantage of inconvenience of reaction control. Any attempt to control reaction by means of variable capacities leads to detuning difficulties. One arrangement in which this kind of reaction control is used is shown by the dotted capacity C₂ in Fig. 9. It is successful, but has the peculiarity that either of the two condensers may be used for tuning or reaction indiscriminately,

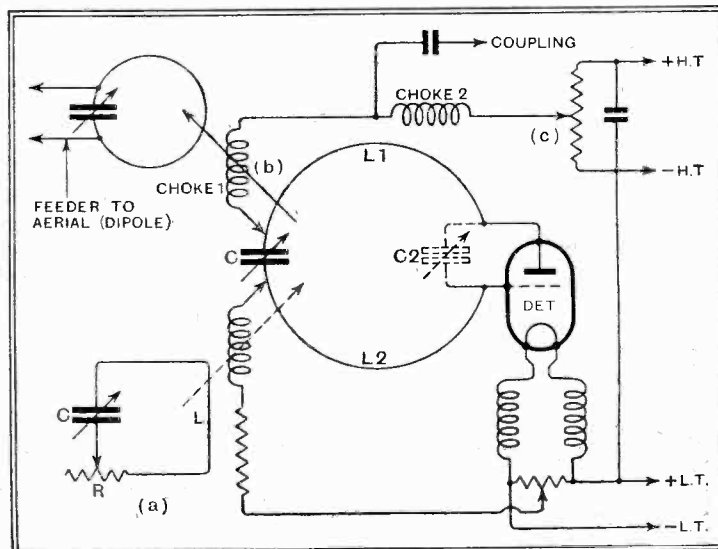


Fig. 9.—This circuit has been successfully used for wavelengths between 1½ and 3 metres.

ately, since both act in the capacity of both tuning and coupling condensers. In a circuit of this type tried by the writer (wavelength about 2.5 metres) a low-capacity valve—the D.E.V.—was used. C was 0.0001 mfd. max., and C₂ about 5 mfd. max. The best method, however, seems to be that shown in the figure (without C₂).

In practically all the circuits for use on these wavelengths it will be found advisable to use anode, grid, and filament chokes. For anode and grid the chokes may consist of about fifty turns of fine wire on a former ¼ in. to ½ in. diameter. To avoid the possibility of these chokes resonating and causing the circuit to act as a tuned plate-tuned grid circuit at their natural wavelength, it is advisable to wind them with resistance wire, and to arrange that they shall either have a different number of turns or be wound on formers of different diameters (e.g., the anode

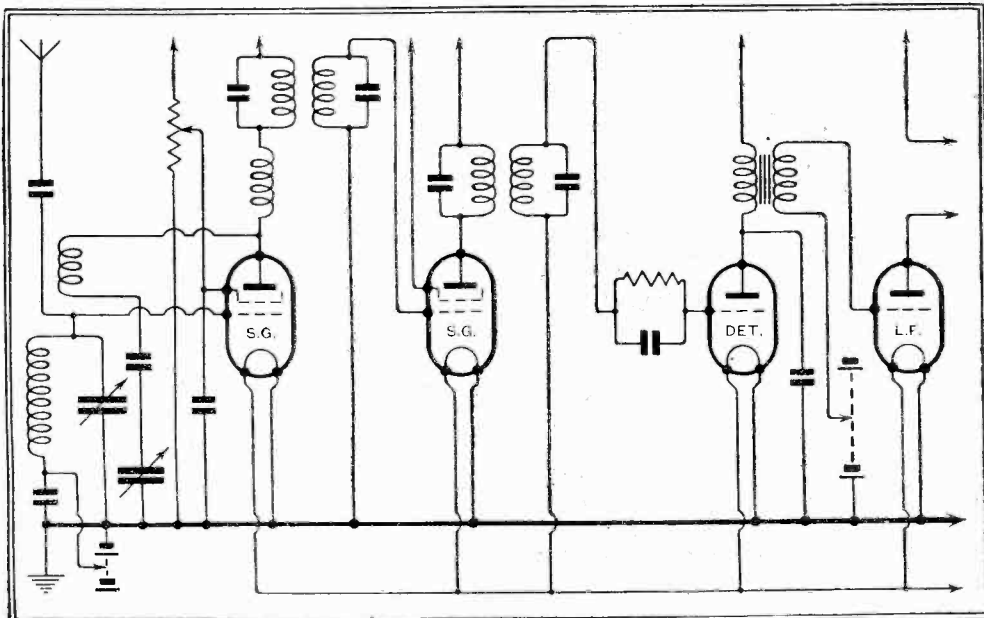


Fig. 7.—Circuit diagram of a complete receiver with I.F. and L.F. amplifying stages. The suggested intermediate frequency is 150 kc.

Practical Short-wave Reception—choke may have, say, 40 turns, the grid choke 50 turns). The filament chokes are most conveniently wound together on one former, 1/2 in. to 1 in. diameter, in "bifilar" fashion.

Another successful method of controlling reaction is by means of a separate absorbing circuit L, C, R, Fig. 9 (a), variably coupled to the detector circuit. Reaction may be controlled (after suitable adjustment of the detector anode voltage) either by varying the coupling between the circuits, the tuning of the absorbing circuit (varying C), or the resistance R. The most convenient method appears to be to set the tuning and resistance of the absorbing circuit to optimum values and vary the coupling. Usually the absorbing circuit may consist of a simple ring or closed loop of wire. On these wavelengths (below 3 metres) it is usual to employ a half-wave dipole aerial coupled to the detector by means of a two-wire feeder. The coupling coil of the feeder may be used as the reaction control quite conveniently (Fig 9 (b)).

It will be generally found best to employ metallised valves for the detector, and it will in general not be found necessary with this type of circuit to decap the valve unless the absolute minimum wavelength possible is required. There is no difficulty in getting below two metres without decapping. It may be found necessary to break the connection between the metallised coating on the valve and the filament pin to which it is connected before the

valve will oscillate satisfactorily. In this latter case nothing must be allowed to touch or approach the coating whilst the valve is in operation, or the potential of this coating, which is "floating," so to speak, will in all probability be disturbed.

This type of detector-oscillator circuit may be used either in conjunction with a plain L.F. amplifier, a super-regenerative circuit either with separate quenching valve or superhet. If the superheterodyne type of circuit is employed it is desirable to have either a band-pass I.F. amplifier with a wide band or one that is flatly tuned, with a high intermediate frequency in either case (300 kc., at least), because

the intermediate frequency is not likely to be too stable on account of the very high signal frequencies involved. Use has been made of the double superheterodyne in this connection, with a first I.F. of about 6,000 kc. When using the super-regenerative type of circuit it is advisable to use a fairly high quenching frequency to avoid the audio-frequency spectrum.

It is advisable to screen all the circuits carefully. A very compact and efficient set for portable work is shown in Fig. 10. It consists of a self-quenching detector coupled to a pentode.

The wavelength range covered by these circuits is very small, e.g., 2.6 to 2.9 metres, but the frequency range comprised is very great (in the case just quoted 10,000 kc.), so there is plenty of room for stations. A tuning range of less than ten per cent. is ample (e.g., 2.5—2.75, 1.9—2.0 m.).

For wavelengths below 1.5 metres reaction types of circuits cannot be used. Use must then be made of the "electron-oscillation" principle, involving circuits which are not so easy to control.

Amateur Call Book

THE Spring issue of the "Radio Amateur Call Book" is now available and contains 195 closely printed pages giving the call-signs, names and addresses of all known amateur transmitting stations in the world. 140 pages being devoted to the United States, and over eight pages to Great Britain. There is also a convenient list, occupying seven pages, of short-wave commercial stations, and another of the principal short-wave broadcasting stations of the world.

Copies may be obtained in Great Britain from Mr. F. T. Carter, Flat A, Gleneagle Mansions, Streatham, S.W.16, for 6s. post free, or the four quarterly issues for 21s.

Amateur transmitters who have been granted new call-signs or who have changed their addresses are urgently requested to communicate either with Mr. Carter or the Q.R.A. Manager of the R.S.C.B., at 53, Victoria Street, London, S.W.1, or *The Wireless World*, in order that their names and correct addresses may appear in future lists.

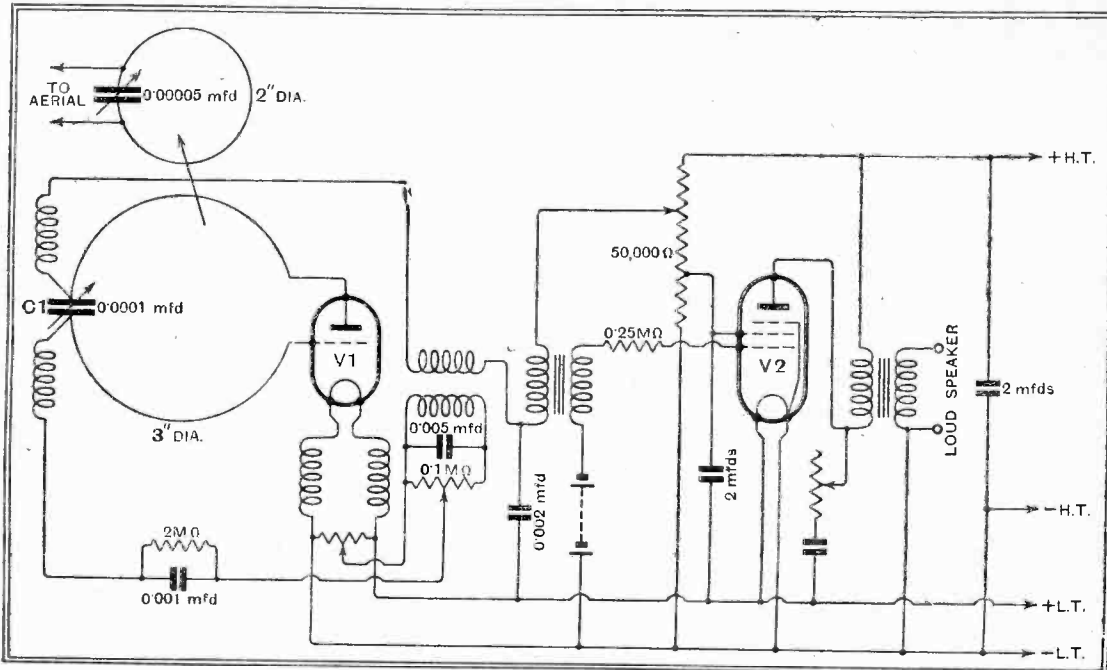
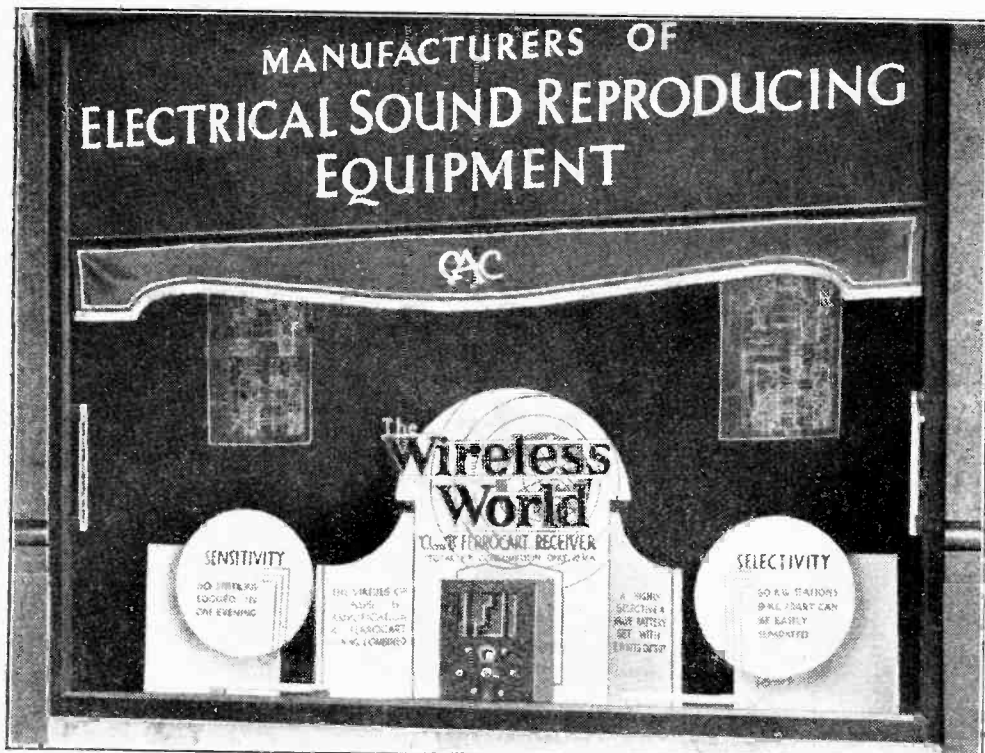


Fig. 10.—Suggested circuit for an efficient portable set embodying a self-quenching detector (Micromesh PBI) coupled to a pentode (Pen. 220). This set is suitable for a wavelength of about 2½ metres.



A MODERN SET IN A MODERN SETTING. Here is the attractive window display arranged by C.A.C. Cabinets, Ltd., at their showrooms in Surrey Street, Strand, London, W.C.2, where *The Wireless World* "Class 'B' Ferrocart" Receiver is demonstrated daily.

UNBIASED

By

FREE GRID

Not Wanted on the 'Phone

ACCORDING to a Press report of an after-dinner speech, a well-known radio publicist has been sparing a little time from giving advice to the long-suffering public in order to tell wireless retailers how to swell the number of their customers.

Briefly, he suggests that at times when broadcasts of universal appeal are being made, such, for instance, as the forthcoming running commentary on the



No greater music.

Derby, they should ring up some householder whom they know to be a non-listener and place a loud speaker close to the microphone of the P.O. telephone.

Such a method of propaganda would, I think, be of very doubtful value. Apart from the fact that the microphone of the ordinary P.O. telephone is noted for its music-mangling properties—and what greater music is there than the sound of the human voice?—there remains the drawback that only one customer could be reached at a time. I am well aware, of course, that, from a technical point of view, there is no difficulty whatever in getting connected up to a couple of dozen people simultaneously as the P.O. telephone service so ably demonstrates each day to many of its subscribers.

In addition to the foregoing objections, it must not be forgotten that a broadcast of universal appeal, like the Derby, is indeed a *rara avis*, and, in the case of most broadcasts, dealers are more likely to offend than to please a potential customer. Can one imagine, for instance, a chamber music addict being won over to radio by a piece of hot jazz, or an undertaker being similarly persuaded if his first introduction to the art happened to be a broadcast appeal by the Royal Life Saving Society?



Sophisticated blacks and—

Grave Dance Danger

FOR some time now I have viewed with misgivings the ever-increasing power of broadcasting stations because of the selectivity-cum-quality question, for, after all, even Mr. Stenode will be of no avail if tuning has to be made so sharp that even the carrier wave is cut off.

The recent proposal of a well-known American broadcasting authority has, however, put a far graver complexion on the whole matter, and I think that a word of warning is necessary.

Briefly, he suggests that the power of all stations in the world should be increased, and the simultaneous broadcasting networks so developed that one super-dance band playing in London, Paris or New York could supply music to every broadcasting station in the world. The idea is being taken up with enthusiasm in America, and representations are, I learn, shortly to be made to the B.B.C.

I suppose that it never occurred to this foolish fellow and his fanatical followers that the fact of millions of people—sophisticated blacks and unsophisticated whites—all dancing in step throughout the world will result in such severe vibrations being set up on the earth's crust that earthquakes and volcanic eruptions of unparalleled magnitude are bound to follow.

To appreciate the truth of my prediction one has only to remember that when a body of troops is crossing a bridge it is compelled to break step in order to prevent the evil effects of sympathetic vibration.

If this jazz maniac and his fellow music manglers are allowed to carry out their ideas I trust that science will rise to the occasion and prevent the world-wide catastrophe which must inevitably follow unless due precautions are taken.

To ward off disaster I suggest to the powers that be that participators in this terpsichorean orgy should be led to break step. This could be achieved by equip-

ping every relay station in the dance chain with suitable delay circuits, each having a slightly different time period.

If any reader can suggest something better in order to avert this grave menace to our lives and property I do urge him strongly to take up his pen and write without delay.

Horrible Din

NOT very long ago I was inveigled into Olympia in an unguarded moment by a man who has a passion for visiting every exhibition held there, irrespective of whether it has anything to do with radio or not.

What struck me most was the excellent manner in which music was distributed throughout the exhibition by means of loud speakers. These latter devices were suspended from the roof at a suitable height, and the result was a pleasant background of music sufficient to tone down the shuffling of feet and other offensive noises which people are in the habit of making when going round an exhibition. At the same time the music was subdued enough to permit of easy conversation with people on the various stands.

This in marked contrast to the state of affairs existing in the radio exhibition, where music belches forth with a hideous blare from every stand, so that the asking of technical questions is well-nigh impossible; indeed, in the case of many stands this state of affairs is intended.

I cannot for the life of me say what good purpose is served by having music (?) pumped through the loud speakers on the stands. Many people fondly



—unsophisticated whites.

imagine that it assists them to choose a loud speaker, and it is certainly an entertaining sight to see them rushing from one instrument to another. All I can say, however, is that anyone who chooses a loud speaker because of its performance on the stand has either no ear for music or has lost all sense of self-respect.

If anyone can lay his hand on his heart and honestly assure me that he enjoys the horrible din which we are compelled to put up with at Olympia, I will gladly eat both my hat and my umbrella.

Tone Control Output Unit

Constructional Details of an Inexpensive Unit for Attachment to Loud Speaker

By A. VAUGHAN

THE addition of tone control to every receiver is rapidly becoming a necessity, owing to the general desire for perfectly natural reproduction. The loud speaker is expected to reproduce a human voice faithfully at its original strength, and equally faithfully reproduce large orchestras at considerably reduced strength. It is a well-known fact that low notes do not carry as well as high notes, so the orchestral reproduction, to be true, must be from a loud speaker emphasising the lower frequencies. Consequently, on speech, the same receiver and loud speaker, without adjustment, will reduce the pitch of the voice due to the low note emphasis. Similarly, if adjusted to give true speech, the orchestra will be minus a considerable amount of bass. Many listeners strike a compromise, while others fit a tone control in the receiver.

Greater Range of Variation

The method of tone control about to be described can be fitted in the loud speaker, and in consequence is a great advantage to listeners using a loud speaker remotely from the receiver. Also, while most forms of tone control simply reduce the high or low note response, leaving the other constant, this method increases one and reduces the other simultaneously, thereby

The theoretical circuit arrangement is shown in Fig. 1 from which it will be seen that the output choke is split up into two sections L1 and L2 which can be either one tapped choke or two separate components. C4 is the usual coupling condenser to the loud speaker, C3 a condenser of the same value, C2 a condenser of 0.2 mfd capacity to tune L2 to 130 cycles. The potentiometer R is connected in parallel with the loud speaker and the chokes in series. The choke L2 and condenser C2 being tuned to 130 cycles will offer a high impedance to frequencies round this value (owing to its naturally flat tuning) but the higher frequencies will be passed through condenser C2 to which it will offer a very low impedance. Again, choke L1 will offer a high impedance to the higher frequencies, but will not offer much impedance to the lower frequencies.

It will be seen from the diagram that the lower frequency voltages developed across L2 C2 are applied to the Z Y portion via C4 and the decoupling condenser C3. The total voltages across the potentiometer are applied to the loud speaker, and by moving the slider Z nearer X or Y, the proportion of high or low notes applied to the loud speaker will be varied accordingly, the high notes being reduced and the low notes being increased simultaneously, and vice versa, with the operation of one control.

In the case where control is desired remotely from the receiver, the potentiometer is fitted in the loud speaker, and three leads must be used for the extension from the receiver, which are con-

It is seldom that a receiver without tone control gives equally realistic reproduction on both speech and music, and the majority of modern sets are equipped with this device. To those possessing earlier types of receiver, the tone control unit described in this article will undoubtedly appeal, as it can be fitted to the loud speaker with very little difficulty.

ected to the points X Y and Z on the potentiometer. The condensers should be fitted in the receiver, not in the loud speaker, so that H.T. supply is isolated from the extension leads. This method of tone control can be similarly used with a low impedance speaker, but in this case the potentiometer is connected across the primary of the step-down transformer.

Table A gives the impedance of the two chokes at various frequencies, from which it will be seen that the values have been chosen for an output valve of medium impedance. If the device follows a very low impedance output valve, the resistance of R and the inductance of L1 and L2 must be reduced accordingly, but C2 is increased to tune L2 still to 130.

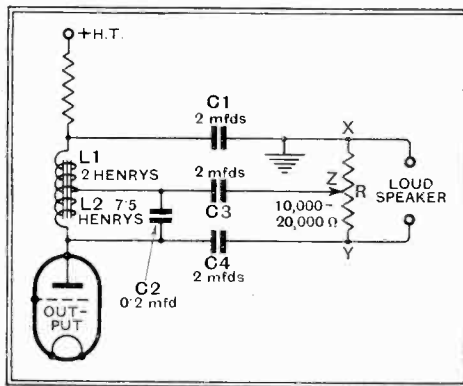


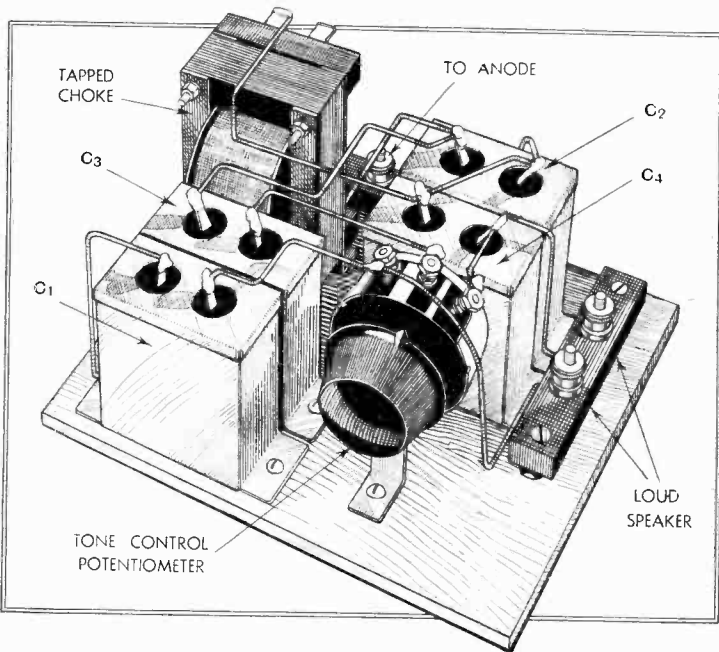
Fig. 1.—Circuit diagram of the tone control unit which is interposed between the last valve and the loud speaker. The potentiometer R should have a value between 10,000 and 20,000 ohms.

TABLE A

Frequency in cycles per sec.	Impedance of L1 in ohms.	Impedance of L2 C2 in ohms.
50	640	2,400
100	1,260	6,000
120	1,500	11,400
130	1,640	30,000
140	1,760	10,600
200	2,500	4,350
300	3,800	2,700
400	5,000	2,000
600	7,500	1,330
800	10,000	1,000
1,000	12,500	800
2,000	25,000	400
3,000	37,500	260
5,000	62,000	160

The high impedances shown for L1 at the high frequencies will be reduced somewhat in practice owing to the self-capacity of L1 which has not been taken into account in the table.

cycles. Similarly, after the high impedance valve R, L1 and L2 must be increased and C2 reduced.



The practical layout of components and wiring details can be easily followed in this illustration.

giving a considerably greater range and flexibility of control.

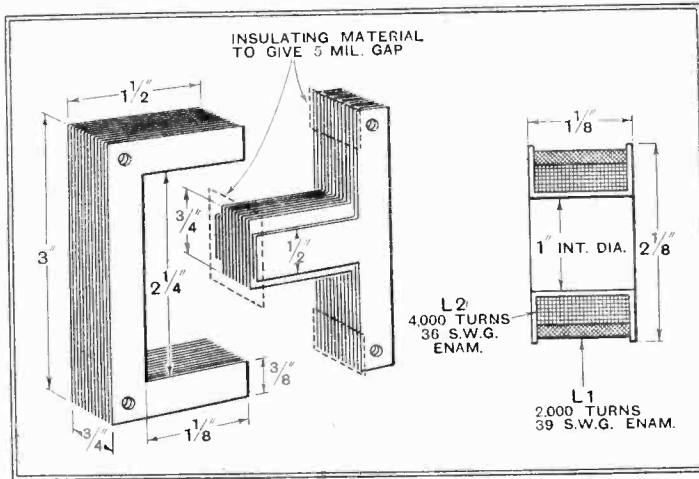
Tone Control Output Unit—

The frequency of 130 cycles chosen as the low note resonance calls for some comment. The resonant frequency should be as low as possible, but among the easily audible notes, 25 cycles would be far too low. A frequency of 50 and 100 cycles also must be definitely avoided; otherwise the hum from half- and full-wave rectifiers on all main receivers will predominate, and will in some cases come up to such a level that all smoothing after the rectifier will be nullified. The third consideration is the medium frequencies which must be obtained partly from impedance L2C2 and partly from impedance L1. Otherwise, if the design is such that the medium frequencies are obtained from choke L1 only, they will be eliminated with the higher frequencies as the position of Z is moved nearer X. Similarly, if obtained from L2C2 only, they will be eliminated with the lower frequencies.

To comply with the first consideration that the frequency of resonance of L2C2 should be as low as possible, L2 or C2 must be very large. A choke L2 having a very large inductance would be cumbersome and costly, or have a high D.C. resistance, neither of which is desirable. A very large capacity C2 would by-pass the medium frequencies as well as the high, and all the medium fre-

quencies would be obtained from L1, which has already been seen to be bad design. Therefore, for the medium frequency consideration, neither L2 nor C2 can be very large, so the resonant frequency of L2C2 cannot be as low as the first consideration requires. Hence the compromise of 130 cycles was chosen, in order to satisfy as much as possible the various considerations which have been already referred to.

A point to be remembered if the two chokes are on one core is that the inductance varies as the square of the number of turns. So a choke having a total inductance of 17 henrys would be required



Details of the iron circuit and winding of the tapped choke.

to give two chokes L1 and L2 of 2 and 7.5 henrys respectively. The tap position would then be determined by dividing the total number of turns by three and allowing one-third for L1 and two-thirds for L2.

The New Output Circuits

THE Output Stage of a Wireless Receiver was the title of a recent lecture by Mr. G. Parr, of the Edison Swan Electric Co., Ltd., before the Smethwick Wireless Society. The lecturer discussed the differences between triodes and pentodes, second and third harmonic distortion, push-pull (including Q.P.P.) and Class "B" amplification.

Prospective members are welcome at the Society's meetings.
Hon. Secretary: Mr. E. Fisher, 33, Freeth Street, Oldbury, Nr. Birmingham.

Television Explained

TELEVISION apparatus was demonstrated before the Radio and Television Section of the Southport Society of Natural Science at a recent meeting. Mr. T. Fazackerley showed a recent type of Baird television. The Section staged a radio and television exhibit at the annual scientific exhibition of the Parent Society on April 13th.

Hon. Secretary: Mr. John Clegg, 34, Scarisbrick New Road, Southport.

A Friend in Need

POINTS which puzzle the novice in regard to valve characteristics were recently elucidated by Mr. Deal, of the Mullard Wireless Service Co., Ltd., for the benefit of the members of the Catford and District Radio and Television Society. The Chairman, Dr. Bannounah, set the ball of discussion rolling, and all the members were soon busy telling Mr. Deal their valve troubles.

Hon. Secretary: Mr. H. W. Floyd, 38, Como Road, Forest Hill, London, S.E. 23.

A Visit to Brentwood

ON a recent Saturday members of the Ilford and District Radio Society visited the Brentwood receiving station of Imperial and International Communications, Ltd. Mr. Keen, who conducted the visitors over the station, had rigged up a special amplifier to enable everyone to hear signals from EAM, Madrid, which were being received on one of the fourteen-valve superheterodynes.

Hon. Secretary: Mr. C. E. Iargen, 16, Clements Road, Ilford.

Short Wave Champion

AN informal debate entitled "Are Short Waves Worth While?" was recently enjoyed by members of the Croydon Radio

CLUB NEWS

Dual Speakers

"DUAL-SPEAKER Equipment" was the subject of Mr. G. T. Peck's lecture at Slade Radio, Birmingham, recently. Excellent reproduction was given on a demonstration set with both gramophone records and radio.

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

New Club at Clacton

THE inaugural meeting of the Clacton and District Radio Club was recently held at Dixon's Café, Station Road, Mr. A. J. Dixon presiding.

Full particulars may be obtained from the Hon. Secretary: Mr. Rodney Loader, 49, Southcliff Park, Clacton-on-Sea.

How Valves are Made

THE intricate processes of valve manufacture were recently described to members of the Battersea and District Radio Society by Mr. Parr, of the Edison Swan Electric Co., Ltd. The lecture was illustrated by lantern slides.

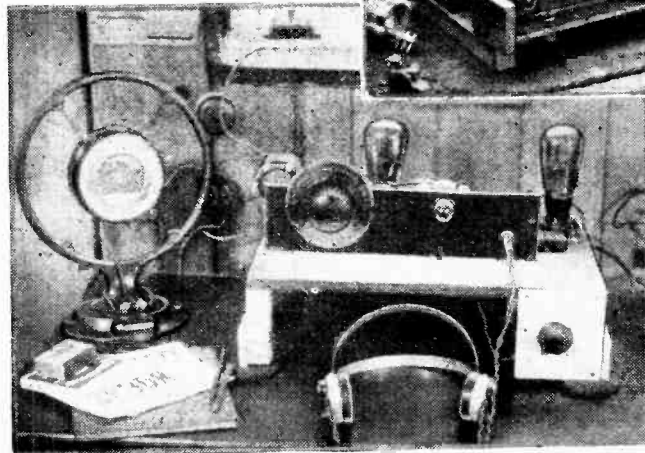
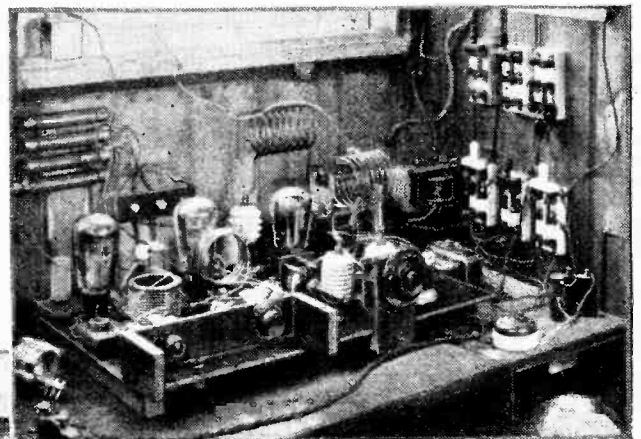
Hon. Secretary: Mr. S. F. Harris, 93, Salford Road, Battersea, London, S.W. 11.

Comparing Pick-ups

COMPARATIVE tests of a number of pick-ups kindly lent by several representative firms were carried out at a recent meeting of the Croydon Wireless and Physical Society. The audience acted as jury, filling up voting papers as they listened to the various pick-ups demonstrated behind the screen. The results were surprisingly uniform.

Hon. Secretary: Mr. H. T. P. Gee, 51-52, Chancery Lane, London, W.C. 2.

G 6FM. A compact station owned and operated by Mr. F. D. Milner, at Lower Edmonton. The photo on the left shows the microphone and 2-valve receiver with which several Australian and New Zealand stations have been heard at good strength. Above is shown the 3-valve transmitter and frequency doubler for 40 and 20 metres.



Society. It soon became evident that the Society's youthful members were ready to champion short waves at all costs, and some of the "old hands" had to use all their skill in presenting arguments against short waves. As a result of the debate the Society is forming a short wave section under the direction of Mr. D. Deacon.

Hon. Secretary: Mr. E. L. Cumbers, 14, Campden Road, South Croydon.

NEWS of the WEEK

Current Events in Brief Review

Vienna Testing

WE learn that the 120 kW. station at Bisamberg, near Vienna, has begun testing. The wavelength of Vienna is 507.2 metres.

A New One

THE latest excuse for non-possession of a wireless licence was put forward by a Birmingham defendant last week, who said he thought that he was covered by the royalties for a year.

2RN Returns

THE many protests by crystal listeners in the Dublin area have resulted in the decision of the authorities to reopen the old 1½-kW. station 2RN, which will now work on a wavelength between 200 and 230 metres.

Damped Oscillations

A SENTENCE of one month's imprisonment has just been passed on a German listener who was caught in the act of deliberately oscillating with intent to interrupt reception of broadcast political speeches.

Another "Broadcasting House"

THE celebration of the tenth anniversary of the foundation of Czechoslovakian broadcasting is to be deferred from this month until next autumn so as to coincide with the inauguration of the great new "Broadcasting House" in Prague.

Radio v. Flies

WIRELESS is to be enlisted in the campaign against the common house fly. It is announced by the French "Office National d'Hygiene Social" that all scientific processes are to be employed in making war on flies. Radio will be employed by speakers all over the world to preach a crusade of extermination.

Forty Crowns a Head

THE Czechoslovakian postal authorities offer a prize of forty crowns for information leading to the detection of each wireless "pirate." To make the award more inviting the authorities guarantee that "anonymity will be respected." This is a wise move, for, to parody Congreve, "Hell has no fury like a pirate caught."

Retailers and Interference

APPARENTLY it is not sufficient that French wireless retailers should supply their customers' sets "in apple pie order." According to a recent legal decision at Cherbourg, the seller who installs a receiver must satisfy himself that the set will not be seriously interfered with in its new locality. The trouble arose when a private customer sued a radio firm for 6,000 francs in respect of a set which, although in perfect condition, picked up violent disturbances from a neighbouring H.T. line, no anti-interference device having been fixed. The Court awarded 1,000 francs.

A Distinguished Reader

MARCHESE MARCONI'S experimental cabin on board the "Elettra" was an irresistible attraction in the "Rooms of the Scientists" at the Ideal Home Exhibition. On the day of our visit the last touch of verisimilitude was given by the fact that the gentleman impersonating the great inventor was reading *The Wireless World!*

Nazi Interval Call

NEW interval signals are characteristic of the majority of German broadcasting stations since the National political crisis. The new call at Witzleben, Berlin, consists of the last notes of the well-known Nazi song "Volk an's Gewehr."

Youth at the Key

BRAVO, Master Russell Stedinger, 2816, Delaware Street, Oakland, California! According to the American Radio Relay

Short Waves from America

MOST large metropolitan centres in the United States went on to daylight saving time on Saturday last, April 29th, and short-wave listeners will be interested to know that new schedules have been prepared for those popular stations W2XAD and W2XAF. W2XAD transmits on Mondays, Wednesdays and Friday from 8 p.m. to 9 p.m. (B.S.T.), and on Sundays from 7 to 9 p.m. (B.S.T.). W2XAF transmits daily from 11.45 p.m. to 3 a.m. (B.S.T.).

Complete for £3-15-0

HERR HITLER has turned his attention to the wireless trade. We understand that the Chancellor, after meeting representatives of the leading manufacturing firms, has decreed that 20,000 receivers with built-in moving-coil loud speakers, shall be constructed and placed on the German market within a limited period, the cost of each receiver not to exceed seventy-five marks. The quality of reproduction must reach an

Designing Television Apparatus

THE Design of Television Transmission Equipment" is the title of a lecture to be delivered by Mr. J. C. Wilson (of the Baird Laboratories) at a meeting of the Television Society to be held at 7 p.m. on Wednesday next, May 10th, at University College, Gower Street, London, W.C.1.

Cards of invitation may be had on written application to the Hon. Secretary, Mr. J. J. Denton, 25, Lisburne Road, Hampstead, London, N.W.3.

Man-made Static: International Conference

THE first world-wide effort to tackle artificial interference with wireless transmission is timed for June 22nd and 23rd when, under the auspices of the International Electro-Technical Commission, an international conference will be held in Paris. Although most of the preliminary work has been carried out by the Radio Electrical Committee of the International Union of Telegraphy, it is felt that the work should proceed on broader lines, and the conference will, therefore, aim at bringing about arrangements between manufacturers of electrical machinery and apparatus as well as the producers and distributors of electrical energy.

Although the good effects which are bound to follow such a conference may not declare themselves immediately, listeners may safely assume that the ether will be much less noisy a year or two hence.

Are Cars Complete Without Radio?

WIRELESS enthusiasts who are seriously considering the possibilities of car radio this summer will be interested in an article based on practical experience, published in the current number of our sister journal, *The Autocar*, in which the writer describes journeys between London and the Midlands in a radio-equipped car. It is important to note that reception, when well toned down, was not disconcerting or calculated to divert the driver's attention from the road.

There are still a few technical problems which must be cleared up, perhaps, before wireless can be said to be a perfect concomitant to the modern car, and we endorse a suggestion of *The Autocar* that a sub-committee of the Society of Motor Manufacturers and Traders, Ltd., should meet a sub-committee of the Radio Manufacturers' Association to discuss various knotty points as they arise.

A Lewcos Event

THE Lewcos Staff Dramatic Society presented an admirable performance of Ian Hay's comedy "The Sport of Kings" to a full house at the Guildhall School of Music on April 25th. Lack of space precludes mention of excellent individual performances and Mr. Frank Lockett, the able producer, must accept the praise due to each and all of his well-selected cast.



THE WORLD'S YOUNGEST? On the right is eight-year-old Jean Hudson, daughter of Mr. Edgar L. Hudson (W3BAK), of Laurel, Delaware. Although not eligible for licence, this little lady can read and type Morse signals at fifteen words per minute. Her fourteen-year-old brother Roland (on left) is, of course, a veteran at the game. He is seated on his portable transmitter.

League, you can claim to be America's youngest licensed radio transmitter, for you are only nine years old and you hold the call signal W6HRZ. What is more, you have already communicated with voice as far as Hawthorne, Nevada.

Keep it up, Russell.

Thanks to Static

WIRELESS retailers in the Larkhill (Liverpool) district have been surprised by the recent mysterious increase in the demand for receiving valves. The Post Office experts have partially solved the problem, for they have discovered that a particularly virulent form of interference has arisen in the district, causing an intermittent crackling in wireless sets in Queen's-drive. The source of the noise has not been traced.

There seems no doubt that many listeners imagined that the trouble was due to faulty valves, hence the increase in the retailers' profits.

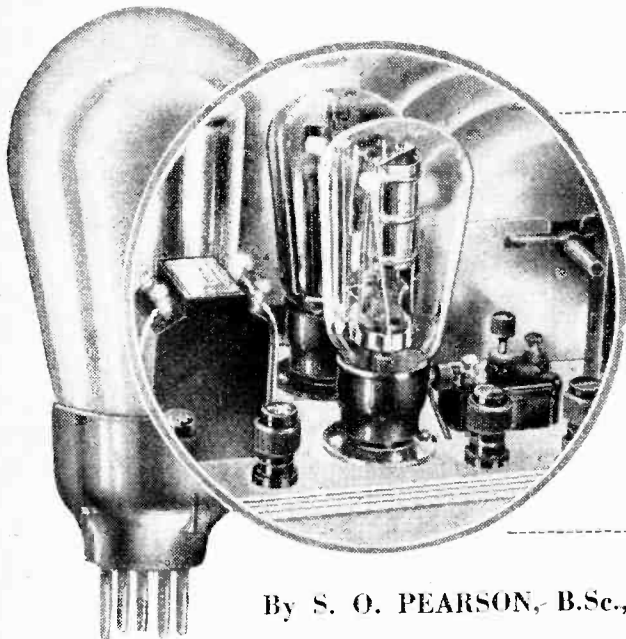
approved standard, so that users shall be certain of good reception of political broadcasts.

The "Magic Bottle"

TO the general public the cathode ray oscillograph is not a familiar object, but undoubtedly it will shortly achieve a much wider fame as a result of the publication of a very important volume entitled "The Applications of the Cathode Ray Oscillograph in Radio Research," by R. A. Watson Watt, J. F. Herd, and L. H. Bainbridge Bell, of the Radio Research Station at Slough. This book will tell how this "magic bottle" can capture and record signals lasting only 1/2000th of a second, make an atmospheric of only 1/500th of a second in duration photograph itself, and indicate the route by which it arrived. These and many other applications will be described in this fascinating volume, which is to be published by H.M. Stationery Office, price 10s. net.

The Pentode Output Valve

Why the Efficiency is So High



By S. O. PEARSON, B.Sc., A.M.I.E.E.

THE pentode is a constant current device and thus differs considerably in its behaviour when compared with a triode. It is shown in this article that if certain compensating circuits are used with the loud speaker the quality of reproduction can be superior to that from any other output valve.

THE pentode is an output valve whose electrical characteristics differ very widely from those of any triode, and for this reason the problem of matching the loud speaker impedance to the valve calls for special consideration. The pentode has two outstanding advantages over the triode; first, it is capable of giving a greater output in milliwatts per signal volt input at the grid, and, secondly, the maximum undistorted output is relatively large for the amount of anode current consumed. There is a further advantage that, with certain types of loud speakers which are weak in the upper register, very effective

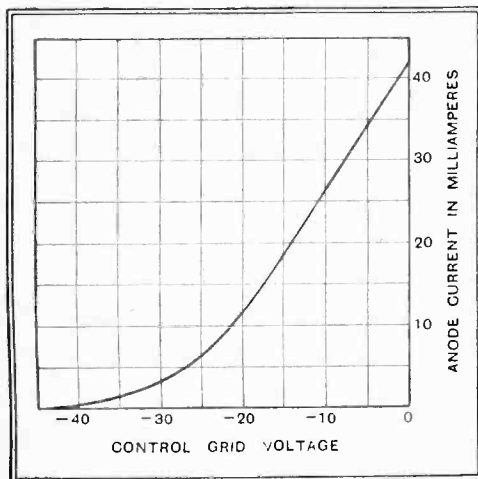


Fig. 1.—Anode current/grid voltage curves for a typical mains pentode taken at an anode voltage of 250 and screen voltage 200.

tone correction is automatically brought into play and this can be adjusted or varied at will.

As in the case of a triode, the pentode possesses the usual anode, cathode (or filament) and control grid. Besides these electrodes there are two auxiliary grids between the control grid and the anode.

One of these is "earthed" to the cathode inside the bulb and is the one nearest to the anode, consisting of an open spiral of wire. The next in order is the "priming grid," also a wire spiral, but rather more closely wound than the earthed grid. This is connected to a terminal at the side of the valve base and, under working conditions, is maintained at a constant positive potential somewhat less than that of the anode itself.

A.C. Resistance Values

For a pentode, the curve showing the relationship between anode current and control grid voltage, with the anode and priming grid kept at normal potentials, is very similar in form to that of a triode, as will be seen from Fig. 1. But, unlike a triode, the curve is hardly affected by a change of anode volts, and it is in this respect that a pentode differs so widely from a triode in its operation. Other things being constant, if the anode voltage is increased or decreased, say, 25 per cent. above or below the normal value, practically no change occurs in the anode current.

Now, in a triode, the change of anode current is very nearly proportional to the change of anode voltage, signifying that the A.C. resistance of the valve is more or less constant. But where a change of voltage results in no change of current, as in a pentode, it follows that the internal impedance of the valve must vary in direct proportion to the voltage. The effective A.C. resistance of a pentode cannot, therefore, be stated in the same way as it can for a triode. For instance, a pentode whose apparent A.C. resistance is, say, 60,000 ohms, expressed as the ratio of change of anode volts to change of current, behaves in actual operation as though it has an A.C. resistance of only four or five thousand ohms.

The anode current/grid volts curve of Fig. 1 is not of such practical use as curves showing the relationship between anode volts and anode current for different fixed values of grid voltage. A series of such curves for a representative pentode is given in Fig. 2, and these show clearly that, above a certain value of anode voltage, the current with any one value of grid voltage varies very little with change of anode volts. The dotted line curve is the corresponding one for an ordinary triode output valve and is included to show, at a glance, the great difference in the nature of the characteristics for the two classes of valve.

The most suitable load impedance for the pentode is determined by considerations of the degree of harmonic distortion that may be permitted. In a triode the

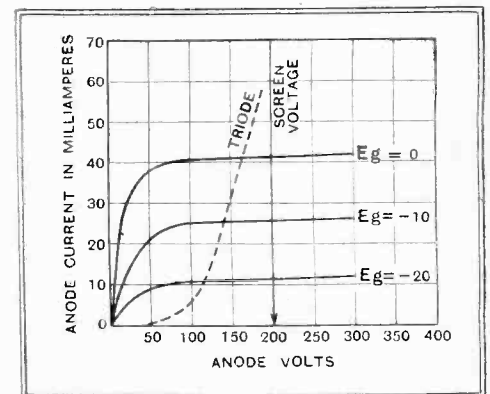


Fig. 2.—Anode current/anode voltage curves for pentode and triode, showing the difference in shape of characteristics.

curvature of the dynamic characteristic curves results in the introduction of a second harmonic, but in the case of a pentode the double curvature results in the addition of not only a second harmonic but a third harmonic also, and the latter usually preponderates. The optimum load impedance is usually chosen so that the harmonic distortion, either 2nd or 3rd, does not exceed 5 per cent. The optimum load is very much more critical for a pentode than for a triode, and for this reason an output choke or transformer with a number of tapings is used to enable the particular loud speaker used to be matched to give the best results. The usual connection with a tapped output choke is shown in Fig. 3.

Speaker Resonance

It has been pointed out that a change of anode volts does not, to all intents and purposes, affect the value of the anode current. So, also, any change in load impedance will not affect the anode current, as it does for a triode. Now the impedance of any loud speaker varies with

The Pentode Output Valve—

frequency, being usually very high at the upper end of the musical frequency scale. Consequently, when such a loud speaker is used in conjunction with an ordinary three electrode output valve, the alternating current delivered to the speaker, with a given signal voltage applied to the grid, falls off as the frequency rises. For this reason most types of loud speaker have been developed in such a way as to compensate for the falling off of current at the higher frequencies, usually by the introduction of some form of resonance.

Constant Current Device

When used with a pentode, the alternating current delivered to the speaker is the same at all frequencies, however the impedance may vary, and so, where an artificial boosting of the upper frequencies is already incorporated in the speaker design, the pentode will result in the reproduction of the upper frequencies being far too pronounced in comparison with those of the middle register, unless some means of partial suppression is provided in the electrical circuit. This correction is effected by connecting a high resistance R across the speaker terminals as in Fig. 3. Although the current supplied by the valve is constant, it divides between the speaker coil and the resistance R in the inverse ratio of the respective impedances. Since R is constant and the speaker impedance rises with frequency, it follows that as the frequency rises a larger proportion of the current will go through R and a smaller proportion through the speaker, as desired. A condenser C of suitable value is connected in series with R to prevent the latter from by-passing any of the current at the very lowest frequencies. Practically all moving iron speakers require compensation of this nature to prevent over shrill reproduction.

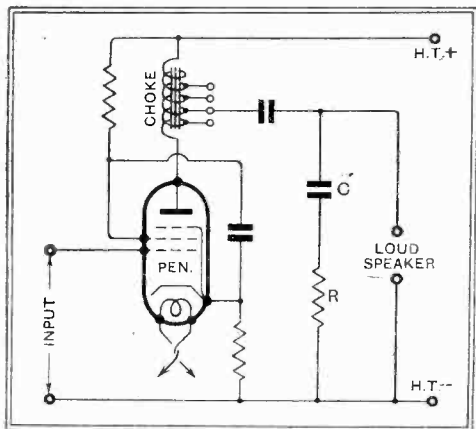


Fig. 3.—Complete pentode output circuit with tapped choke for matching loud speaker and impedance limiting device CR.

Moving-coil speakers are in a class by themselves and require, from the theoretical point of view, constant current at all frequencies, and so it would appear that the pentode would be ideal for operating this type of speaker. But the theoretical conditions are not fully borne out in practice on account of diaphragm or cone resonances. As a matter of fact paper

resonance at high frequencies is usually introduced purposely to compensate for loss of high notes when used in conjunction with a triode. So a speaker with a stiff-paper cone must be compensated in the same manner as for a moving iron speaker when used with a pentode. When the cone of the moving coil speaker is made of a very soft material, no compensation is required, but in practice it is

unsafe to operate a pentode without a resistance across the speaker or primary winding of the output transformer because the wide variation of valve impedance may cause dangerously high voltages to be developed during the passage of any powerful transients.

With careful matching and compensation the pentode can be made to render more realistic reproduction than a triode.

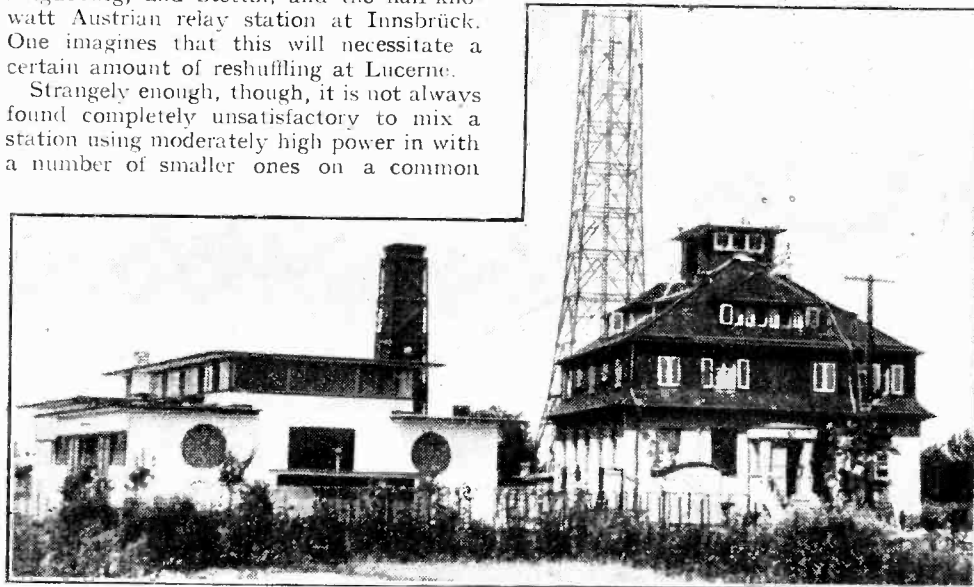
DISTANT RECEPTION NOTES**Shared Wavelengths : Results That Astonish**

SO Portugal is to join the ranks of the high-powered transmitters. The new Lisbon station, which will be able to use up to 100 kilowatts when required, is nearing completion, and tests are likely to start early in the autumn. The wavelength is to be 283.6 metres, which is at present occupied by three German relays, Berlin, Magdeburg, and Stettin, and the half-kilowatt Austrian relay station at Innsbrück. One imagines that this will necessitate a certain amount of reshuffling at Lucerne.

Strangely enough, though, it is not always found completely unsatisfactory to mix a station using moderately high power in with a number of smaller ones on a common

four-valve set containing two screen-grids, detector, and a power output stage still brings in a round dozen Continental stations at full loud-speaker strength with the reaction control knob right over at its minimum setting.

Amongst these stations, which are received so strongly that one is to all intents



A POPULAR DEUTSCHLANDSENDER. The transmitter buildings at Frankfurt, one of the best known of German broadcasting stations. The wavelength is 259.3 metres and the power 17 kilowatts. Frankfurt serves two relay stations, Cassel and Trier.

wavelength. The most astonishing example is to be found on 453.2 metres. This is occupied by no fewer than nine stations with outputs ranging from 150 watts to 1 kilowatt, and a tenth has recently been added in the shape of the 7-kilowatt Milan Experimental station, which relays Rome. Despite the multiplicity of its wavelength partners, I hear that reception within the service area of Milan is very good, and I have not heard of many complaints from those served by the other relays on the same wavelength. It will be still more interesting to see what happens when common-wavelength working of two super-power stations is attempted—the West National and London National on 261.5 metres.

Good Signals from Ireland

Athlone must be classed as one of the most successful of the new high-powered stations. In most parts of England and Wales its transmissions are received at almost local-station strength and the quality is remarkably good. One only hopes that the programmes will not eventually be spoilt by too much advertising.

As an indication of how good conditions still are, despite the nearness of the summer season, I may say that a straightforward

and purposes within their service areas, are Nürnberg (on certain evenings), Trieste, Turin, Heilsberg, Hilversum, Breslau, the Poste Parisien, Brussels No. 2 (now much stronger than No. 1), Leipzig, Rome, Langenberg, and Prague on the medium waves; and on the long waves, Zeesen, Warsaw, and Radio-Paris.

By making the set a little more sensitive numbers of other stations can be brought up to full loud-speaker strength and thoroughly well received. Barcelona, for instance, is better heard now than it has been for some weeks, and Hamburg is often very good indeed. Mühlacker's is a wonderful transmission at times when the London Regional is not working, and there has been little trouble recently from the Algiers heterodyne. Brno is well worth attention, and Göteborg is often to be found coming in well on 321.9 metres. Fécamp still suffers rather badly from spark signal interference. Bratislava on 278.8 metres is often receivable with real entertainment value. There is a slight tailing off at the very top of the medium-wave band, though Vienna and Florence are almost, if not quite, as good as ever. Stockholm and Katowice are nearly always to be relied upon for good quality and good programmes. D. EXER.

Practical HINTS AND TIPS

AIDS TO BETTER RECEPTION

ADAPTORS, by means of which the working currents and voltages of valves may be measured *in situ*, are produced by a number of manufacturers, and are extremely useful as an aid to checking operating conditions with a minimum of trouble.

Misleading Measurements

The adaptor is inserted between the valve under suspicion and its holder, and so the meter may be joined to the appropriate points without disturbing the wiring.

Unfortunately, the leads between adaptor and meter must inevitably introduce some risk of stray inter-circuit coupling, and thus self-oscillation may be provoked. The anode current taken by a valve in a state of oscillation will be different from that consumed under normal working conditions, and so, before relying implicitly on a measurement made in this way, one should satisfy one's self that the set is completely stable.

Self-oscillation may occur when dealing with H.F., I.F., or sometimes with detector valves. The most certain and usually the easiest way of ensuring immunity is to short-circuit the grid coil of the valve concerned; this course will not prejudice the accuracy of the readings in any way.

ONE of the simplest and cheapest methods of rectifying A.C. current for supplying the field of a moving-coil loud speaker is that shown in Fig. 1. The diagram is almost self-explanatory, but it should be emphasised that it is virtually essential that the principle of hum neutralising (hum bucking) should be embodied in the loud speaker.

Energising Field Magnets

It will usually be convenient to wire the rectifier circuit across the "dead" side of the on-off switch of the receiver, so that the current may be supplied automatically when needed. If this plan be adopted, it should not be forgotten that heavier main fuses will be required.

The arrangement shown is applicable to the field windings having the almost standardised resistance of 2,500 ohms; where it is desired to feed the field winding of the older type, which was origin-

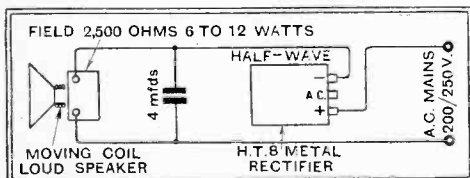


Fig. 1.—Feeding a high-resistance field winding from A.C. mains at normal voltage through a metal rectifier.

ally designed for connection to a 6-volt accumulator, the method suggested in Fig. 2 will be found satisfactory. Due to the fact that the voltage required is low, it will be necessary in this case to interpose

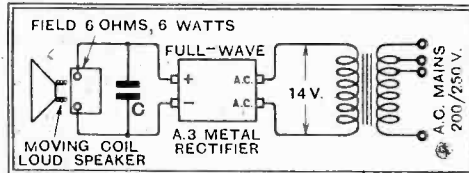


Fig. 2.—Supplying rectified current for an older type of field winding with a low-resistance winding.

a step-down transformer between the mains and the metal rectifier.

One of the advantages of working with a low rectified voltage is that a high-capacity dry electrolytic condenser may be used in the position marked C for purposes of smoothing.

IN the "Class B" Eliminator described in *The Wireless World* of April 14th, a resistance of 1,800 ohms was inserted in series with the rectifier in order to limit the output to 60 milliamps. As this resistance is inserted in the negative lead, it

The "Class B" Eliminator

may be regarded as a source of "free" grid bias; by converting it into a potentiometer in the manner shown in Fig. 3, any desired proportion of the total voltage developed across it may be employed for this purpose.

As the current flowing through the resistance in question will be maintained at a sensibly constant value, irrespective of load, by the action of the neon stabiliser, bias might be derived in this way even for a receiver in which anode current varies with modulation—as, for instance, when "Class B" or quiescent push-pull is employed. Without a stabiliser anode supply from the mains is normally ruled out for such sets.

As a potentiometer of 1,800 ohms is not a standard commercial product, it might be found more convenient to use a standard 300 ohm wire-wound potentiometer in series with a fixed resistor of 1,500 ohms; this would enable bias voltages varying from zero to about 18 to be taken off the variable section.

AS has already been stated in these columns, there is no easier or more certain way of improving the selectivity of an existing set than by adding an extra tuned aerial circuit. Of course, this addition is only applicable to sets in which the

Two-circuit Tuner Coupling

existing input circuit is of the single-tuned variety. It would appear that the great majority of failures to obtain satisfactory results from this addition are due to the fact that provision is not made for sufficiently loose coupling between the added circuit and the existing input circuit of the set. It is sometimes rather difficult to determine exactly whether the coupling is loose enough or not; in cases of uncertainty it is wise not to be satisfied unless it is possible to loosen coupling to such an extent that an easily perceptible reduction in signal strength can be brought about by setting the coupling at minimum.

OCCASIONALLY a failure in insulation between the cathode and the heating element of an indirectly heated valve still gives rise to trouble. A test for insulation between the heater and cathode pins is almost valueless when the valve is cold, as the fault will probably only manifest itself when the heater is working at its normal temperature.

Heater-Cathode Insulation

This is a case where an indirect test may often be made much more easily than a direct one. If the valve under suspicion is biased by means of a resistance in its cathode circuit the fault in question will

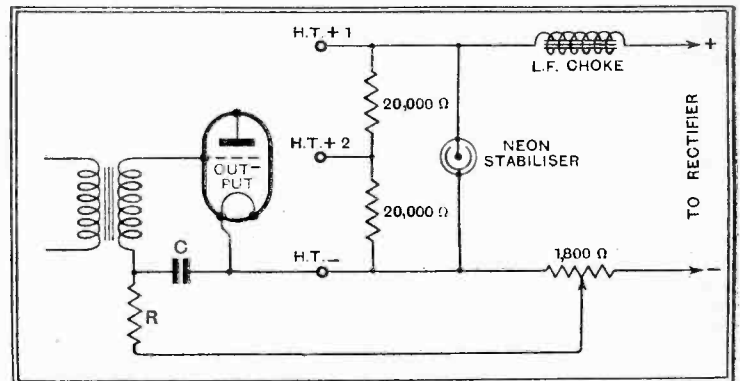


Fig. 3.—Free bias from the "Class B" Eliminator"; the decoupling components R and C may have values of respectively 100,000 ohms and 1 mfd.

introduce a short-circuit across this resistance, and so any change made experimentally in its value will not be followed by the usual changes in anode current. An indirect test is made by temporarily replacing the fixed resistor by a variable one, and at the same time inserting a milliammeter in series with the anode.

BROADCAST BREVITIES

By Our Special Correspondent

"Bowdlerised" Broadcasting

NOBODY these days seems to love the B.B.C. Balance and Control section. These hard-working and conscientious engineers have always had to submit to a kind of cold indulgence from artistes and listeners alike, but in the last week or two this "necessary evil" attitude seems to have developed into open hostility.

They are accused of "sub-editing" the great conductors ("editing" would be bad enough!), and one critic has gone so far as to accuse them of providing the public with bowdlerised versions of the classics.

Cruel Accusations

These are cruel accusations, and the accused engineers need all the balance and control they can muster to preserve at least an outward calm, for I know that these shafts run deep.

The truth, which is self-evident to every reader of *The Wireless World*, is that broadcast programmes would hardly flatter the artistes and conductors if they were left to the tender mercies of even the best of microphones and amplifiers.

Tricks of the Microphone

To some degree, of course, a broadcast soloist can control and balance his performance by various little microphone tricks. These include throwing back the head when a high note is tackled and lowering the voice to a confidential whisper when approaching near to the microphone. But microphone dodges are beyond the scope of, say, a symphony orchestra, and it would certainly distract the Queen's Hall audience to see the instrumentalists rushing to and fro in order to preserve a correct ratio between volume, pitch, and distance from the microphone.

They Would Change Their Tune!

I suggest that the Balance and Control section wastes no time in denying the allegations and defying the allegators; failing which they might take a night off and let the critics hear what an uncontrolled concert really sounds like.

Personally, I should prefer a chorus of corncrakes.

A Satisfied Empire

IT says something for the popularity of Empire broadcasting that over 5,000 people have actually put pen to paper in order to tell the B.B.C. what they think of the service. Of these practically 700 troubled to complete the very comprehensive questionnaire and another 340-odd actually went to the expense of sending cables.

Who can now say the Empire is indifferent?

Would the Money Flow?

In the light of these figures I think that the B.B.C. "ambassadors" like Mr. Malcolm Frost and his chief, Mr. Cecil Graves, will not find it very difficult to persuade the Dominions and Colonies to pay their just share towards the upkeep and improvement of the service.

What About it, B.B.C.?

HERE is an idea from New Zealand which might well be copied by the B.B.C. I hear that 2YA, Wellington, now has a small auxiliary station working on a shorter wavelength, which is specially used for broadcasting gramophone records while the parent station is sending out the news bulletins, the music being for the benefit of those who have already seen the news in the papers.

Yet listeners at the heart of the Empire have no alternative to the First News Bulletin, most of which is available at length in the evening papers, and, possibly, in some of the more alert morning journals.

Bravo, West Regional!

CONSIDERING the success which the B.B.C. engineers experienced with the first unannounced modulated transmissions from West Regional, it is not surprising that people in the West are applauding the excellence of the test transmissions which go out daily (Sundays excepted) on 309.9 metres between 11.10 and 11.50 a.m. and between 10.45 p.m. and midnight.

Transatlantic Report

Glowing reports are not confined to Wales and the West of England. I hear that after the early morning test on April 13th, reports came from a ship off the coast of Norway and a listener in St. John's Newfoundland. Splendid reception has also been reported from Berlin.

Wanted: A Sedative

It is in no spirit of vindictiveness that I utter the wish that West Regional will act as a real bromide to Radio Vitus, that little Parisian pest (as D. Exer put it last week) which performs a regular St. Vitus dance between 306 and 312 metres, upsetting Cardiff in the process.

Let Radio Vitus see what fifty kilowatts taste like.

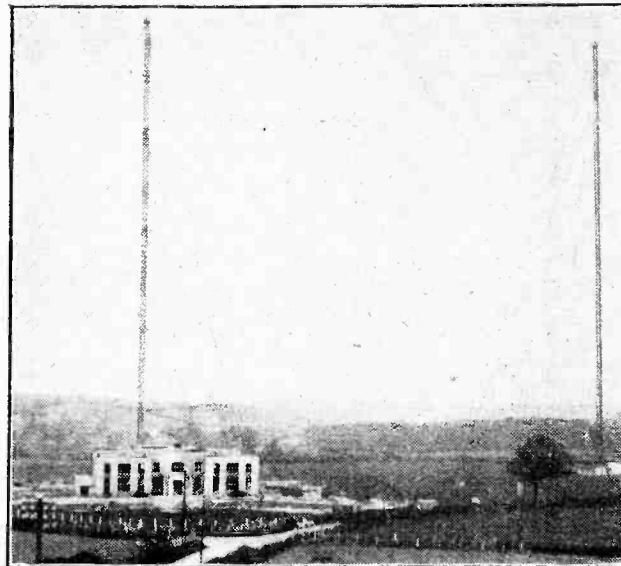
B.B.C. versus Man-made Static

IF you should hear Daventry National working overtime it would be a reasonably safe bet that the B.B.C. is engaged in an experiment to combat man-made static.

Trolley Buses on Test

The trolley bus question was tackled on April 12th with the cordial co-operation of the Hastings Corporation. As all the buses were in service during the day it was necessary to carry out the test after midnight, and for this purpose several buses were run empty through the streets (what the late revellers thought is not recorded!) while Daventry National sent out a special transmission from midnight to 1 a.m.

I understand that some useful data were obtained.



CALLING THE WEST. A striking view of the new West Regional B.B.C. station near Watchet, Somerset, which has begun daily tests on 309.9 metres. In general plan the station resembles its companion transmitters of the Regional scheme.

National Grid Troubles

The B.B.C. fear that electrical interference may increase slightly with the gradual completion of the National Grid electricity scheme, though the static is not so noticeable as might be expected. Most of the trouble seems to be caused in wet weather by surface leakage across insulators; even so, it is only observed by listeners who are very near to the power lines.

By the way, can you tell me why the amount of interference is not affected by the voltage? Apparently a 30,000-volt cable causes no more interference than one of comparatively low voltage.

On Empire Day

EMPIRE DAY (May 24th) will be notable for broadcast speeches by Mr. J. H. Thomas and the Archbishop of Canterbury from the Empire Day Luncheon at the Junior Carlton Club.

A special Empire Day Programme will be heard in the evening.

Nightingales Again

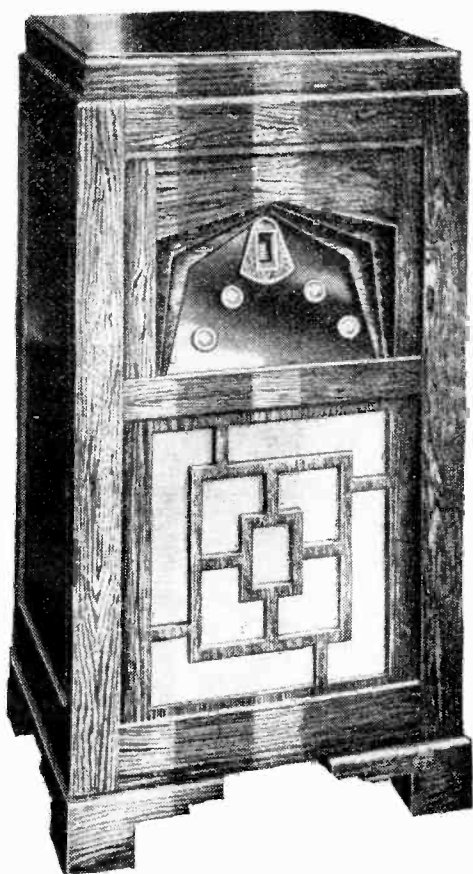
THE B.B.C. impresarios are off to Pangbourne to arrange contracts with the nightingales. During the period May 22nd to the 27th it is hoped to relay the song of the nightingale at intervals in the late dance music.

The nightingale is one of the few artistes who are sought for by the B.B.C. His lot is not that of the majority of performers, who, it would seem, can never be quite sure that they will not suddenly receive notice to quit.

Stick to the Helm, Sir Charles

I AM glad that there is a strong feeling in favour of Vice-Admiral Sir Charles Crippen's retention of his post as President of the International Broadcasting Union. Much as Sir Charles's services are valued at Broadcasting House, I believe that it is the general view that if he decides to relinquish one or other of his two big tasks he should continue to exert his powerful influence on international broadcasting.

There are not many people with his experience as a pilot in the turbulent wavelength channels.



R.G.D. Supersonic Radio

MODEL 701 D.C. Gramophone

Seven-valve D.C. Superheterodyne
Embodying Dual Loud Speakers
and Automatic Record Changer

Features: Seven-valve D.C. superheterodyne radio gramophone. Dual moving-coil loud speakers, automatic record changer, wavelength calibrated scale. Variable- μ H.F. amplifier, separate oscillator and S.G. first detector. Variable- μ I.F. amplifier, anode bend second detector and push-pull output. The controls include: (1) Tuning. (2) Combined wave-change and radio-gramophone switch. (3) Volume control effective on radio and gramophone, also mains switch. (4) Tone control. On motor board (1) Gramophone motor switch. (2) Repeat and reject control. **Price:** 67 guineas. **Makers:** Radio Gramophone Development Co., Ltd., 18/20, Frederick Street, Birmingham, 1.

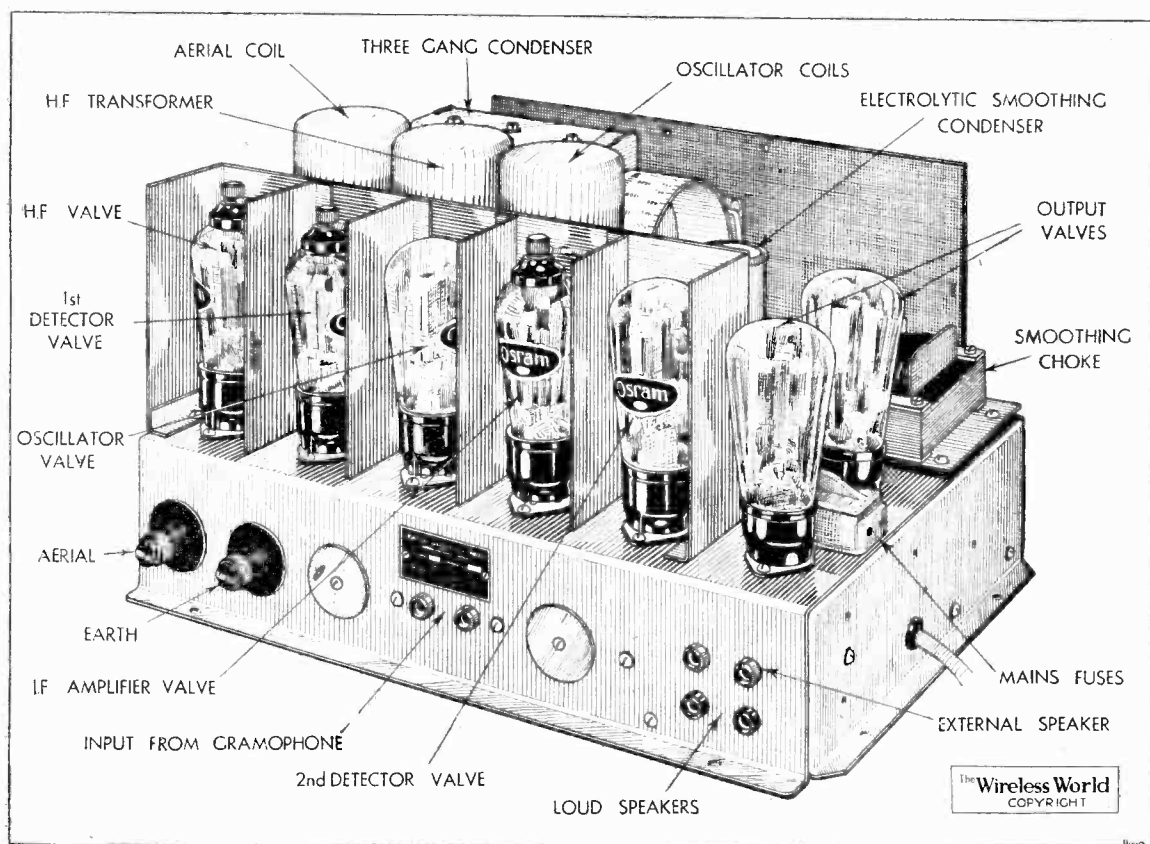
Of the many problems that beset the designer of a D.C. receiver that of obtaining an adequate power output under all conditions is possibly the most important of them all. For there is no simple means of increasing the voltage, as in the case of an alternating current supply, and when deductions have been made for grid bias and the requirements of smoothing about eighty per cent. only of the supply voltage will be available for operating the power stage. Yet, despite the many difficulties, D.C. operated receivers have attained a very high degree of efficiency, as instance the model 701 D.C. radio-gramophone, made by the Radio Gramophone Development Co., Ltd. This instrument is basically the same as their A.C. model, and comprises a seven-valve superheterodyne receiver, an automatic record changer, and dual-compensated loud speakers, and, in common with all R.G.D. products, the workmanship is of the very best.

The circuit employed is comparatively straightforward for a superheterodyne, and consists of one H.F. stage, preceded by a single-tuned circuit loosely coupled to the aerial. This is joined to a screen-grid

first detector by an H.F. transformer, the secondary circuit of which is tuned. There is a separate oscillator embodying a triode valve and one intermediate frequency amplifier; band pass I.F. transformers precede and follow this valve. The high and intermediate frequency stages both contain variable- μ screen-grid valves.

Thus there are two pre-selector tuned circuits and four in the I.F. amplifier, the degree of selectivity afforded by this chain of six tuned circuits being adequate for all normal requirements. An anode bend second detector, for which a triode valve is used, follows, and finally there is a pair of output valves working in push-pull. Incidentally, both first and second

detectors are of the anode bend type, and, being self-biased, will handle a comparatively large input. The customary split-secondary L.F. intervalve transformer usually preceding a push-pull amplifier is not employed in the present receiver, but in its place is a centre-tapped choke resistance capacity coupled to the detector valve. This may seem on first acquaintance somewhat unusual, but closer examination will reveal that it is but an auto-transformer with a centre-tapped secondary and a parallel-feed input circuit. It does not, of course, provide a voltage step-up, but actually there is no need to enhance the low frequency amplification, as ample power is available even on distant stations. Power is fed to the two moving-coil loud



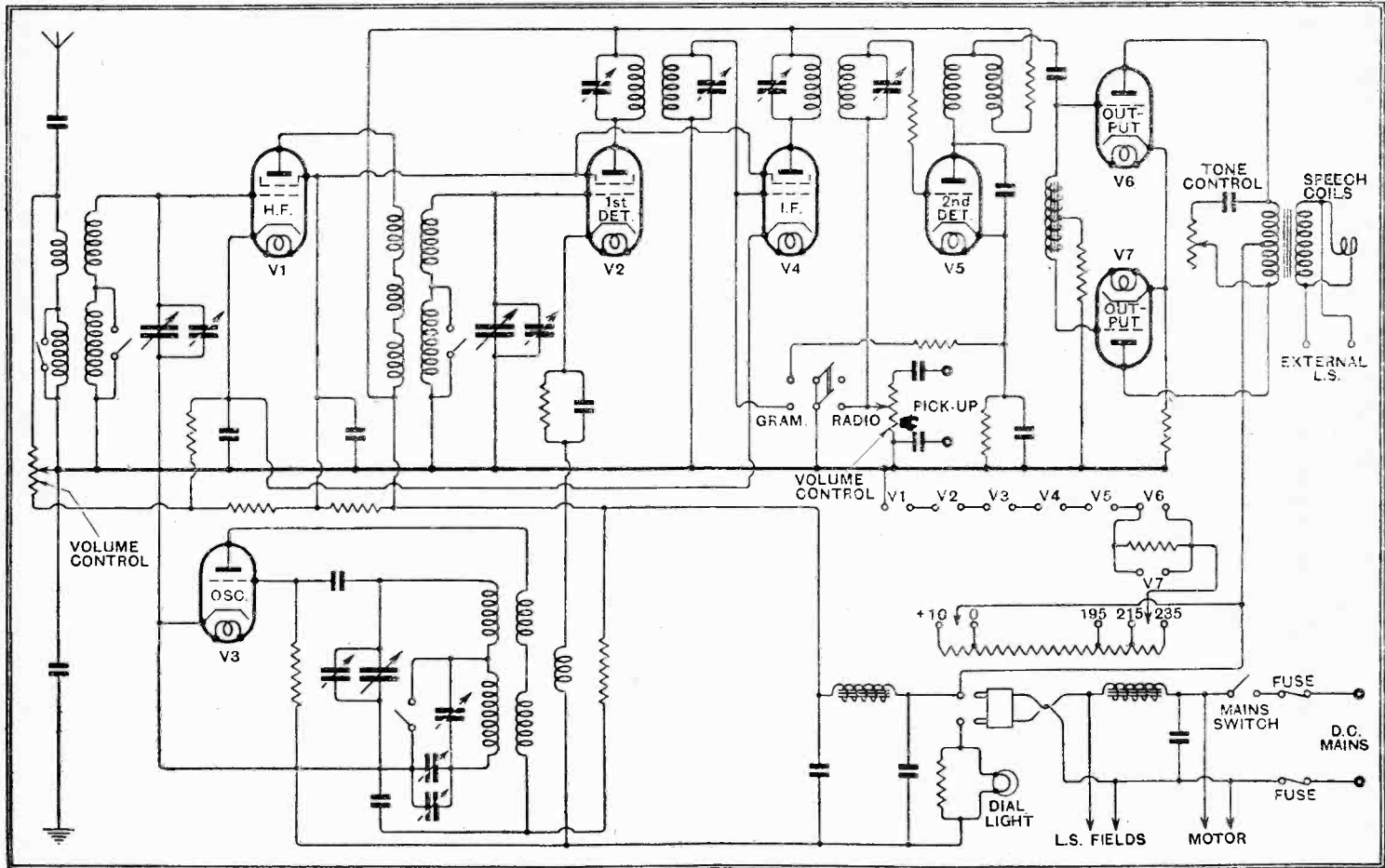
Rear view of the chassis showing the comprehensive valve screening.

R.G.D. Supersonic Radio Gramophone—speakers by an orthodox push-pull output transformer, across the primary winding of which is connected a tone control consisting of a variable resistance and a con-

found when playing partially worn records, as it materially helps in reducing surface noises.

The reproduction of the higher frequencies is, perhaps, slightly better on gram-

as a polarity indicator. A useful feature is the inclusion of a two-pin plug joined to the mains input leads after the first smoothing choke, which enables this choke to be inserted either in the positive or the



Complete circuit diagram. Provision is made for positive or negative smoothing.

denser. The loud speakers are of the energised type with their field windings joined in parallel and connected to the mains through a smoothing choke.

Volume is controlled by varying the grid bias of the first H.F. valve simultaneously with that of the I.F. amplifier, and also by reducing the signal input. These three functions are combined in a single control and linked with it is a second potentiometer, which serves as the volume control for the gramophone. This control, in addition to answering for both radio and gramophone, embodies also the mains on-off switch.

Effective Tone Control

The wave-change switch is made to serve a dual rôle also, for combined with it is the radio-to-gramophone switch. A tone control is not an essential adjunct, for the acoustic output is particularly well balanced; the bass is well in evidence, but does not obtrude or overshadow the upper and middle registers, both of which are well reproduced. Actually, the main usefulness of the tone control would seem to be as a whistle or heterodyne suppressor should interference of this nature be encountered and be sufficiently high in pitch to come within the range of the tone control. A further use for it might be

phone, which does not imply that broadcast reproduction lacks brilliance, since the difference is only just discernible to a trained ear. Selectivity has its price, but in the R.G.D. receiver the cost is surprisingly low.

Tuning is facilitated by the provision of a wavelength-calibrated scale, marked in bold figures and illuminated from the back, the dial light, incidentally, serving

negative lead. The plug is a little inaccessible, being located between the output valves and the panel, but it is an initial adjustment, and will probably be dealt with by the installing engineer.

All controls are mounted on an inclined panel placed at a convenient height for easy access when sitting in an armchair. There are two additional controls mounted on the motor-board, and these relate to the operation of the Garrard automatic record changer. They consist of a start and stop, reject and repeat switches. The record changer holds eight 12in. or 10in. records.

As a wireless receiver the performance is fully in keeping with that expected from a well-designed superheterodyne; sensitivity and selectivity are more than adequate to cope with present-day conditions. Quite a short aerial suffices for the reception of all the principal broadcast stations, whilst in many cases the volume control must be adjusted to avoid overloading. Best results, so far as volume and quality of reproduction are concerned, are not necessarily obtained with the volume control at maximum and the optimum position must be found by trial. With the output stage working well within its power-handling capabilities, the volume is ample for a living room of more than average size.

BLUE PRINTS

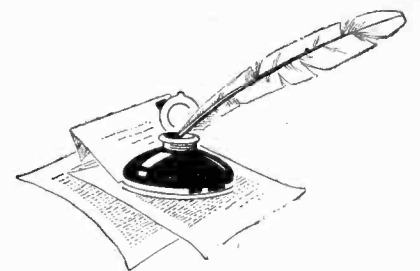
For the convenience of constructors full sized blue prints are available of the following popular *Wireless World* sets that have been recently described, price 1s. 6d., post free:

- Monodial A.C. Super. (Booklet, price 1s. 8d. post free.)
- Short Wave Two. (November 4th and December 23rd, 1932.)
- Straight Three. (December 16th, 1932.)
- Modern D.C. Three. (December 30th, 1932, and January 6th, 1933.)
- All-wave Monodial Super. (January 27th and February 10th, 1933.)
- Modern A.C. Quality Amplifier. (February 17th, 1933.)
- Ferrocarril III. (February 24th and March 3rd, 1933.)
- * A.V.C. Monodial Super. (March 17th and 24th, 1933.) With 2.5 watt or 5 watt amplifier. State which is required when ordering.
- The Class "B" Ferrocarril Receiver. (April 17th, 1933.)
- Universal A.C. Short-wave Converter. (April 28th, 1933.)

* Price of this blue print is 2/-.

These can be obtained from the Publishers, Hiffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

Letters to the Editor.



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

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

A Direct-reading Signal Strength Indicator

MANY constructors of the Monodial Super with A.V.C. will fit a tuning meter. This is usually inserted in the cathode lead of the three VMS4's. In this position the meter readings are inversely proportional to signal strength. At an extra cost of about four shillings the meter can be made to give readings which are approximately proportional to the field intensity of the received station. This is an obvious advantage, especially to non-technical users of the receiver. A 0-15 millimeter of low resistance can be made to read zero with no signal, and 12 with maximum R.F. input, corresponding to the old "R" scale of signal strength.

The meter is connected across a bridge circuit, with the three vari-mu valves on one side, and the other three valves and the screen-grid potentiometer on the other, as shown in the circuit diagram. The zero reading is adjusted by the potentiometer P, and the maximum by R. The alterations

The various methods by which A.V.C. is applied were given by C. N. Smythe, B.Sc., of the General Electric Company:—

1. Briefly, simple A.V.C. consists of using the potential developed by a diode detector as a negative bias, increasing with signal strength, which is applied to the H.F. valves. This arrangement only functions when used in a set having more H.F. valves than is desirable.

2. Next, in amplified A.V.C. the D.C. triode, and the appreciable change in anode bias potential is applied to the grid of a current which results renders available large changes of bias potential. A necessary delay action is readily introduced by returning the second element of a double diode detector to the cathode through a generous capacity. This method, used necessarily on a sensitive receiver, gives considerable mush between station settings.

3. Quiet A.V.C. makes use of an additional tuned circuit and valve, and is arranged to render the set insensitive except when a carrier is applied to the detector. As a means of automatic control this is

structor" into an intensely interesting field where milliammeters and voltmeters change their readings as he tunes, while involving little more theory than a knowledge of Ohm's Law. The "listening constructor" will probably only find disappointment in that his set will no longer possess those essentials—range with silent background.

The habit of accepting every American innovation as of paramount importance and to be adopted without question should not apply to A.V.C. The majority of listeners in this country have but a single local station and for every other his set should be working initially at maximum sensitivity.

F. H. HAYNES.

London, E.C.1.

The Price of Components

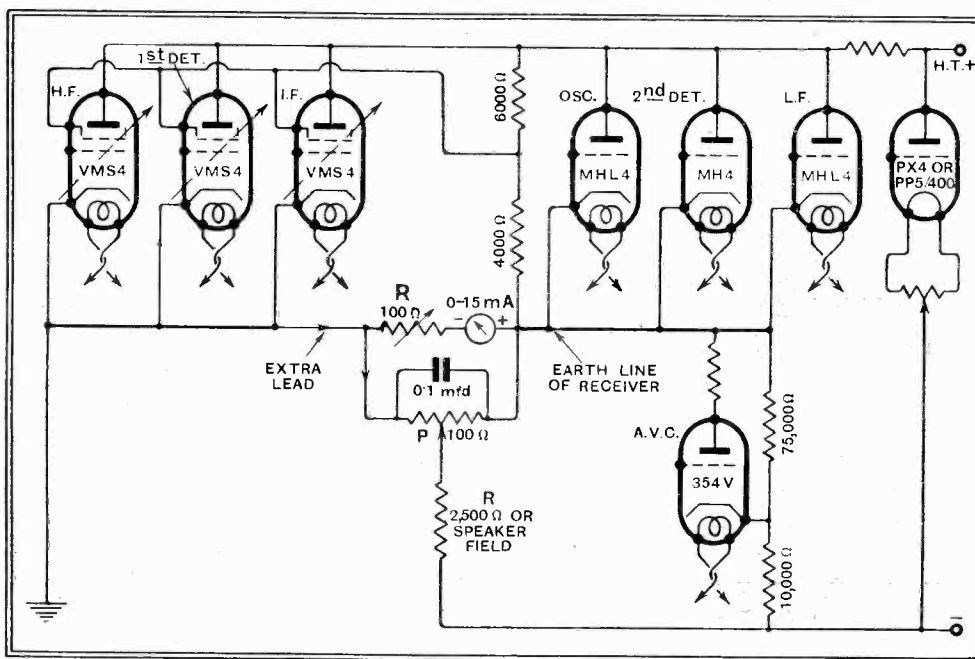
THE writer was interested to see your leader under the above heading, and, having some knowledge of the component market as well as the set market, he begs to submit the following comments for consideration.

In the first case, experience has shown that the great majority of constructors like their components not only to be good, but also to appear good; and it is a very common experience for one to come across constructors who take a pride in showing people the insides of their sets, not only because they have built them themselves, but because of the fine internal appearance, which in many cases is superior to the internal appearance of a completely manufactured set.

The next point to consider is this, namely, that the case, for example, of an audio transformer, apart from any possible electrical advantages it may have, forms a mechanical shield for the winding, preventing not only damage in transit, but damage when being handled by the constructor or when in the dealer's stock or on show in his window. One has only to examine one of the so-called skeleton components, such as manufacturers use, after it has been left out in the open for a short time under conditions corresponding to a trader's window, to realise that not only is it almost impossible to prevent it from deteriorating in performance, but its appearance tends to deteriorate so rapidly that it is not long before it can be classified as "junk."

The next consideration is "performance." In these days of rubbishy reproduction, not only in the case of many cheap manufactured sets on the market, but also—I am sorry to state—in the case of sets put out by reputable papers, it may be that your proposal can be considered as desirable—in other words, if *The Wireless World*, too, is in favour of reducing the performance of its designs to the level one expects from the average type of completely manufactured set, well and good; let it go ahead, and no one will henceforward bother to build to its specifications.

On the other hand, the writer has always felt that, up till now at any rate, *The Wireless World* considered excellence of design and fineness of performance in reproduction



to the wiring are quite simple. The resistances are mounted on the power chassis, and one extra lead is run in the A.V.C. cable. The meter is connected through a two-pin plug.

This arrangement can be used with any form of automatic volume control.
Bristol. COLIN GOATES.

A.V.C.—A Dissenting Voice!

SHOULD we accept, without question, the general opinion which has suddenly arisen that a set to be useful must embody A.V.C.? Your editorial in the issue of March 24th will, doubtless, prove correct, and next season's sets of the more elaborate type will include A.V.C. in their specifications. Users of less ambitious sets not so equipped, however, may console themselves with the fact that A.V.C. is not without its failings.

the most satisfactory, the desired results being easily obtained.

Assuming the A.V.C. is to compensate for the effects of fading, it is important to bear in mind that the feeblest parts of the transmission will be unaffected but that the A.V.C. will cut down all other transmission to this weak level. One has only to arrange a receiver to produce this effect in order to at once condemn its use as producing an extremely insensitive receiver. In a super-heterodyne the weak signal is represented at the second detector as one of very low modulation, yet A.V.C. takes into account only the amplitude of the carrier. It is also of importance to appreciate that A.V.C. in no way corrects for the distortion which accompanies fading. Some measure of A.V.C. is useful in limiting tuning spread due to detector overloading.

A.V.C. takes the "experimenting con-

as the first requirements of any receivers described in its columns, and if it continues to believe in that policy it will not be deterred for one moment from using the very best apparatus it can get for use in its sets, irrespective of its cost; for there is very little room for doubt that, in the past at any rate—and, the writer believes, at the present time and in the future—those constructors who build *Wireless World* sets, or the sets of good design put out by certain manufacturers, do so not for any possible saving in cost as compared with the completely manufactured article, but for the joy of the building and the fairly well founded belief that they can employ in their sets better apparatus than the majority of present-day manufacturers can afford to use. J. BAGGS.

New Moston, Manchester.

IN your remarks on the price of components you omit to mention the valve.

We have recently seen American multi-valve sets offered for sale here which include valves such as are making a belated bow in this country.

The English price of the valves contained would in some cases account for a very large part of the selling price of the complete set, loud speaker included, although these sets and valves come from the land of high wages, high prices, and trusts.

In spite of the high price of English valves, the life of heaters is still very much x ; some will run to the end of their useful emission, and then one may have three or four wasters before chancing upon another long-lifer.

Despite mergers, rationalisation, organisation, research, and so forth, almost every advance of major importance in valve construction has originated abroad.

A comparison of American with English valve prices, or comparison of the prices at which English valves are being sold abroad (after surmounting high tariff barriers) with the prices asked in this country, would be interesting. WM. A. RICHARDSON.

Ashford, Kent.

Schools Wireless

INFORMED you as long ago as last October that we were thinking of constructing the Monodial A.C. Super or the Modern Straight 5 to use as a school set.

You strongly deprecated the former and even seemed doubtful about the latter.*

However, as the result of some experience and enquiries I meant having a reserve of power and constructed your Modern Straight 5.

Believe me, it is almost ideal. I have the set permanently installed in my room, and loud-speaker extension wires have been run to six of the classrooms. Reception of music in each of these leaves nothing to be desired, though speech suffers somewhat from classroom resonance. In purely speech lessons we place the speaker an inch or so from the baffle board, and so weaken the bass frequencies. In any case, no child has to strain in the least to hear all that is said.

I thought you would be interested to hear of the successful use of one of your sets in a school, and am sure you can recommend it with every confidence to any other enquirer.

I should like to express my gratitude to you and *The Wireless World* staff for a very efficient addition to our facilities here.

H. CHAMBERS, Headmaster,
City of Nottingham Education Committee.

* We hesitated to recommend sets which seemed likely to be rather too ambitious for local reception work.—ED.

LABORATORY TESTS

NEW RADIO PRODUCTS REVIEWED

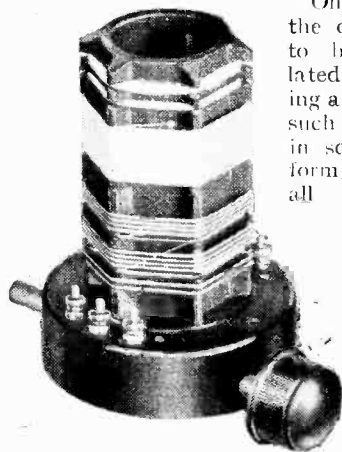
LISSEN UNIVERSAL COIL

THE Lissen Universal Four Wave-Range Coil, to give its correct description, is designed to cover all the broadcast wavebands at present in use when tuned by a 0.0005 mfd. condenser. A four-position switch mounted in the base enables the following wavebands to be selected: 12-34 metres, 27-84 metres, 200-555 metres, and 900-2,100 metres. Particular care is necessary in the layout of the components, and especially in the choice of the tuning condenser, to extend the wave-range down to 12 metres, for we found that although no difficulty was experienced in tuning down to 15 metres with quite normal components and an orthodox layout, more attention to small details was necessary to so reduce the stray capacities that the lowest wavelength could be reached.

Reaction is perfectly satisfactory on all four ranges, and if the reaction condenser, for which a 0.0003 mfd. suffices, is connected in the "earthy" end of the reaction winding no trouble will be experienced from hand capacity. The tuning condenser must be fitted with a good slow-motion drive, and it is essential that it should have a very low minimum capacity.

The presence of the medium- and long-wave windings does not seem to affect the performance of the short-wave section, and on these wavebands the efficiency is as good as can reasonably be expected with a coil of such versatile application.

On the whole the designers are to be congratulated on producing a single coil of such wide range in so compact a form, for its overall height is



Lissen
Universal
four-range
coil.

4½ in., and the diameter of the base 3 in. The various coils are wound on a six-ribbed ebonite former measuring 2 in. in diameter. The base is a neat bakelite moulding.

The makers are Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex, and the price, complete with extension rods, is 15s.

BLOCK L.T. ACCUMULATOR

AN unconventional storage cell in which the customary lead grill filled with oxide paste has been replaced by a special type of compressed electrodes consisting of the active material only has been introduced by Block Batteries, Ltd., Abbey Road, Barking, Essex. Known as the Block Accumulator, it is made in an 80-

Block plateless two-volt accumulator rated at 80 amp.-hours.

amp.-hour size, nominal rating, and takes the form of a cylindrical bakelite container in which is a seamless lead cylinder having pasted on to its inside surface the active paste forming the negative electrode. The positive element is a light lead core heavily pasted with a lead oxide. This is adequately insulated and is immersed in the usual solution of sulphuric acid.

This method of construction leads to a considerable saving in weight and space, for it is claimed that in the Block cell double the amp.-hour capacity is obtained for a given size.

The new accumulator is an improved version of the original Fuller block-type cell, but is far more convenient for radio use than its prototype, since the charging rate is commensurate with that of any normal battery of equivalent capacity. It is, however, suitable for slow discharge only, and the normal rate is of the order of 0.5 amp. Owing to the particular nature of its construction, the cell may be left in a fully charged state without attention for long periods. Very little leakage of the charge takes place and, furthermore, internal sulphation is so slow that the cell does not suffer harm from this cause.

A specimen cell has been subjected to a test consisting of continuous discharge at 0.5 amp. and after the first charge 77 hours elapsed before the voltage dropped to 1.8. Subsequent discharges gave 80 hours and 78 hours work respectively under similar conditions, so that it would seem that on continuous work an actual capacity of about 40 amp.-hours may be expected. On intermittent discharge we fully expect the battery will give a considerably longer working time.

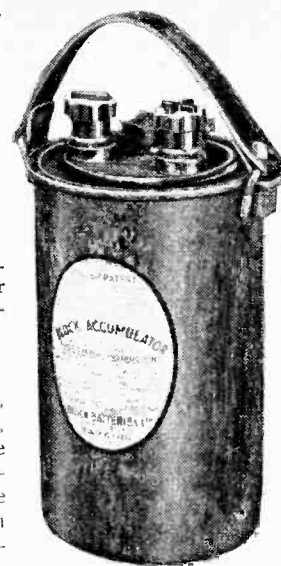
The battery is fitted with non-interchangeable terminals clearly marked and a large filler cap with a gas vent. It is available in a variety of coloured containers, and the price is 11s. 6d. for a two-volt cell.

BUSCO SWITCHES

A READJUSTMENT in the prices of Busco Switches, samples of which we reviewed in our issue dated March 31st last, brings the two-point model down to 1s., whilst the three-point type is obtainable for 1s. 3d.

Change of Address

The Public Address Department and the Special Products Branch of the Marconiophone Co., Ltd., hitherto occupying premises at 21, City Road, London, E.C.3, are now accommodated in Radio House, 210-212, Tottenham Court Road, London, W.1. The telephone number is Museum 4144.



READERS' PROBLEMS

Ferrocart and Q.P.P.

A READER who has already purchased the essential components for Q.P.P. amplification asks whether this system is applicable to the Ferrocart Class B receiver. We gather that he intends to use low-power output valves of the LP2 type, and so presumably an intermediate stage of L.F. amplification between the detector and the push-pull output valves will not be needed.

There is no basic reason why the Ferrocart set should not be modified in this manner; it is suggested that the receiver up to and including the detector valve should be built exactly as described, and that the output stage should be rearranged as shown in Fig. 1. It will be noticed that slight

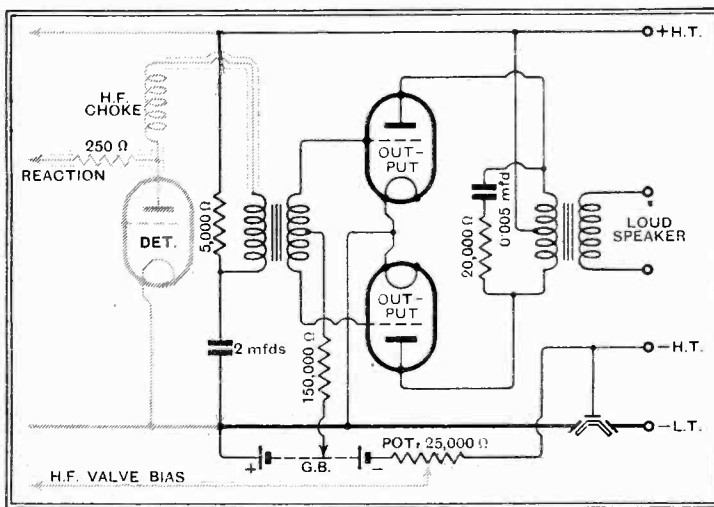


Fig. 1.—The Ferrocart "Class B" receiver, modified by the substitution of a Q.P.P. output stage. Alterations to the original circuit are shown in full lines.

modifications will become necessary in the grid bias system; in order to simplify matters the arrangement illustrated provides for adjustment of output valve bias by means of battery tapplings, the potentiometer being used solely as a volume control by variation of H.F. valve bias. There are advantages in using a potentiometer for critical adjustment of output valve bias as well, and if this refinement is desired it is suggested that two potentiometers might be connected in the manner described in the "Readers' Problems" section of the issue for March 17th.

It should be noted that, for the arrangement at present under discussion the push-pull interval transformer must be of the high-ratio type specially designed for Q.P.P.

A Bad Earth

WE are asked what can be deduced from the fact that the removal of the earth connection from an A.C. mains receiver makes no apparent difference to sensitivity or selectivity. Our correspondent, naturally enough, seems to think that a defect in his receiver is indicated.

We do not think that this is so; perhaps the most logical implication is that the earth connection is poor and ineffective, but it

should be remembered that all mains sets are earthed to a greater or lesser extent through the mains themselves.

It would nevertheless be well worth while to go to the trouble of trying to improve the earth connection.

L.F. Reaction

IT is a matter of some importance that interaction between pick-up and loud-speaker should be avoided, and accordingly connections and components associated with the output circuit should not be placed in close proximity to the pick-up and its leads.

From a description of the effects noticed by a querist, we are inclined to think that attention to this matter should remove his

difficulties. The set works satisfactorily as a broadcast receiver, but when the pick-up is in operation L.F. instability and whistling occur when the volume control is set towards maximum. If the leads associated with the input and output ends of the amplifier are in any way mixed together it would be advisable to separate them, and if it is not possible to give greater spacing than at present the expedient of shielding these wires should be tried. It is worth while pointing out that flexible screened wire specially made for pick-up connections is available commercially.

Smoothing Unnecessary

WHEN a receiver is to be fed from the accumulator battery of a house-lighting plant, it is usually quite unnecessary to fit any smoothing devices. This statement is made on the assumption that the set will not be used while the accumulator battery is being charged; while charging is actually in progress there is bound to be a more or

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.

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.

less noisy background, unless a fairly extensive smoothing system is included.

In spite of the fact that the usual smoothing equipment is fitted to his receiver, a correspondent finds that reception suffers while charging is in progress, and asks us to suggest how this interference may be prevented.

We suggest that in the first place the brushes of the charging dynamo should be attended to, and that sparking should be reduced as much as possible. At the same time, it would probably be wise to fit an "interference suppressor" to the dynamo; the simplest arrangement, consisting of a pair of large condensers shunted across the output, with an earth connection to their junction point, will probably improve matters. There is also the possibility that interference is being caused by the electrical ignition system of the engine which drives the dynamo, and it may be necessary to fit the usual preventive devices.

A.C. Practice with Battery Valves

ONE of the advantages of indirectly heated valves is that their cathodes need not be connected together. In practice, and particularly in certain A.V.C. circuits, matters are so arranged that a considerable difference of potential may exist between the cathode of one valve and that of the others in the receiver.

A querist, who is trying several rather unconventional systems of A.V.C., bemoans the fact that he is forced to use battery valves, and so is barred from employing

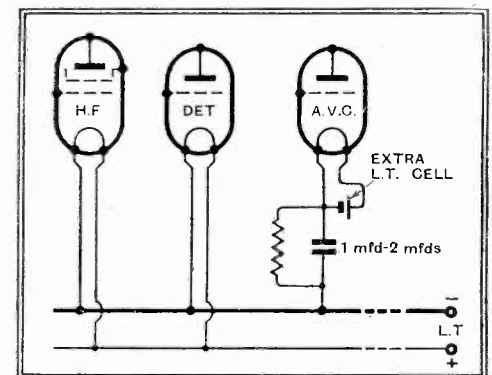


Fig. 2.—By heating a battery valve from a separate L.T. cell its cathode may be treated exactly like that of an A.C. valve, and, if necessary, isolated by a high resistance from the filament circuits of the remaining valves in the receiver.

any method in which the cathodes are at different potentials.

This correspondent loses sight of the fact that, as L.T. accumulators are now so inexpensive, it is quite a practical expedient to feed any valve of which the cathode must be isolated from the others by means of an extra cell. An arrangement of this sort works quite satisfactorily, and so none of the special schemes devised for indirectly heated valves are to be ruled out entirely for battery users. For instance, it is possible to isolate the cathode of a valve in the manner shown in Fig. 2.

The Wireless World

THE
PRACTICAL RADIO
JOURNAL
23rd Year of Publication

No. 715.

FRIDAY, MAY 12TH, 1933.

VOL. XXXII. No. 19.

Proprietors: ILIFFE & SONS LTD.

Editor:
HUGH S. POCOCK.

Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1.

Telephone: Hop 3333 (50 lines).
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.
Telegrams: "Cyclist, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:
Guildhall Buildings, Navigation Street, 2.
Telegrams: "Autopress, Birmingham." Telephone: 2970 Midland (3 lines).

MANCHESTER: 260, Deansgate, 3.
Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.
Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND
CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:
Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other
countries abroad, £1 3s. 10d. per annum.

*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.*

CONTENTS

	Page
PROGRAMMES FROM ABROAD, pp. I—XXIV	
Editorial Comment	333
Increasing Bass Response	334
Athlone	337
Practical Hints and Tips	338
The Catkin Valve	340
Broadcast Brevities	342
Marconiphone 3-valve Radio Gramophone	344
Laboratory Tests	346
The Pentagrid Converter	347
Letters to the Editor	348
News of the Week	349
Unbiased	350

EDITORIAL COMMENT

Heading for Disaster

Back Pedalling in America

INTELLIGENT opinion in America is calling for a halt in the downward trend of prices of sets which, with ever-increasing impetus, is dragging down the quality of reproduction till there is no place left for pride in performance. Leading American journals are urging a return to quality in radio receivers, and the following is an actual quotation which is typical of the views held: "Steadily the average of our receiving sets grows worse and worse, more and more deficient in quality of reproduction, inadequate in material equipment and durability." America, it would seem, has during the past season or two been infected with the idea that mass-production and low prices are the only road to prosperity in the radio industry, but now at last the rather bitter experience through which the radio industry in America has passed seems to have taught the lesson that shoddy products in the radio industry do not mean prosperity, and that mass-production and cheapness are a safe policy only when quality does not suffer.

Are manufacturers in this country ready to profit by the example of America's mistakes and for once show initiative by short-circuiting America's season of retrogression whilst America is back pedalling? For the first time the opportunity presents itself to catch up technically and then lead the way with British individuality in future designs. If we in this country firmly resolve to maintain the quality of our sets at a high level we stand a very good chance of being at least on equal terms with America in the coming season. But if America's products of this season are again to be the British

manufacturers' standard for next, we shall be mass-producing cheap and nasty sets at a time when the pendulum in America has swung right over to a policy of "quality first."

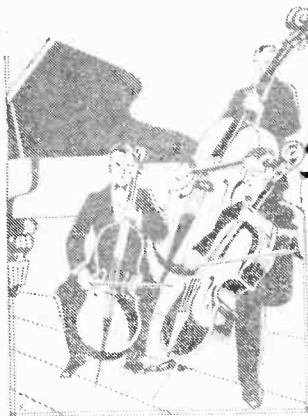
Of what use is it for the designers of broadcast transmitters to have gone on from year to year making steady improvements in the technique of broadcasting, until the quality transmitted has to-day reached a very high standard indeed, if set designers begin to pull away in the opposite direction and undo the good work which has been accomplished on the transmitting side?

The Catkin Valve

New Ideas in Construction

FIRST details are now available of a new series of valves which represent an entirely new departure in construction and promise much for the future development of this most important unit of the receiver. In this issue constructional drawings are included with our description so as to give our readers complete information on the points of novelty which have been introduced.

The "Catkin" is not a new valve with entirely new characteristics. The valve is at present being manufactured in types which are interchangeable with the existing series of receiving valves, so that no special receivers need be designed around these valves; they can be used in the same positions as their equivalents of orthodox type. Samples of the new valves are in our hands, but they have reached us too recently for it to be possible to include a report of our own tests with this first description which is based on information from the makers whom we congratulate on being first with a development of this importance.



Increasing Bass Response

How to Choose the Coupling Condenser for the Parallel-fed Transformer

By R. W. H. BLOXAM

IT is probably not generally known that the parallel-fed low-frequency transformer, which has found such wide application in receivers, can be arranged in circuit so as to raise the level of the bass response. This valuable property is explained in the accompanying article and a diagram is given which shows at a glance the value of coupling condenser required for different transformers to effect the bass resonance at any required frequency.

It is well known that the problem of securing good bass response is more serious in the case of gramophone reproduction than in radio reception, owing to the falling characteristic of the recording level below about 250 cycles.

Assuming that the overall response of the amplifier and loud speaker is sensibly level down to, say, 50 cycles, the bass reproduction for broadcast reception will generally be reasonably satisfactory.

It must not be forgotten, however, that the frequency characteristic of the modern receiver with a small self-contained loud speaker is not inherently level, and compared to its prototype, the moving-coil speaker with a large cone, freely suspended at the edge, the bass is likely to be deficient.

Attempts to bring up the low-frequency response by acoustic or mechanical resonance, that is to say, by introducing cabinet resonance, or by making the loud speaker diaphragm resonate on its surround at an audible frequency, often result in an artificiality of bass response that is only too obvious to the keen musical ear.

For gramophone reproduction the use

of a pick-up with a rising characteristic at low frequencies may provide a measure of compensation, but this will generally be insufficient to maintain the response to the extent desirable, bearing in mind the additional loss in the loud speaker and the decreased sensitivity of the ear towards the limits of the audible frequency spectrum.

In Fig. 1 the lower curve shows the falling characteristic of the recording below 250 cycles. The response at 250 cycles corresponds to the "level," since the response for all recorded frequencies higher than this will remain about the same until the upper recording limit is approached.

The uppermost curve has been plotted from the published response curve of a well-known pick-up of high quality, having a generally rising characteristic at the lower frequencies.

The dotted curve shows the resultant electrical output from the pick-up, and is obtained by algebraically summing the values of A and C referred to the level.

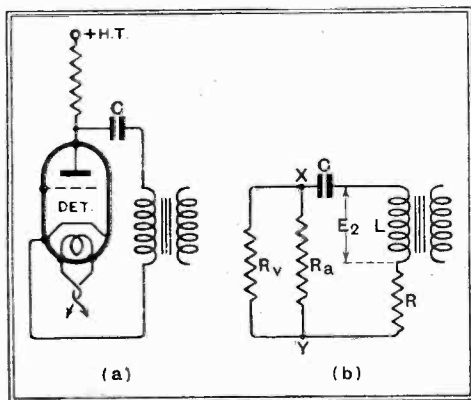


Fig. 2.—The conventional parallel-fed transformer scheme (a) and the equivalent electrical circuit (b).

It is plainly seen that the electrical output below 80 cycles falls badly below level, being accentuated in this particular case by a droop in the pick-up characteristic.

Whilst another design of pick-up might make this deficiency good to some extent it is not possible to extend the compensation to very much lower frequencies without introducing undesirable features.

Down to 50 Cycles

Special compensating filters or networks provide the correction necessary to raise the bass response, but they suffer the disadvantages of adding considerably to the bulk and to the cost of the apparatus.

For true fidelity of reproduction excessive resonances of a mechanical nature are undesirable, since they are not readily controlled or altered. Rather the compensation should be electrical in character, in which case excessive responses are more readily obviated.

Before considering means of providing a measure of compensation in the ampli-

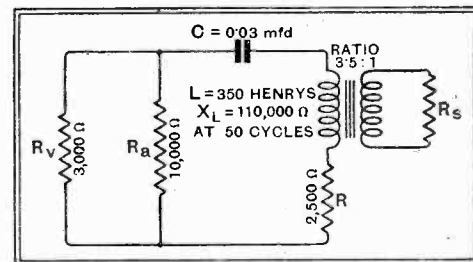


Fig. 3.—Showing typical values for the components used in the circuit of Fig. 2.

fier itself, it is desirable to give some consideration to the question of the lowest frequency which we need to reproduce for good quality.

Glib talk is sometimes heard of "reproduction down to 20 cycles," but, in point of fact, whilst such low frequencies do convey some sensation of sound they hardly ever occur in music. A study of the frequency characteristics of musical instruments shows that the lowest fundamental frequency of a few reaches 32 cycles, but the majority of the bass instruments do not reach much below 50 cycles. This has been clearly shown in articles on reproduction.¹

It is instructive to apply a small 50-cycle potential derived, say, from one-

¹ "The Last Component," *The Wireless World*, March 4th, 1931, and "Broadcast Reproduction," *The Wireless World*, May 4th, 1932.

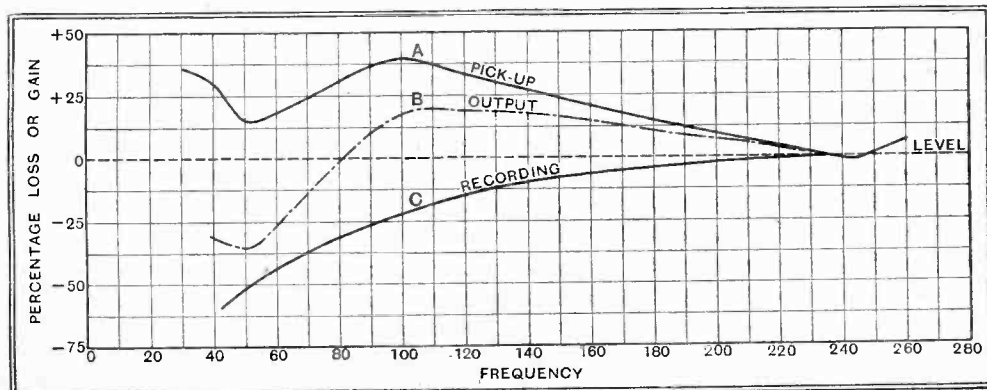


Fig. 1.—By combining the response curves of a well-known pick-up (A) and a typical gramophone record (C) the resultant output (B) is seen to give bass attenuation.

Increasing Bass Response—

half of a mains transformer heater winding to a potentiometer connected across the input of the amplifier. This gives a tone practically free from harmonics, and those who have not tried it previously will possibly be surprised at the very low pitch of the resulting sound. A frequency of 25 cycles implies that the pitch will be an octave lower, of course.

It is therefore certain that if cut-off (i.e., 70 per cent. of the normal "level") is not reached until 40 cycles we shall miss very little.

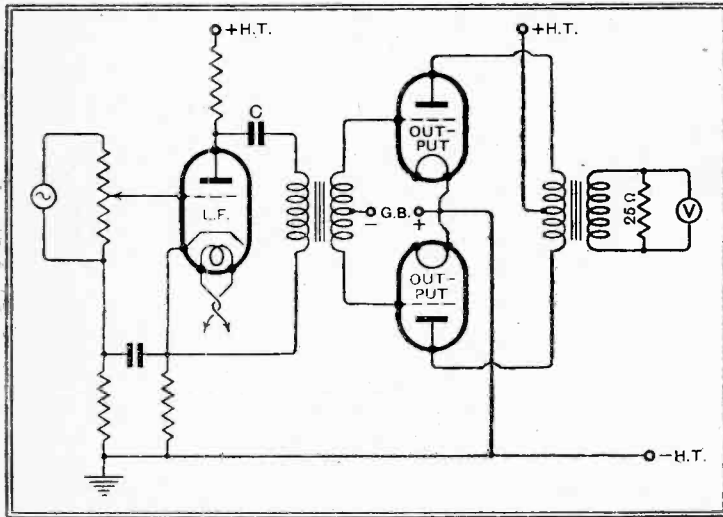


Fig. 4.—Circuit with push-pull output used by the author to examine the frequency response of parallel-fed transformer coupling.

It has recently been shown that a measure of bass compensation can be obtained with pentode valves when a choke-capacity output coupling is employed by choosing a coupling condenser having a somewhat smaller capacity than that previously adopted by convention.

The Equivalent Circuit

It is the purpose of this article to show that some measure of compensation can be obtained also with the now commonly employed parallel-fed transformer inter-valve coupling, although the action differs somewhat, and the application is not limited to pentodes.

Fig. 2a shows the conventional connections of a triode valve with resistance anode feed, coupled by means of a con-

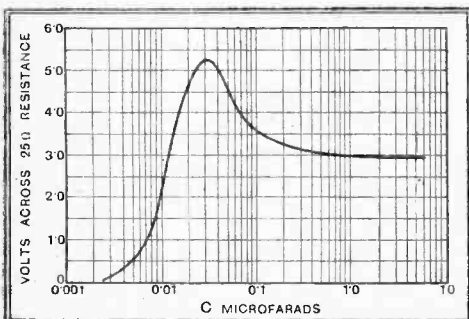


Fig. 5.—An increase of bass response can be obtained by arranging a suitable resonance frequency between the L.F. transformer primary and the coupling condenser.

denser C to the primary of the transformer. Fig. 2b shows the equivalent electrical circuit, in which R_v represents the A.C. resistance of the valve, R_a the external feed or coupling resistance, and R the resistance associated with L .

Considering the action of the circuit, it is convenient to assume the application of an A.C. voltage across the points X Y representing the signal voltage developed across the anode feed resistance R_a . We will assume this to be 10 volts.

As far as the output is concerned, we are interested in the resulting voltage E_2 developed across L , since this voltage, multiplied by the ratio of transformation, gives us substantially the voltage impressed between grid and filament of the succeeding valve, neglecting core losses, etc.

We thus have a series circuit formed by L and C , with the input voltage applied across its ends, and at a frequency $f =$

$\frac{1}{2\pi\sqrt{LC}}$ cycles the voltage across L will be a maximum, and if the total resistance R_t of the circuit, which comprises R

plus R_v and R_a in parallel, is sufficiently low, the voltage E_2 across L may be greater than the voltage applied across X Y at frequencies near resonance.

Let us assume that the constants of the circuit are as shown in Fig. 3. If we assume the total resistance R_t to comprise the primary resistance plus the resistance of the two parallel paths through R_v and R_a , and the resonant frequency is 50 cycles, then the impedance at the resonant frequency is equal to $R_t = 4,800$ ohms, and the current $I = \frac{E}{Z} =$

$$\frac{E}{R_t} = \frac{10}{4,800} = 0.00208 \text{ amp.}$$

The voltage across L is then given by $I \times XL$ ($XL = 2\pi fL = 0.00208 \times 110,000 = 228$ volts, which is obviously impossible in practice. But we have not taken into account the resistance thrown into the circuit by the transformer, which will be equal to R_s divided by the square of the transformation ratio $= R_s/3.5^2$, which must be added to R and the effective value of R_v and R_a in parallel.

Now it will readily be seen that since

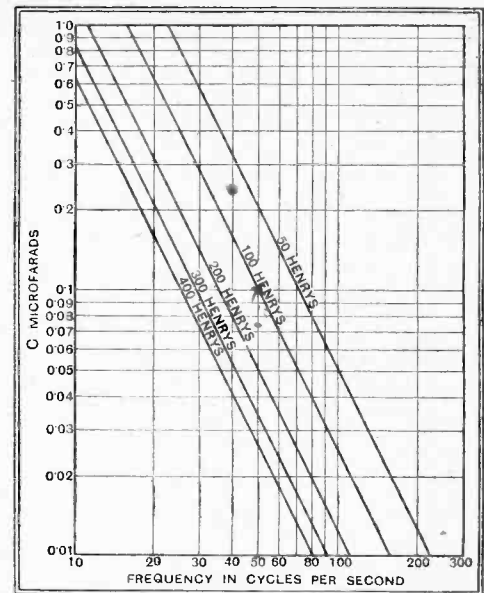


Fig. 6.—Given the primary inductance, the value of the capacity required to produce resonance at various frequencies can be read from this diagram.

R_s is the dynamic input resistance of the valve connected to the transformer secondary, R_s divided by the square of the ratio of transformation will be very large; indeed, it will be so large that R , R_v , and R_a may be almost neglected. Thus if we now assume the input resistance to the valve to be 0.8 megohm, we find that R_t will be approximately 70,000 ohms, and across L we have 15.7 volts at resonance. At any other frequency the impedance of the circuit is

$$Z = \sqrt{R^2 + (\omega L - 1/\omega C)^2}$$

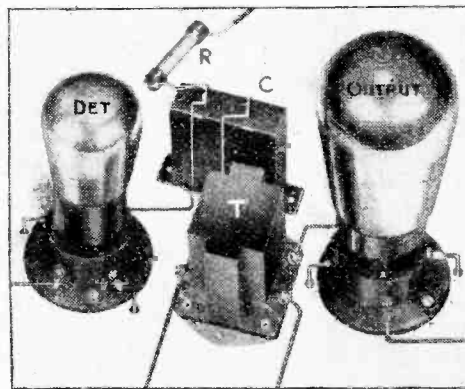
At frequencies well above resonance the voltage across L is a little less than the applied voltage across X Y.

From the foregoing two facts emerge. First, that the total resistance of the circuit determines whether or not any increased voltage will appear across L at resonance, and secondly that the step-up obtained will be greater for higher resonance frequency, since the value of ωL also becomes greater.

If the values of L and C are suitably chosen, we can arrange the resonant frequency at a point towards the lower end of the audible frequency

range where it will be effective in compensating the bass to some extent, provided that the resistance of the circuit is low enough. The actual working value of the resistance is therefore all-important, since its value determines, together with XL , whether we obtain any step-up that is worth while.

Measurements were made on an amplifier comprising a push-pull output stage, since this case would seem to be the worst



The essential components required for L.F. parallel feed. By a suitable choice of the transformer T and the condenser C the bass response can be increased.

Increasing Bass Response—

in regard to the high value of R_s to be expected.

The arrangement is shown in Fig. 4. A constant 50-cycle voltage was applied to the input of the first valve, and the voltage across the 25-ohm resistance, representing the loud speaker, was measured with various values of coupling capacity C .

The results are shown in Fig. 5, from which it is seen that an increase of response of over 50 per cent. above level is obtained for resonance at this frequency.

The value of the open circuit inductance of the transformer primary is generally stated by the makers, and the value of capacity required to produce resonance at a given frequency may be determined from Fig. 6, or by calculation. Alternatively, the value of L may be obtained experimentally by the method mentioned above and illustrated in Fig. 4.

The shape of the response curve will be similar to that of Fig. 5, and it will be noted that the cut-off point is reached

rather rapidly, below the resonance frequency, which suggests that the latter should be arranged as low as possible in the audible range, but it must be remembered that when records are reproduced the input voltage has the form of the middle curve B of Fig. 1 and falls off at the lower frequencies; hence the compensation obtainable becomes less with decreasing frequency, due to this cause, and the decreased value of XL .

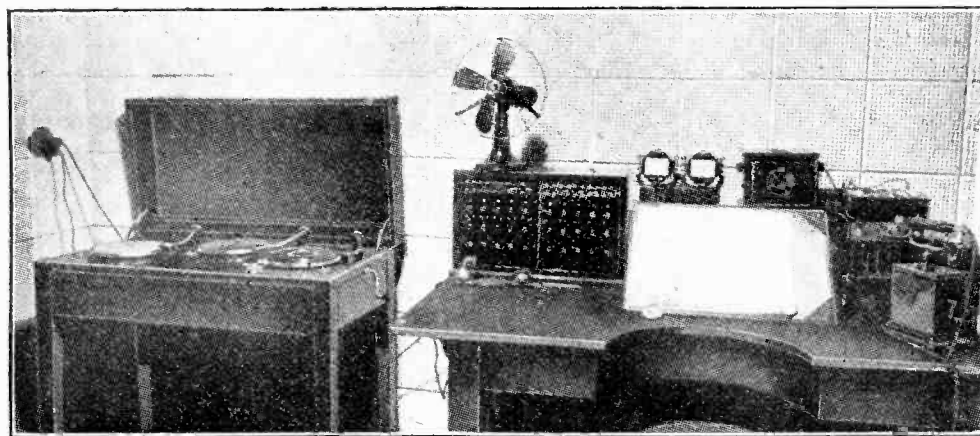
A compromise must be made, therefore, and in the particular case discussed this was found to be effected satisfactorily by fixing the resonance frequency at about 60 cycles by choice of a suitable value of capacity. Aural tests with various values of capacity show that the bass is considerably augmented when the resonant frequency falls anywhere between about 50 and 100 cycles. Screening should be fairly comprehensive, in order to prevent hum voltages being picked up from the rectified H.T. supply or from the heater wiring.

DISTANT RECEPTION NOTES

Can Stations Claim Wavelength "Rights"?

ONE does not envy the wavelength allocation committee of the forthcoming Lucerne Conference its task! Every little nation in Europe (as well as most of the big ones) will urge its claims to more—and longer—wavelengths and to higher-powered transmitters. Nobody wants wavelengths below 250 metres, though there are more than thirty channels below this mark and the bottom of the medium waveband that must be allotted to someone. Most of them will probably be

One of the most pressing problems is the Russian programme. In all previous plans Russia has been regarded as outside Europe; but the interference caused by her stations nowadays gives ample proof that from the broadcasting point of view she is very much within it. The Russians have a most ambitious programme entailing the erection of fifty or more high-powered stations, some of them with output ratings up to 500 kilowatts. Will it be possible to make Russia realise that if she proceeds with this scheme,



TAKING NO RISKS AT WARSAW. Every possible contingency seems to have been provided for in the announcer's studio at Warsaw (Polskie Radio). Two microphones, three gramophone turntables, a specially shaped desk, an electric fan, and an elaborate internal telephone system all help the announcer in his task of "keeping the pot boiling."

assigned as group wavelengths to families of small relays; but even so there is sure to be much heartburning.

Stations that have used certain wavelengths for so long that they have come to regard them as their inalienable right will be loth to give them up; yet give them up they must in many cases, for nothing short of a complete reshuffle can straighten out the present tangle and make room at the same time for the thirty-odd new high-powered transmitters that are likely to be in operation within the next eighteen months.

which is out of all proportion, the inevitable result must be chaos so far as broadcast reception is concerned, not only in neighbouring countries, but also in her own? One hopes so, but the present régime in Russia may prove unwilling to co-operate with the rest of Europe.

Whatever else it does, the Lucerne Conference must endeavour to obtain from Governments an undertaking to put down wavelength wandering with a firm hand. Owing to the crowded state of both wavebands, no plan can succeed unless stations

adhere strictly to their allotted channels. In the United States the Federal Radio Board allows no station to deviate by more than 200 cycles from its proper frequency. The first offence brings an immediate warning; the second, unless some acceptable explanation is forthcoming, leads to the guilty station being ordered "off the air."

A glance at any month's U.I.R. report will show that many European stations wander by two thousand cycles or more between the beginning and the end of a given four weeks. At present the U.I.R. has no real powers to prevent this kind of thing. Acting through the Governments concerned, it could and should have such powers, if only international agreement could be reached that the most drastic action would be taken against offenders.

Wintry Conditions

There is very little noticeable diminution in the volume at which distant stations are received and the choice of programmes is still almost, if not quite, as wide on most evenings as it was in the depths of winter. On looking back through long-distance logs covering the last ten years I can find no similar instance of the persistence of what are virtually winter conditions for reception to such a late date. Improvements in transmitters must be largely responsible for this happy state of affairs.

Motala, Oslo and Kalundborg are outstanding long-wave transmissions at the moment. As they all transmit excellent programmes and are usually receivable at any time when they are working, the long-distance enthusiast should make a special note of them.

The medium-wave band is a very happy hunting ground just now. Between 450 and 550 metres something is to be found at almost every division of the tuning dials and there is a band almost as good between 320 and 350 metres.

Noteworthy medium-wave stations are: Katowice, Rome, Stockholm, Lyons la Doua, Beromünster, Leipzig, Budapest, Prague, Florence, Strasbourg, Hilversum, Heilsberg and Turin. D. EXER.

"THE WIRELESS ENGINEER"

IN the May number of *The Wireless Engineer* is an important contribution to "The Simplification of Accurate Measurement of Radio-frequencies," by W. H. F. Griffiths, F.Inst.P., A.M.I.E.E. Dealing first with the successive stages in the improvement of resonant circuit oscillators and the development of the dynatron oscillator, the author then describes in detail a stable oscillating wavemeter working on this principle.

The American developments up to the present time in A.V.C. are discussed in another contribution, and details of some typical circuits are given.

An absorption wavemeter for use on short waves is described by the staff of the Radio Research Station, Slough. Although covering a wide frequency range, a portion of each band can be spread to extend over the major part of the condenser scale, thereby affording greater accuracy within the restricted range.

In addition to other material, the issue contains monthly abstracts and translations of the world's technical wireless articles and patents.

Copies can be obtained by order from newsgagents or direct from the publishers of *The Wireless World*.

ATHLONE



High power alone does not account for the excellence of the Athlone transmissions. The station is situated on an ideal site 300 feet above sea level, and the masts are 330 feet high.

WITH the advent of the 60-kilowatt transmitter at Athlone the Irish Free State has definitely won a place in the broadcasting sun. Although in January, 1926, the 1½ kW. Dublin station, 2RN, made its broadcasting début and was followed soon afterwards by the low-powered relay station at Cork, English and Continental loud speakers have heard comparatively little of the Emerald Isle. But the "voice of Dublin" has now become the "voice of the Irish Free State," and since Athlone joined the ranks of the ether giants in February, reports of good reception have been received from all parts of England, Scotland and Wales and from Scandinavia, Europe, Newfoundland, the Yukon, Canada and the United States. The station has even received a report from Gisborne, New Zealand, though Dublin officials cannot but doubt the accuracy of this remarkable claim.

The Athlone and 2RN studios are in the Post Office building, Dublin, and the station director, Mr. S. Clandillon, presented me with the freedom of the studios. These, for a country possessing one of the most modern transmitters in Europe, are somewhat disappointing. There are three studios proper—one for orchestral and dramatic performances, another for vocal presentations, and the third for solo items—besides two rehearsal rooms which can also be used for broadcasting. All the studios have sound-proof walls, and drapings are suspended on the ugly-looking rafters to obviate echo effects.

Mr. Clandillon, the station director, who has been associated with 2RN since its inception, is a versatile and capable programme builder. The fluent Gaelic

speaker and the principal announcer is Miss Margaret O'Grady, an M.A. graduate of the National University.

The Athlone transmitter is at Moydrum, 2½ miles east of historic Athlone on the river Shannon. The station obtains its 10,000 volts from the famous Shannon hydro-electric scheme. The site is ideal, flat rural country, about 300 ft. above sea level and practically at the geographical heart of Ireland. The station now wears a more pretentious air than in June last when, under dripping tarpaulins, engineers "carried on" for distant listeners to hear the Eucharistic Con-

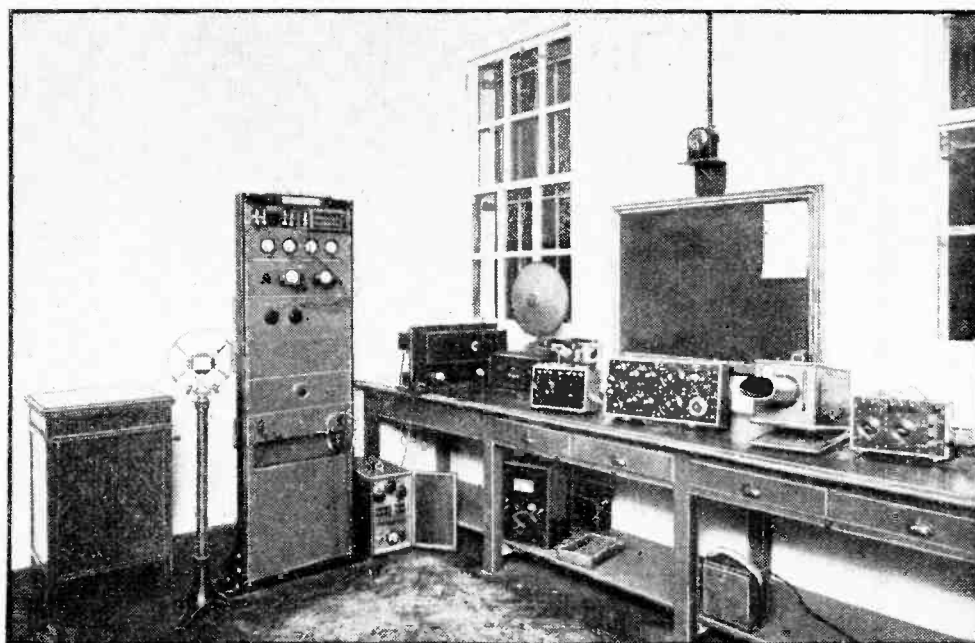
The New Voice of the Irish Free State

By A SPECIAL CORRESPONDENT

gress. The two 330ft.-high unpainted galvanised steel masts supporting the T-aerial are hinged on insulated ball and socket joints, thus permitting a greater degree of sway than in the case of the more common system of stays alone.

The engineer, Mr. Lyons, whose staff numbers about seven, conducted me through the transmitting hall, which is 100 ft. long by 35 ft. wide. The transmitter is of the same type as the B.B.C. Regional plants, but of higher power; if necessary, this power can be doubled to 120 kW. Points of difference between Athlone and the Regional transmitters are that the former uses a crystal-controlled oscillator instead of tuning fork, and in place of the ordinary H.T. generators employs mercury arc rectifiers for supplying the H.T. current to the valve anodes.

Among the features that impressed me were these: The largest valve dissipates 10,000 watts at the anode, and the smallest valve about 3 watts. From the 5,000-gallon storage tanks under the building 3,000 gallons of distilled water pass every hour through the valves. If a valve fails another is automatically switched into place. The whole of the transmitter is screened and cannot be operated if a "gate" is open. The power demand off the supply mains is 350 kW.



The control room with its checking equipment fills a dual rôle, for on special occasions it can be used as a studio. Note the microphone and gramophone cabinet.

Practical Hints and Tips—

doing harm through a short-circuit to earth. Lastly, the risk of hum being produced by induced voltages from badly installed lighting circuits, etc., is greatly reduced. Almost the only disadvantage is that the ohmic resistance of the extension leads must be low in proportion to that of the speech coil of the loud speaker.

The ordinary method of connecting a loud speaker with the output transformer at the remote end is shown in Fig. 2 (b). This has all the disadvantages previously suggested, but, as it is in effect a high-impedance transmission line, ohmic resist-

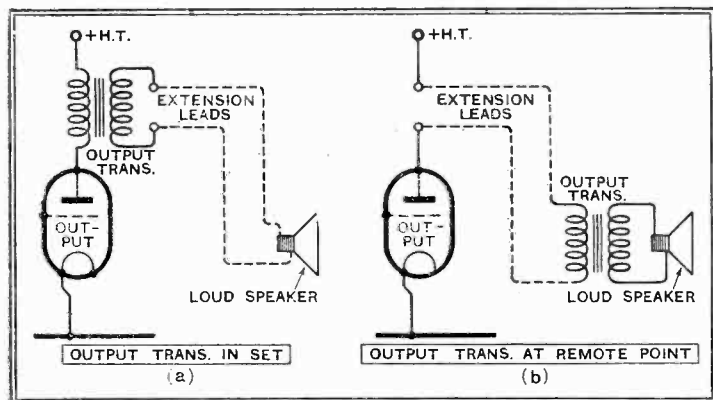


Fig. 2.—Alternative positions for an output transformer.

ance is of little importance, and so the finest wire that is sufficiently strong mechanically may be used. Insulation is, of course, important with this system.

IN ninety-nine cases out of a hundred nothing but good can result from increasing the capacity of by-pass condensers in L.F. decoupling circuits. In most modern sets, when motor-boating or some other form of instability occurs, or even when quality is deficient, the first thing to do is to try the addition of extra capacity in parallel with the

Ensuring L.F. Stability

existing detector-anode decoupling condenser.

Even when dealing with a well-tried standard receiver of known excellence, it may be worth while to try this expedient if quality seems to be a little "rough." No designer advocates a by-pass condenser very much larger than that considered necessary for dealing with the amount of magnification obtainable under average conditions, but sometimes the average is exceeded by a very fair margin. For example, the detector valve may be a particularly "hot" specimen; rectifier output may be high, and the associated decoupling resistance may be under rather than over its rated value. All these factors work in the same direction, tending to reduce the margin of safety, and this is a case where extra decoupling might well be beneficial.

One cannot usually increase the value of a decoupling resistance without risk of upsetting the designer's original intentions, but the use of a larger condenser should have the same beneficial effect, and, at the worst, can do no harm,

AS stated in the article in which the "A.V.C. Unit" was described, the potentiometer adjustment of bias voltage for the control valve will generally provide the small amount of manual regulation that is needed when automatic control is in operation. For maximum loudness this potentiometer is adjusted so that the grid of the A.V.C.

Manual and Automatic Control

valve is made to work at a voltage appreciably more negative than that which stops the flow of anode current entirely. In this way delayed control is introduced, and no bias voltage is fed back to the controlled valves until signals have reached a certain value, which may easily be determined by trial.

When, on the other hand, it is desired to reduce volume below the normal level, a certain amount of anode current may be allowed to flow in the A.V.C. valve by reducing its negative bias by rotating the potentiometer slider towards the positive end, i.e., that end of the resistance element which is connected to the least negative socket on the bias battery.

In cases where a further manual control is desirable it is generally best to fit it in the L.F. section of the receiver. Where resistance coupling is employed it is a fairly easy matter to substitute a potentiometer for the normal fixed grid leak or anode resistance, but with transformer coupling it is rather more difficult to devise a control that is entirely free from objections. In most cases the fitting of a 50,000-ohm vari-

able resistance in shunt with the transformer primary will prove satisfactory enough.

IT is worth while to bear in mind that the input capacity of a valve changes with variations in H.T. voltage or heating current, and as a consequence the stray capacity existing across its grid circuit is also subject to variation through these causes.

Why Tuning Changes

Therefore it follows that the operations of calibrating, or "ganging," a set should only be carried out when voltages throughout are those which will normally be applied when the set is in operation.

To carry the subject a little farther, it may be pointed out that when tuning "drifts," and the condenser setting corresponding to a known station is observed to have undergone a change, we have an indication that the power supply system may be behaving erratically, and that investigation is called for.

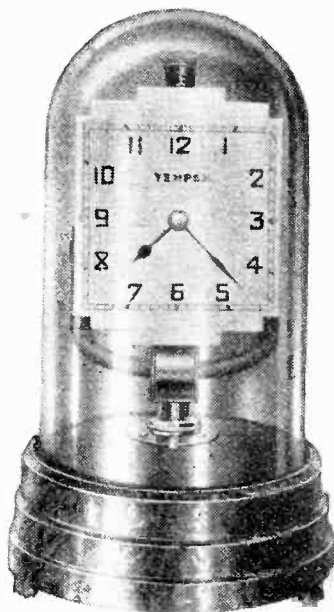
USERS of battery-fed receivers in which volume is regulated by variation of negative bias supplied to the H.F. valve should remember that, when using the set for gramophone reproduction, the "radio" volume control should always be set at minimum. In this way H.T. battery current is conserved; with maximum bias, anode and screening grid current combined will usually amount only to a matter of microamperes, whereas with the bias potentiometer set for maximum sensitivity, it may rise to 3 or 4 milliamps.

Variable-mu Battery Sets

As an alternative to this plan, there is no reason why, in a battery set, an extra switch should not be fitted in to break the filament circuit of the H.F. valve.

"TEMPEX" CLOCKS

A NEW range of electric clocks is now being marketed by Messrs. Exide Services, Ltd., 203-231, Shaftesbury Avenue, London, W.C.2, and will be available through all Exide Service Stations and the usual dealers. There are two types, a synchronous motor clock for controlled A.C. mains, and for those without mains supply a pendulum-controlled clock for operation from batteries.



"Templex" electric clocks. (Left) Battery model, type N.202. (Right) A.C. mains model, type A.C.303.

The A.C. model (type A.C.303) is housed in a neat moulded case and costs 30s., while the battery-operated model is available in two types, the P.101 at 45s. in a case similar to the A.C. model, and the N.202 at 49s. 6d. enclosed in a domed glass container.

The Catkin Valve

A Radical Departure in Design

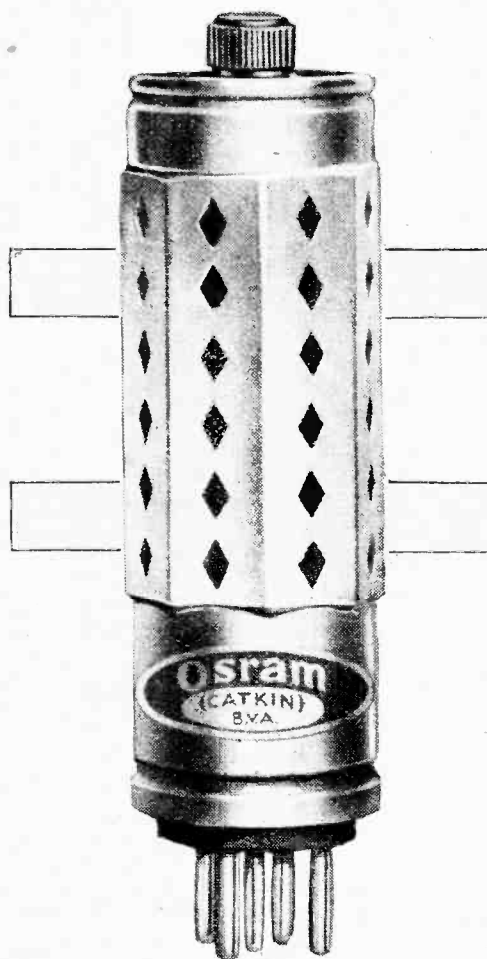
VALVE design is never at a standstill. The steadily increasing figure for mutual conductance is, perhaps, to be expected, and the addition of an extra grid or so no longer creates surprise. Now we are to experience what is undoubtedly a most radical development in valve technique since the inception of the triode. The familiar form of valve with its glass bulb is soon to disappear. Its place will be taken by one of greatly reduced dimensions where the glass envelope is replaced by a metal cylinder which is actually the anode.

Valves in which the glass envelope has been replaced by a copper container represent, of course, well-proved practice in transmitting valves where water-cooling is directly applied to the anodes. Such valves are designated C.A.T. (cooled anode transmitters), promptly designated "cats" in laboratory slang. From this abbreviation is derived the name "Catkin" as indicating the genealogy of the valve better than kitten; so Catkin was adopted as the name for the new miniature air-cooled version now to be available for reception.

An examination of the Catkin valve manufactured by Marconi and Osram supports the claims put forward.

Smaller Valve Losses

The spacing between the elements of a valve governs characteristic. If uniformity between one valve and another of corresponding type is to be maintained, accuracies of less than a thousandth of an inch are required in the disposition of the electrodes. Such precision is undoubtedly difficult to maintain when the only support afforded to the elements depends upon the critical setting up of wires embedded in glass. The Catkin has no such arrangements. First of all a robust steel clamp surrounding a mica insulator firmly holds the supporting wires. These wires are, moreover, straight, for it will be appreciated that where bent wires are used accuracy cannot so well be maintained. Next, the entire electrode system is located with precision within the anode envelope by mica spacing pieces. Thus the entire system forms a single and absolutely rigid unit as distinct from the comparatively meagre support which it is possible to provide for the electrodes in the glass type. This is the primary merit of the Catkin, accruing from which we may expect uniformity of set performance, and there will be no such thing as a "picked" valve. To the set manufacturer valve uni-



formity permits of standardisation of receiver performance, and the correct working conditions will be maintained without the need for special testing of the initial set of valves. The rigidity of the electrodes and accuracy of spacing are claimed to be immeasurably greater than is possible in the valve of conventional design.

It cannot be denied that the flattened glass portion giving support to the electrodes is a source of losses. Glass is by no means one of the best dielectrics, and the time has come when attention must be drawn to the magnitude of the dielectric losses arising in the valve itself. The advent of tuning coils of very high efficiency has served to emphasise that the losses arising from the conventional type of valve are of sufficient magnitude to mar the superior merits of a modern tuned circuit. Bearing this in mind, in the design of the Catkin it was decided to abandon the glass "pinch" and substi-

tute mica as the insulator. It is true that the outgoing leads pass through a glass ring at the base of this new valve, but here they are set around the circumference. The resulting capacity between the leads is exceedingly small where we have glass as the dielectric.

Screen-grid and detector valves are, nowadays, usually metallised. There is thus an earth potential spread over the insulating glass, preventing it from acquiring an electric charge. Metallising has the effect of reducing interelectrode capacity, and, moreover, it prevents the setting up of stray electric fields which would otherwise arise between the charged globe and the surrounding leads, a condition which, if permitted, is a prodigious source of hum in mains receivers and a common cause of spurious back-coupling.

The electric field within the anode of the Catkin valve is entirely uninfluenced by any surrounding charges, and the electrons cannot build up unwanted potentials which might interfere with the field within the electrodes.

Better Screening

Should circumstances demand it the signal potential on the anode of the Catkin may be prevented from creating stray coupling by the provision of a tubular metal screening cover shown in the photograph. The inclusion of this outer screen is optional. It extends over the valve from top to bottom, and, like metallising, is connected to the cathode in the case of mains valves, but has the additional advantage that it embraces the outgoing leads at the base. This outer screen is perforated to afford ready dissipation of heat and its octagonally flattened faces prevent it rolling. Being parallel sided, quantities of valves occupy much less space than hitherto.

In the exposed anode type a coating of black enamel is applied giving sufficient insulation to prevent shock should one accidentally touch the high-voltage anode. It will be appreciated that the generous heat dissipation afforded by the Catkin design gives cooling for the grid as well as the anode. Conditions are very different in the glass type, where the large surrounding vacuum presents the difficult problem of getting the heat away where dissipation by convection or conduction is non-existent. Effectiveness of cooling does, of course, to a very large extent, govern the rating of output valves.

Present-day sets with enormous overall gain are very prone to what is commonly called "howling," which arises from the sound vibrations



The Catkin Valve.—

causing movement of the electrodes, usually in the case of the detector valve. By virtue of its rigidity the Catkin is not likely to be influenced in this way. As a further precaution, however, the valve is secured to its base ring by a rubber clamp, and the sound conduction path is limited to the thin conducting wires joined to the valve pins. It is well known that rubber is the only sound insulating material which will provide a non-microphonic mounting, and we now have, for the first time, an effectively sprung clamp, and this is independent of the valve holder. A non-microphonic mounting is of vast importance when the set, as is now commonly the case, takes up a position immediately behind a single or perhaps dual loud speakers, into which the output valve delivers several watts.

Wireless is now finding its place as part of the equipment of the car, and the

ing for the voltage variation of the car battery. Compactness is another important advantage in this application. The much reduced size of the metal envelope as compared with the glass counterpart is an important feature in the prevention

floor with but little risk of damage either by fracture or by derangement of the critical spacing of the electrodes.

The copper-to-glass union is an interesting feature of the new valve, and it is a creditable achievement to produce a gas-tight seal under mass production methods. In order that the vacuum may be well maintained in a valve, excessive temperature rise for any prolonged period must be avoided. All metal parts within the valve are, of course, gas-freed at a high temperature, but in the course of manufacture the glass bulb in a conventional valve is a prolific source of gas and necessitates prolonged de-gassing.

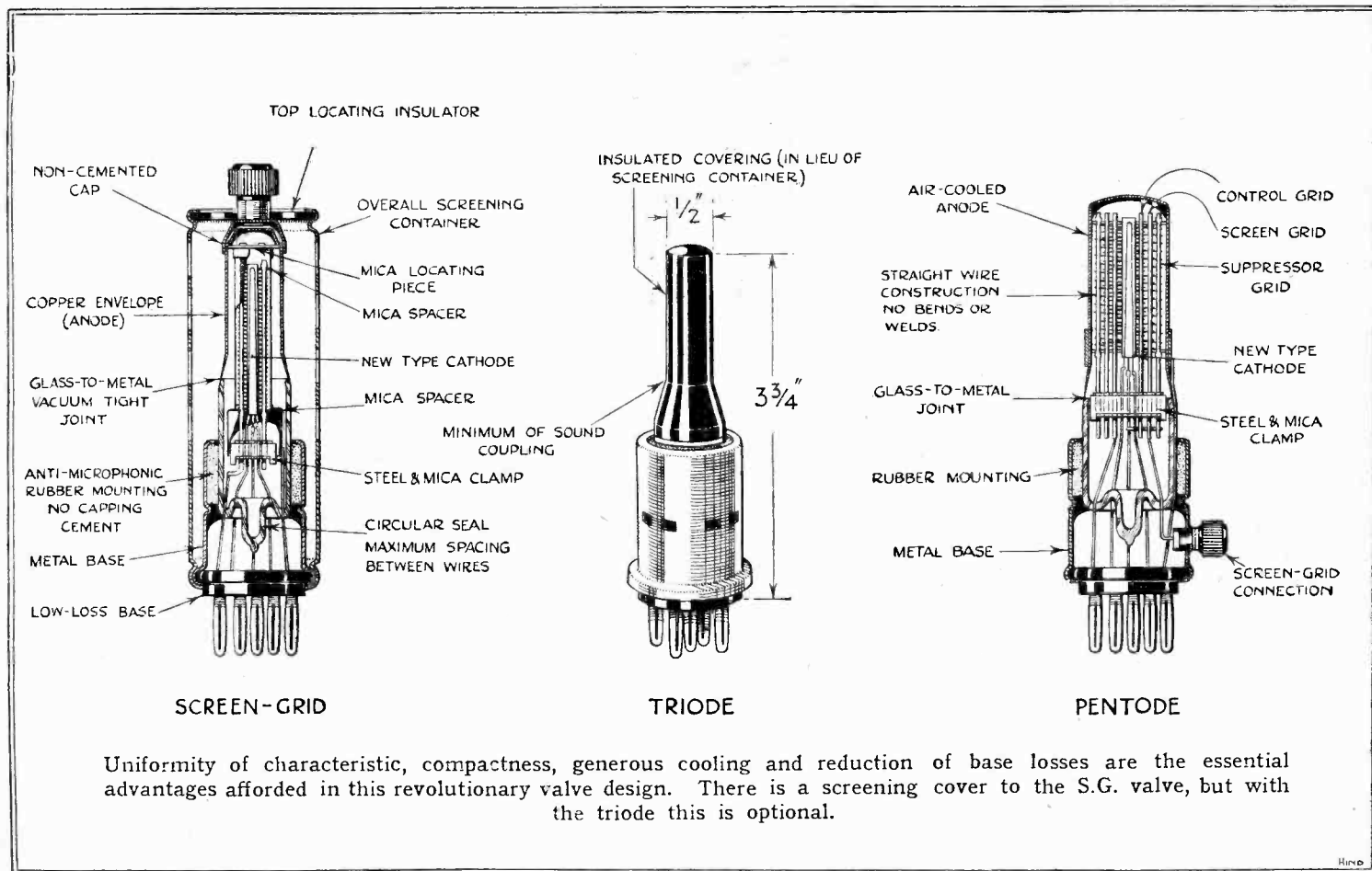
Catkin equivalents of the MS₄B, VMS₄, MH₄, and MPT₄ will make their appearance on the market almost immediately. These are the types which are in most general use, and it is the intention of the manufacturers to add to this range shortly. The characteristics of the Catkin valves

BY resorting almost entirely to metal, instead of glass, in the manufacture of a revolutionary new receiving valve called the "Catkin," the Osram and Marconi Companies claim to have achieved for the first time real consistency in valve characteristics. In other words, every "Catkin" can be regarded as a "picked valve." The anode forms the external envelope in the new valve, which is almost unbreakable and non-microphonic.

of direct coupling with the sound output of the loud speaker.

Some valve users have experienced trouble due to the glass bulb breaking away from its bakelite base. Fracturing of the cement in this way is a weakness of present valves, and it is interesting to note that no form of

DRAWINGS TO ILLUSTRATE DETAILS OF THE NEW VALVES



Catkin valve, being uninfluenced by vibration, whilst being robust and compact, has attractive possibilities for car radio. In this connection, in addition to durability, it should be noted that a new form of filament-cathode design has been adopted, which permits of a 10 per cent. fluctuation of heater potential, thus allow-

ing cementing is employed and a loose cap becomes an impossibility.

Copper-to-glass Union

The Catkin valve is practically unbreakable, and may be dropped from a height of several feet on to a concrete

floor for which they serve as replacements. The four types issued are those adopted in the more popular sets, so that in many cases immediate advantage can be taken of their use.

At a later date we hope to give a report of our own experiences with these valves.



BROADCAST

WHEN LEEDS SPEAKS. The talks studio at the new Yorkshire headquarters of the B.B.C. On the right is the "cue light" device for indicating to the speaker when the microphone is in circuit for broadcasting or, alternatively, connected to the dramatic control panel. The studio colour scheme is green and orange.

A little self-selection might be advisable, and I think readers who are interested might do worse than forward applications to the Corporation now.

An Awkward Period

THE period "twixt tea and dinner" has always offered a problem to the programme builders, and now that it is definitely decided to exclude talks from

the 6.30 to 8 p.m. period during the summer months, their difficulties are accentuated.

The trouble is that there is very little suitable "outside broadcast" material available at this hour; it is the transitional period in the day when the world refuses to take life seriously. Work is over, but the pleasures of the evening have not really begun.

For the Present . . .

For the present the Programme Department is obviously in a bunker as regards new ideas for this period. At the moment the intention is to fill the 6.30 to 8 p.m. period exclusively with light music of the kind provided by the Gershom Parkington Quintet and Reginald King's Orchestra.

Car Drivers and Wireless

This, by the way, seems to be the ideal sort of programme for the radio-minded motorist, of whom we shall probably see and hear quite a lot this summer. Few people will object to the reception of soothing music while driving; it is only when the man at the wheel is tempted to listen too closely to a classical concert, or, more dangerous still, a debate in the talks studio, that pedestrians and other motorists will stand in peril.

Programmes for Motorists

But even light music, according to some people, might prove too much of a distraction to a driver who has any musical sense. If this is really the case, it might be advisable to prepare special programmes for motorists. As these would require a minimum amount of mental concentration, it is difficult to say what form they should take. Tom-tom music and slow fox-trots might make for safety.

The Leeds Recipe

TAKE one old Quaker Meeting House, as much money as you like, and Mr. J. C. Proctor, F.R.I.B.A. With these ingredients there is nothing more to worry about; in a few months' time you have one of the finest broadcasting studios in Europe.

Last week, by kind invitation of Mr. Edward Liveing, North Regional Director, I was escorted into a rather severe-looking conventicle in Woodhouse Lane, Leeds. Only the inscription "Broadcasting House" on the outside door prepared me for the startling transformation within.

The Last Word

The Leeds building is undoubtedly the last word in broadcast studio technique, for the architect, Mr. Proctor, has benefited by the experience gained in Portland Place, and has not hesitated to add a number of clever and original touches of his own.

New Mike Suspension

It is not often, I imagine, that an architect gives a lead to the engineering department, although close co-operation between the two branches has always been the rule with the B.B.C., but at Woodhouse Lane Mr. Proctor has set the engineers thinking by producing his own design for a microphone suspension device, and this gleaming arrangement, chromium-plated and balanced like a huge crane, dominates the whole of the big studio.

What Mr. Ashbridge Thought

Mr. Ashbridge, Chief Engineer of the B.B.C., was eyeing the arrangement with a non-committal expression, and I asked him whether the design had the full approval of the engineering branch.

The "Chief" said that it was possible that the arrangement might be adopted in other studios. Could an architect receive higher praise?

Function of the Studios

Mr. Liveing was anxious to explain that the new studios must not in any sense be regarded as the special property of Leeds. They were intended to "put Yorkshire on the map." Lancashire has always had its say at the North Regional microphone, but since the Leeds-Bradford relay station faded out two years ago it cannot be said that Yorkshire has enjoyed the same facilities.

Now, however, with a studio bigger than anything at Broadcasting House except the Concert Hall, listeners in the North will have an opportunity to hear the brass bands and massed choral concerts which are so dear to the heart of every Yorkshireman.

Broadcasting House in Miniature

The new accommodation comprises two floors and a basement, and consists of two studios, artists' and band waiting rooms, a control room with the most modern equipment, battery, machine and echo rooms, dramatic control room and administrative offices.

The Northern Repeater

Special importance attaches to the control room, for it is the focal point for all S.B.

The New Organ

WORDS are always inadequate to describe the impressions created by music, and I will not attempt the verbal fireworks which would be necessary to do justice to the new organ in the Concert Hall at Broadcasting House.

There is no doubt that listeners may expect a real treat on or about June 16th, when the organ will be heard for the first time in a broadcast programme to which a number of eminent organists will contribute.

Inaugural Recital

Having regard to the distinguished players who have shown an interest in the instrument during its construction, I think the B.B.C. will have to include among its recitalists Mr. Berkeley Mason, Mr. G. D. Cunningham, and, of course, the designer of the organ, Sir W. G. Alcock. Probably the inaugural recital will resolve itself into a performance of a composition by each of these great executants.

Orchestral Flexibility

During a test recital I was struck not only by the organ's richness of tone, but by its ease of control. Thanks to a combination of all the latest "gadgets" and the enclosure of the whole instrument in swell boxes, the player can command an almost infinite range of tone with the flexibility of an orchestral conductor.

A Studio Audience ?

Most of these effects should be apparent to broadcast listeners, but the B.B.C. will doubtless admit some of the general public to the Concert Hall for the inaugural recital, though how the lucky few will be chosen is undecided.

BREVITIES

By Our Special Correspondent

programmes between London, Manchester, Newcastle and the North.

In fact, Leeds is the Northern repeater station, filling the same function as Bristol in the West.

"We Want West Regional"

SOMETHING quite new in the experience of the B.B.C. engineers has occurred in connection with the West Regional tests. Listeners, instead of protesting at the changed conditions, as has usually occurred when a Regional has been on test, are actually clamouring for a complete service from the new high-power station.

In consequence, West Regional will tomorrow (Saturday) take over all the Regional transmissions.

A Daring Test

This transfer from the old to the new transmitter has been carried out in a very much shorter time than was the case with the other Regional stations, but I, for one, am a little doubtful as to whether things will go quite so smoothly when West National begins testing.

No Heterodyning ?

This synchronising of the West and London National wavelengths constitutes quite the most daring test of its kind ever attempted by the B.B.C., and it will be distinctly interesting in a fortnight's time to see whether the two transmitters can avoid heterodyning each other.

It is quite likely that West National will begin its first tests on or about June 1st.

"Tickets, Please"

THE platform of a wayside station provides the scene for a modern fairy story with music entitled "Tickets, Please," which is to be broadcast on May 16th (National) and May 23rd (Regional). This is the first musical play to be put on the air under the direction of Mr. Val Gielgud.

I am told that the play contains several very catchy tunes (train catchy?); one, "I am singing while you are dancing," is in the repertoire of the B.B.C. Dance Orchestra, while another, "Tell me at teatime," is shortly to be published, and is likely to be sung and whistled everywhere.

An "R. L. S." Play

IF you want the cosmopolitan atmosphere these days spend a few minutes in the foyer of Broadcasting House. Any day you may see the English, French, American, Negro, Polynesian, Japanese and Indian artistes who are rehearsing for the broadcasting of "The Bottle Imp," by Robert Louis Stevenson, on Saturday, May 20th.

The story of Keewe and his wonderful bottle was written for a Polynesian audience. It is a thrilling tale, and is to be found among the Island Night's Entertainments. It should make a good microphone play. Lance Sieveking is the producer.

Memories of the Lyric

MEMORIES of the Lyric Theatre, Hammersmith, will be revived by a programme to be broadcast on May 20th, with Sir Nigel Playfair as compère and Alfred

Reynolds as conductor of the B.B.C. Theatre Orchestra. The name of the Lyric, Hammersmith, is inseparably connected with the names of Nigel Playfair and Alfred Reynolds, for these two created the Lyric tradition. During their régime such plays as "Derby Day," "Midsummer Madness," "Tantivy Towers," "The Beggar's Opera," "Abraham Lincoln," and "Riverside Nights" were presented to Hammersmith audiences. Numbers from these and other notable successes will be heard by National listeners on May 20th.

The New Showmanship

BY commissioning professional actors to broadcast translations of speeches given in the English Parliament, Poland has opened up new possibilities for broadcast entertainment.

Hitherto the very notion of broadcast debates from Westminster has made strong men blanch, but a moment's thought will show that the speeches could be made much more acceptable if they were dramatised.

Making Speeches Palatable

I should like Mr. Val Gielgud or Mr. Eric Maschwitz to choose suitable vaudeville actors and comedians who could be guaranteed to give us the actual words from a Parliamentary debate flavoured with the mannerisms and asides which could make even the Budget speech palatable.

Mr. Gillie Potter would make any Cabinet speech more fragrant.

Car Thrills Broadcast

THE thrill experienced last year when one of the sternest battles in the history of motor racing was fought should be repeated on May 27th, when London Regional listeners will share with the Midland Region a running commentary on the Open Hill Climb for Racing and Sports Cars at Shelsley Walsh, given by Mr. F. J. Findon and Major Vernon Brook.

Accidents . . . but Not Serious

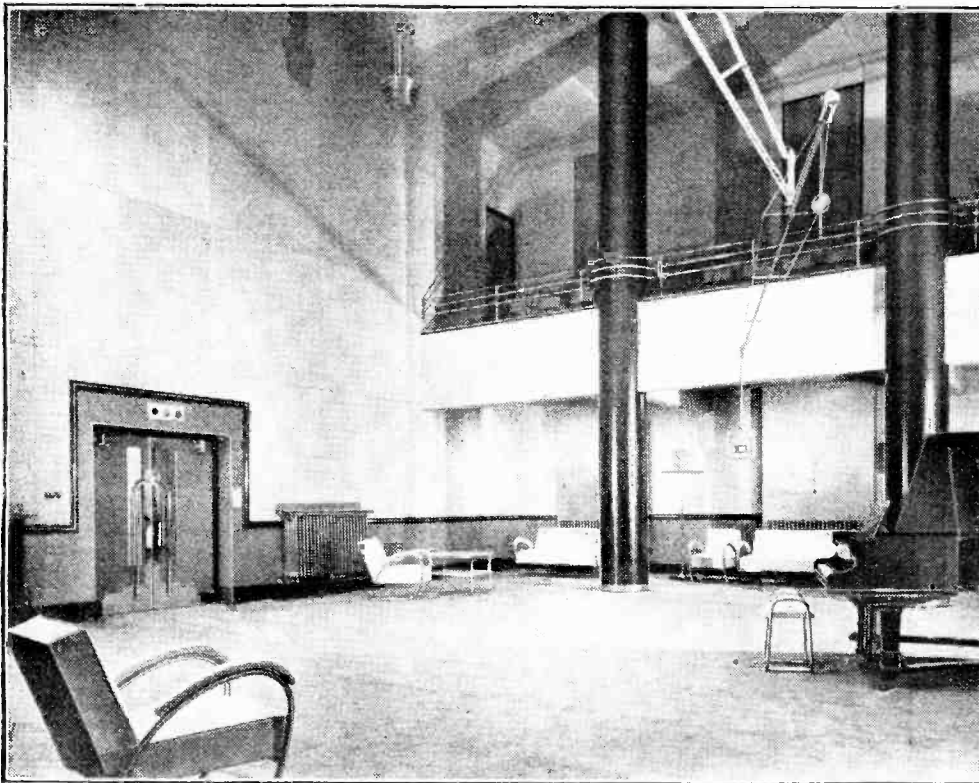
Shelsley is situated about twelve miles north-west of Worcester. From the foot to the summit of the hill is over one thousand yards. On each side of the narrow, twisting road are steep banks, forming a natural grandstand for the thousands of onlookers. Beyond the bank on one side rises a beautiful wooded slope; on the other is a sheer drop down the side of a great rolling hill. The commentator's hut will be erected on the bank at an advantageous point on the course.

Although accidents do sometimes occur at Shelsley they are rarely serious.

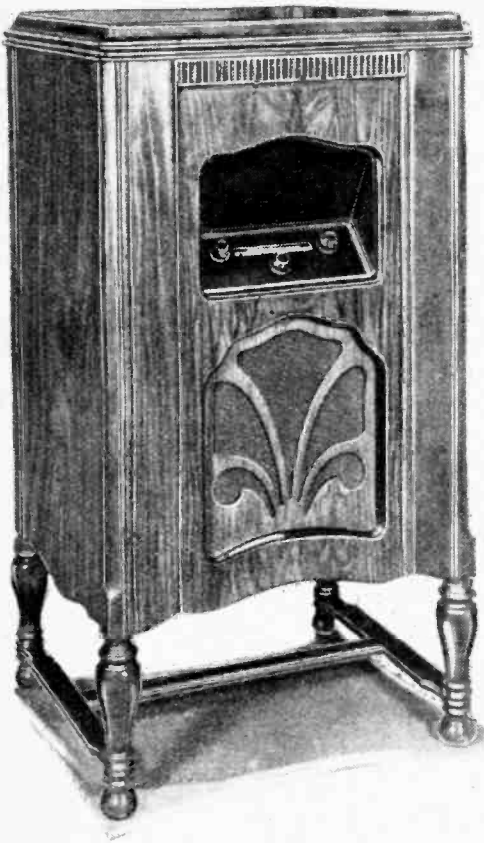
Something New

IF you should tune in the Scottish Regional on May 25th, do not imagine that your set has suddenly begun converting the speech or otherwise chopping it up, in the manner resorted to by the Post Office to obtain secrecy on the radio telephone routes.

Actually, you may be listening to the first broadcast of a play in Gaelic. This is "Dunach," written by Donald Robertson. Of the plot I can tell you nothing, so get out the old Gaelic lexicon and listen for yourselves.



THE VERY LATEST. This, the new main studio at Leeds, was formerly a Friends' Meeting House. The original gallery has been given distinctly bold treatment and the ugly iron pillars have been completely enclosed by glossy black columns. Note the novel microphone suspension device.



Marconiphone

Model 254

A Compact Three-Valve Console Radio-Gramophone

Type.—Three-valve console radio-gramophone. Moving-coil loud speaker. Disc type induction motor with automatic stop. **Circuit.**—Screen-grid H.F. stage with band-pass input filter, grid detector with reaction, power pentode output valve, full-wave valve rectifier. **Controls.**—(1) Tuning, with rotating horizontal scale calibrated in wavelengths. (2) Combined radio and grammo. volume control and reaction. (3) Wave range and on-off switch. **Price.**—24 guineas. **Makers.**—The Marconiphone Co., Ltd., 210/212, Tottenham Court Road, London, W.1.

The quality of reproduction on both radio and gramophone is full and satisfying, and the bass response is broad without any obvious tendency to resonate on a particular note. Adequate balance is imparted to the general effect by the brilliant response in the upper-middle register, particularly in the region of 2,000-2,500 cycles. To avoid harshness and to reduce background noise and needle scratch, no attempt has been made to maintain the response into the extreme high frequencies, and it will be safe to estimate the top cut-off as being in the region of 3,500-4,000 cycles. At the natural level of the human voice speech is well reproduced though, as might be expected, there is some tendency to hollowness if the volume is excessive.

The volume available from gramophone records is just sufficient to load the output valve fully, so that the full range of the volume control is available. The automatic switch on the induction type disc motor produces an appreciable click in the loud speaker when the record is started and stopped, but there is a commendable absence of mechanical noise

from the pick-up when the lid is closed, as the precaution has been taken of lining this with baize. The friction type hinge, by means of which the lid can be set at any angle, is a refinement which will be readily appreciated.

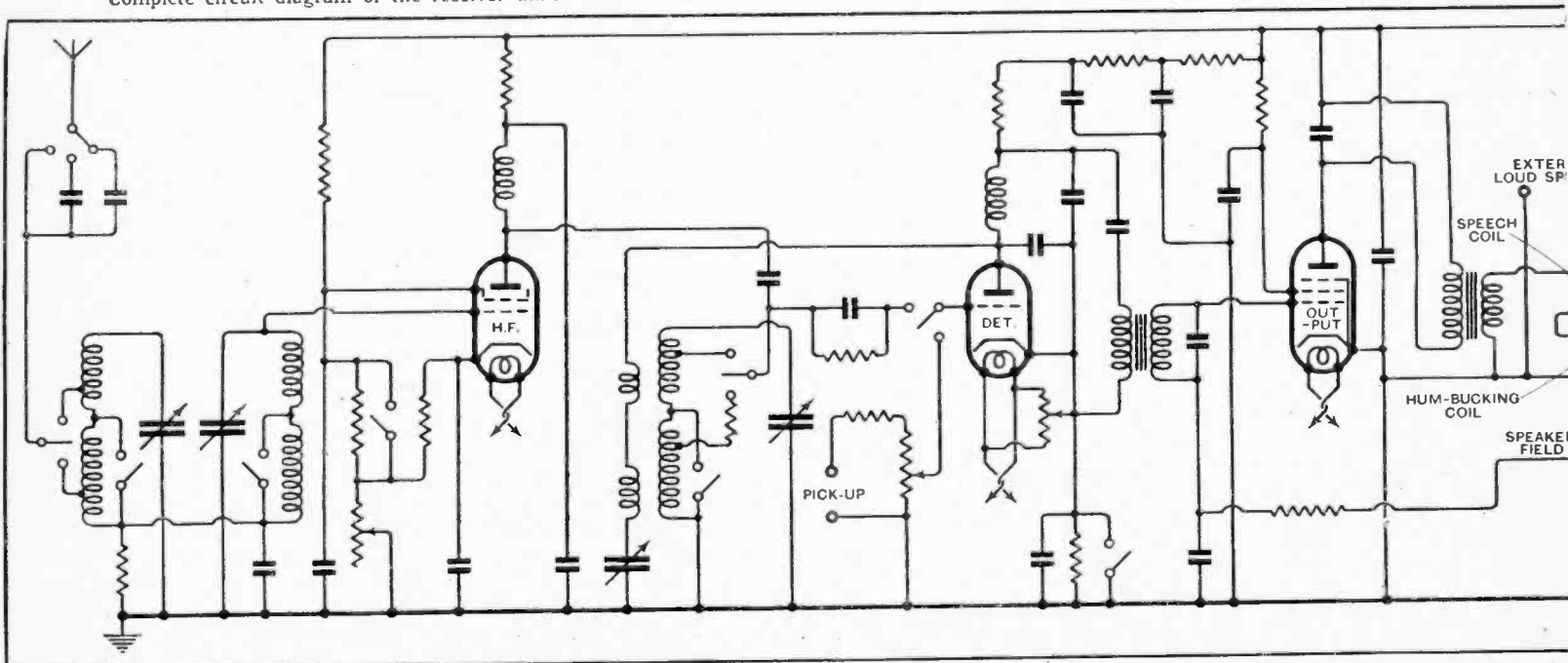
The hum level is sufficiently low to escape notice unless one is sitting close to the loud speaker. It can be adjusted to a minimum by a small filament potentiometer mounted at the back of the chassis.

Range and Selectivity

Tested in Central London the daylight range of the receiver proved to be exceptionally good. At midday no fewer than five Continental stations were available at good programme strength on the medium waveband. After nightfall, therefore, the choice of at least thirty alternative programmes can be confidently predicted. On long waves, of course, the set gave an even better account of itself under daylight conditions, and the absence of background noise on this wave range was a noticeable feature. The selectivity gave ample neutral ground between Daventry

THE specification of this receiver indicates that it is admirably suited to the requirements of the average household. It offers a choice of radio or gramophone reproduction with an undistorted power output of 1½ watts—quite sufficient for a large living room. The three-valve radio circuit has sufficient range to give reliable reception of all the more important British and Continental stations while the inclusion of band-pass tuning ensures adequate selectivity in relation to the sensitivity of the circuit. The controls are simple to operate and the boldly marked horizontal tuning scale is easily read.

Complete circuit diagram of the receiver unit. The reaction condenser and the radio and pick-up volume controls are ganged.



Marconiphone Model 254

and Radio Paris for the uninterrupted reception of Königswusterhausen.

With a full-size aerial and the receiver adjusted for maximum range three, or, at the most, four channels on either side of the Brookmans Park transmitters were lost on the medium waveband. This is quite a good result for a receiver with only one H.F. stage and even better results would, of course, be obtained with a shorter aerial and at a greater distance from the local transmitter. Every precaution has been taken, in addition to the use of a band-pass input filter, to ensure the maximum possible selectivity. The aerial tuning coil is tapped down and the choice of three alternative connections through series aerial condensers is available. Similarly, the tuned grid circuit between the H.F. and detector valves is tapped to reduce detector loading.

Coupled Volume Controls

The volume control, which is arranged to vary the bias on the screened grid valve, also has some bearing on selectivity, as it is coupled mechanically to the reaction condenser. This spindle also carries the pick-up volume control and considerable simplification of the controls is thus effected. When reproducing gramophone records the lower half of the potentiometer feeding the screened grid of the H.F. valve is short-circuited, thus preventing the infiltration of radio signals.

The anode supply to the detector valve is exceptionally well filtered and decoupled and the output from this valve is passed on to the pentode power amplifier through a parallel-fed transformer. The field of the moving coil loud speaker, which is connected in the negative H.T. lead, is used both for smoothing and to provide the bias for the output valve. To reduce mains ripple a hum-bucking coil in series with the speech coil is wound on the outside of the field winding.

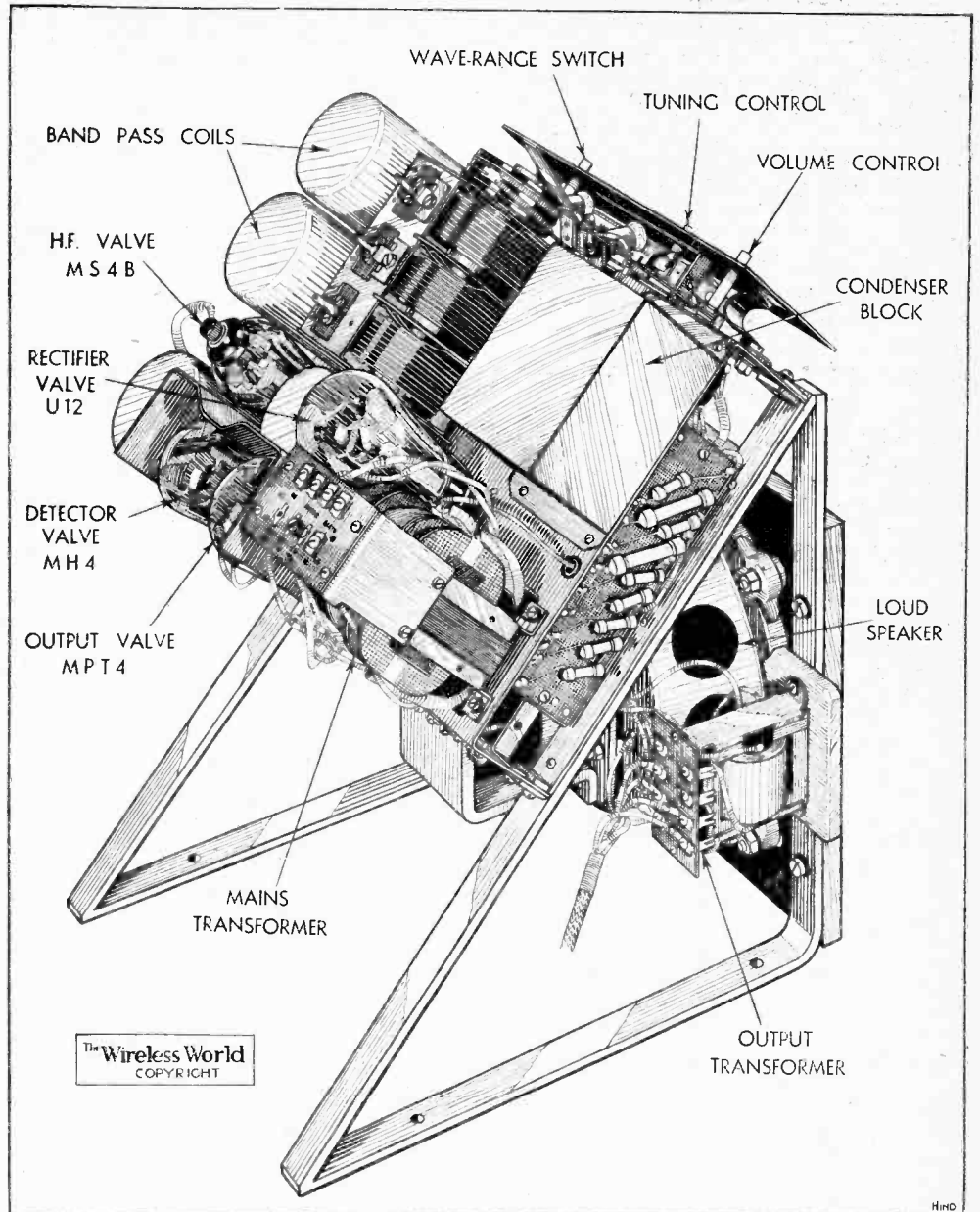
The power supply circuit calls for little comment. It will be noticed that parallel terminals are provided for the gramophone motor and a small series condenser is included to enable radio signals to be picked up from the mains in circumstances where an outdoor aerial is impracticable. The twin dial lamps are connected in series across the filament heater winding.

The chassis assembly is exceptionally well thought out and lends itself to easy removal for servicing. The triangular framework carrying the loud speaker on a subsidiary baffle and the receiver chassis at the correct angle for fitting the control recess is pushed up to the front of the cabinet and held down by four screws in the base. Snug fitting between the control panel and the cabinet is ensured by spring loading the panel which presses firmly against the slot provided for it in the cabinet. An incidental advantage of mounting the chassis in this way is the improved accessibility for valve replacements. Incidentally, it is unnecessary to remove the control knobs when withdrawing the chassis.

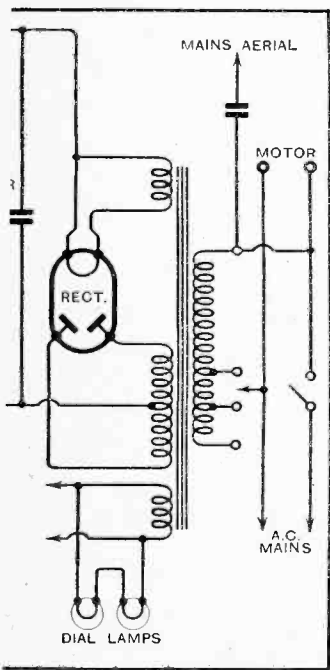
Adjustment of the primary of the mains transformer to the supply voltage is effected by a shorting plug at the back of the chassis. Access to this and to the hum adjuster can only be gained after removing the back panel which is gauze covered to reduce box resonance. It is not necessary, however, to remove this panel to adjust the aerial input, which is controlled by a small three-position switch mounted on a bracket at the side of the cabinet. The cabinet is well proportioned and for a console is not unduly bulky. The dimensions are: height 38in., width 20½in., depth 17in.

To sum up, the reproduction contains no qualities which are likely to attract unfavourable attention after living with the set for some time. The selectivity meets all reasonable demands, both on medium and long waves, while it would probably be necessary to go to a superheterodyne to improve on the range. Ample volume is available and mains hum is unobtrusive. The power consumption on radio is 65 watts and on gramophone 95 watts.

A CHASSIS LAYOUT DESIGNED FOR ACCESSIBILITY

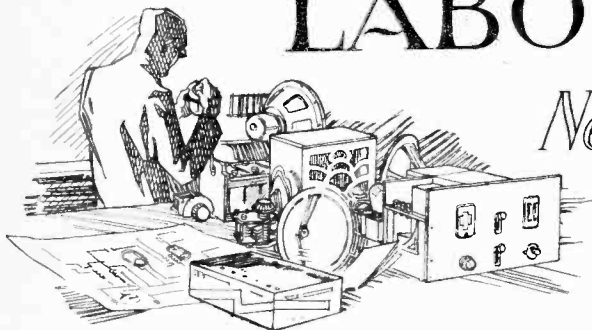


Loud speaker and chassis are combined in a single unit, the chassis being inclined so as to register with the recessed aperture in the cabinet.



LABORATORY TESTS

New Radio Products Reviewed

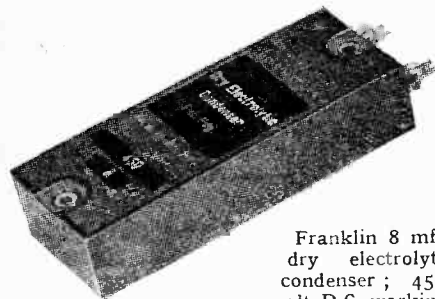


FRANKLIN DRY ELECTROLYTIC CONDENSERS

MADE by the Franklin Electric Co., Ltd., 150, Charing Cross Road, London, W.C.2, these dry electrolytic condensers are obtainable in a wide range of values and for various working voltages. The larger values, which in the low-voltage class amount to some hundreds of microfarads, are suitable for use in grid bias circuits, whilst those of from two to eight microfarads come within the category of H.T. smoothing condensers. A specimen of the latter type, rated at 8 microfarads and 450 volts D.C. working, was tested and successfully withstood D.C. potentials up to 500 volts without unduly straining the dielectric. With potentials of between 500 and 600 volts occasional breakdown occurred, but the condenser immediately resealed itself and did not appear to have suffered in the least by this misuse.

On raising the applied potential to a little over 600 volts, a definite breakdown occurred from which the condenser did not recover by resealing.

The leakage current at the rated working potential is a shade less than one milliamp. All capacities are made to a uniform size,



Franklin 8 mfd. dry electrolytic condenser; 450-volt D.C. working.

a moulded bakelite case measuring $3\frac{1}{2}$ in. \times $1\frac{1}{2}$ in. \times $\frac{1}{2}$ in. being used. The price of the model illustrated here is 6s.

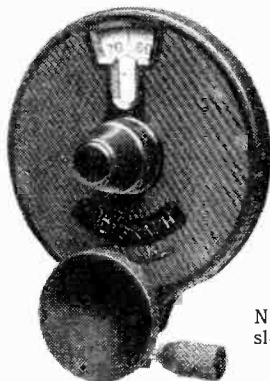
"SME" SOLDERING PASTE

"SME" is not a substitute for solder, but actual solder in the convenient form of a paste mixed with the requisite quantity of a non-corrosive flux. Soldered joints can be made without the aid of a tinned copper bit, the heat being applied to the joint by a poker or a blow-lamp for large work, and by a match or a candle in the case of light materials, such as thin wires, etc.

We have verified by test that "Sme" soldering paste makes a perfectly satisfactory joint, and find that the maker's claims are in no way exaggerated, for it is very simple indeed to handle. The paste is sold in tubes costing $7\frac{1}{2}$ d. each, and it is available also in tins, containing 1 lb.; supplies can be obtained from Andrew R. Findlay, 17, Robertson Street, Glasgow, C.2.

IGRANIC INDIGRAPH DIAL

THE Igranic Indigraph slow-motion dial, which embodies a micrometer adjustment, has been redesigned, and in its latest form is now definitely a better dial for short-wave work than the model it replaces, despite the fact that the earlier dial had



New Igranic Indigraph slow-motion dial with micrometer drive.

few equals in this particular field. The main drive, giving a 9 to 1 reduction, is much smoother to operate, as the micrometer mechanism can be put entirely out of gear. When in action this

gives a reduction of 600 to 1, and is invaluable for short- and ultra-short-wave reception.

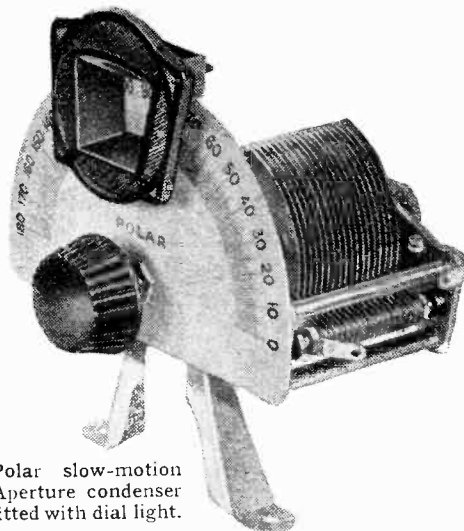
The shape, size, and general design of the new dial is the same as the earlier models, so, also, is the price, which is 9s. 6d.

The makers are the Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.4.

POLAR APERTURE CONDENSER

THIS condenser is particularly well suited for use in the simpler type of receivers in which a single tuned circuit is used. It consists of the Polar No. 2 type slow-motion condenser mounted on a bracket $2\frac{1}{2}$ in. high. A semi-circular translucent scale is fitted, and provision is made for illuminating it from the back. The slow-motion drive gives a reduction of about nine to one.

The measured minimum and maximum capacities of a 0.0005 mfd. specimen were 14 m-mids. and 500 m-mids. respectively.



Polar slow-motion Aperture condenser fitted with dial light.

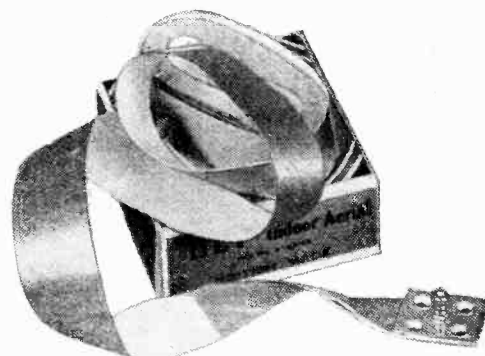
The condenser is quite robust despite its small size. Aluminium is employed for the

vanes and plates, whilst the spindle and supporting rods, also the fixing bush, are of brass.

This style is obtainable in 0.00035 mfd. and 0.0003 mfd. sizes in addition, the price being 7s. 6d. in each case.

"HET" INDOOR AERIAL

MADE by the Univolt Electric, Ltd., 119-125, Finsbury Pavement, London, E.C.2, the Het Indoor Aerial takes the form of a metal foil strip one inch wide and having a backing of adhesive paper so that it can be readily attached to the wall or to woodwork. One end is provided with a small brass plate in which are four screw holes for fixing, and it carries a terminal to which is joined the aerial lead to the receiver. The aerial can be run round the room either above or below the picture moulding in the form of a frieze, and will harmonise with most furnishing schemes.



"Het" metal strip indoor aerial.

since it can be obtained finished either in gilt or silver, and the price is 1s. 6d.

Catalogues Received

Westinghouse Brake and Saxby Signal Co., Ltd., 82, York Road, King's Cross, London, N.1.—Leaflet I.P. 11W, giving operating instructions and circuit details for the new high-frequency metal rectifiers designated the Westector.

The Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—Sixty-three-page descriptive booklet dealing with the full range of Mazda valves. Characteristic curves, operating conditions and some typical circuits are given. Also illustrated folder describing the B.T.H. range of gramophone pick-ups.

Thompson, Diamond and Butcher, 34, Farringdon Road, London, E.C.1.—1933 radio wholesale catalogue describing and illustrating the full range of receivers, radio gramophones, accessories and components handled by this firm.

R. Cadisch and Sons, 5 and 6, Red Lion Square, London, W.C.1.—New Season's Radio Catalogue in which 206 pages are devoted to illustrations and descriptive matter of this firm's range of receivers, radio gramophones, accessories and components. A separate section deals with the numerous other articles, electrical, mechanical, and of domestic interest also handled.

The Pentagrid Converter

An American Development in Frequency Changers

By CLAUDE L. LYONS, B.Sc.

HERE is the first description of a new single-valve frequency changer which should simplify the construction of the superheterodyne. It combines in one envelope the electrodes necessary for a triode oscillator and a variable-mu first detector with the added advantage that aerial radiation and interaction between tuning circuits is avoided.

IN view of the ever-increasing popularity of the superheterodyne, the Pentagrid Converter valve which has been recently developed in America is of considerable interest. Two types of valve are available in that country: the first is intended for use in ordinary A.C. receivers and has a 2.5 volts heater, while the other, which is also of the indirectly heated cathode type, is rated for 6.3 volts for use in car sets.

The valve is intended to function as a single-valve frequency changer, and it not only oscillates and rectifies, but complete isolation of the two processes is obtained. There are six electrodes; immediately surrounding the cathode is the oscillator grid, and outside this the oscillator anode is fitted. This does not surround the grid in the normal manner, however, but consists merely of two bars. Around the whole oscillator assembly is placed one portion of the screen-grid. Outside this is the control grid of the detector portion, then comes the second portion of the screen-grid, which is connected internally to the first, and, lastly, the detector anode.

detector control grid. This being so, the detector cathode is a cloud of electrons, and the control grid, second screen-grid, and anode form the remaining three electrodes of an ordinary screen-grid first-detector valve, the characteristics of which are of the variable-mu type. It may thus be used for automatic volume control purposes.

Electronic Mixing

The connections for the new valve are shown in Fig. 1, from which the arrangement of the electrodes will also be apparent. It will be seen that the tuned oscillator circuit is connected between the oscillator grid and the earth line, which is negative H.T. for this valve, while the reaction coil in the oscillator anode circuit is coupled to it. The grid is negatively biased by means of the voltage drop set up by the passage of grid current through the resistance R2.

In the detector portion, the incoming signal is applied in the usual way to the control grid, and the initial negative bias is obtained through the drop along the cathode resistance R1. The resistance R4 and condenser C are the usual filter circuit for A.V.C. The I.F. transformer is connected in the anode circuit, to which electrode a potential of some 250 volts is applied. The common screens are fed from the usual 100 volts point on the H.T. supply.

It will be observed that oscillation takes place

among the inner electrodes of the valve, and rectification, through which the beat note between the incoming signals and the local oscillations is formed, and amplification occur in the action of the outer electrodes. Normally, where two separate valves are used, it is necessary to provide coupling between the circuits of the two valves so that the oscillations are applied to the detector as well as the

signal. It is sometimes found that this coupling leads to difficulties, since with certain arrangements interaction may occur between the tuning controls, and there is a danger of radiation from the aerial unless an H.F. stage be used.

No such circuit coupling is employed with the Pentagrid, and the necessary coupling occurs within the valve and, by virtue of the screening, is entirely electronic in nature. It has been stated that the cathode of the variable-mu portion of the valve is a cloud of electrons around the inner screen-grid. The intensity of this cloud depends upon the instantaneous potentials of the oscillator electrodes. These are continuously changing, since the valve is oscillating, and the density of

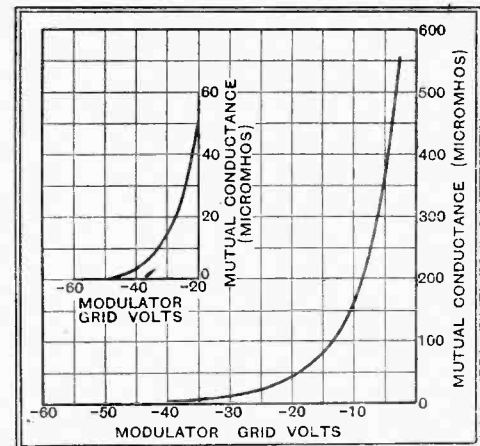


Fig. 2.—Characteristics of the Pentagrid showing that a large negative grid bias can be applied.

the electron cloud varies in sympathy. As a result, the anode current of the variable-mu portion of the valve varies also at the oscillator frequency. The action can perhaps best be visualised by regarding the arrangement as similar to a two-valve circuit in which the first detector cathode is heated by the oscillator current so that its temperature varies with the oscillator current. With ordinary valves, of course, a scheme of this nature is impracticable on account of the temperature lag.

Good A.V.C. Control

Although the oscillator thus affects the operation of the detector so that electronic mixing is obtained, the potentials of the purely rectifier electrodes do not modify the oscillator action in any way. It is possible, therefore, to control volume by varying the bias applied to the control grid, so increasing the range of control in an A.V.C. set. The curves of Fig. 2 show that the bias can be varied up to about 50 volts negative, at which the mutual conductance is under 0.001 mA/V. This is probably impossible with any other single-valve frequency changer.

It is stated that normal type oscillator

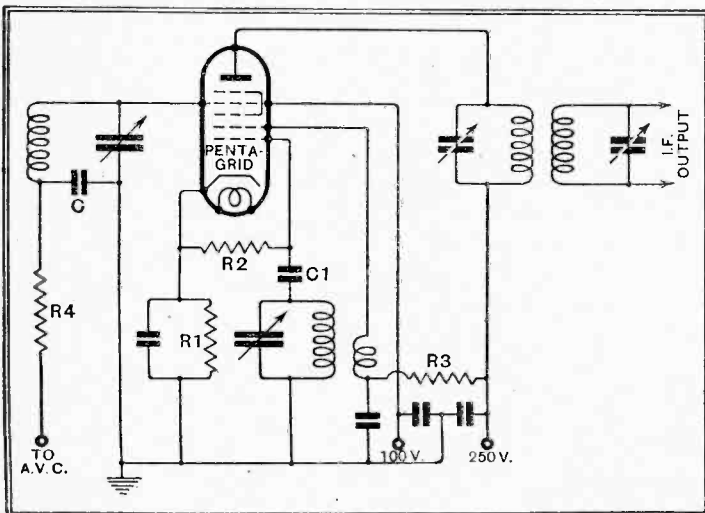


Fig. 1.—The circuit arrangement and the electrode layout of the new Pentagrid frequency changing valve.

In operation the cathode, inner grid, and oscillator anode form the three electrodes of a conventional oscillator system, which is screened from the other electrodes by the first screening grid. From the point of view of connections, the cathode is common to the detector; actually, however, it is stated that the true detector cathode is a cloud of electrons existing between the first screening grid and the

The Pentagrid Converter—

coils can be employed, and, of course, the methods of ganging the oscillator and signal frequency circuits follow the usual practice. The values of the other components depend largely upon the voltages applied to the valve, and the grid leak R2 is particularly important. If an incorrect value be employed here, a tendency to low-frequency howling or squegging may be apparent.

It will be seen, therefore, that the new valve combines within a single glass envelope the electrodes necessary for perform-

ing the functions of both a triode oscillator and a variable- μ first detector, and it is claimed that the efficiency is at least equal to the normal arrangement. Furthermore, there is the not unimportant advantage that interaction between the tuning circuits and aerial radiation is avoided. The valve, therefore, is to be welcomed as affording a simplification in the superheterodyne, and it probably represents the first efficient single-valve frequency changing device which is not open to objection on the score of difficulties due to effective balancing.

periodical, be it on radio or other subject, neither Dutch nor foreign, can compare with it. In view of the fact that I spend on professional literature, both radio and medico-chemical, about £10 a year, which is for Holland rather much, I can say I know what a good periodical means and looks like.

I hope that there will be many sequels to your last constructional article, about an input-transformer, and if I am allowed to make a suggestion it would be greatly appreciated by many of your Dutch readers, as myself, experimenting with public-address gear, if you would publish an article on the construction of 20 hy.-120 mA. chokes and tapped output chokes for push-pull. I sincerely hope that shortly we may find something on these lines in the pages of *The Wireless World*. I hope that *The Wireless World* may still a very long time be the factotum of every real amateur.

C. W. VERBAARSSCHOTT.

Voorburg, Holland.

Correspondence

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

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

The Ferrocart III

The following interesting report on the performance of the above set has been received from Lt.-Col. H. Ashley-Scarlett, President of the Golders Green and Hendon Radio Scientific Society, who carried out a test in collaboration with a fellow member, Mr. J. C. Emerson, B.Sc.

The Ferrocart III A.C. receiver described in *The Wireless World* of March 3rd, has been the subject of a test carried out by myself and a fellow member, Mr. J. C. Emerson, B.Sc. The following report on performance will, we think, be an encouragement to other readers who contemplate building the receiver.

Quality.—For the type of receiver remarkably good; there was no aural evidence of high note loss on local station reception. If any criticism could be made it would be that the very low notes are slightly lacking. Hum is quite absent and volume is quite sufficient for ordinary domestic requirements.

Pick-up.—The set is quite stable when using a pick-up—quality as above.

Selectivity.—Most noticeably good, especially on the lower part of the medium wave band where most interference is usually experienced.

Sensitivity.—Up to standard.

Range.—Twenty-five broadcasting stations easily received on the loud speaker during daytime at programme strength. After dusk the number was increased to 68, with the greatest facility.

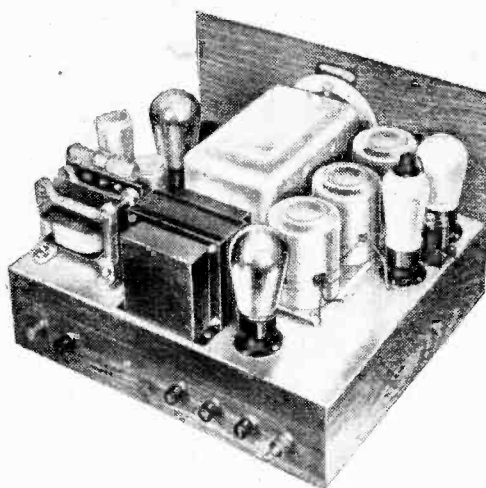
Reaction.—Particularly good and effective. **General.**—An excellent general-purpose receiver. The set was tested six miles from Brookmans Park. On the National programme use of local station switch was necessary to reduce the signal to a comfortable level. To receive foreign stations when very closely spaced the volume control was turned down to allow full scope to reaction, thus obtaining the necessary selectivity. The reaction control is excellent and does not give rise to the terrific distortion usually associated with its use. The condenser dial is marked in metres, but the readings are approximate only. In view of the high selectivity a closer division of the marking would be an advantage. The dial setting is somewhat affected by the position of the reaction condenser.

The appearance and finish of the set are

excellent, and we would particularly mention the neat method of mounting and bringing out the leads of the power transformer.

H. ASHLEY-SCARLETT, Lt.-Col.
President, Golders Green and Hendon
Radio Scientific Society.

19th April, 1933.



"The Wireless World" Ferrocart III, an A.C. receiver described in our issue of March 3rd, 1933.

A Birthday Greeting from Holland

ON the occasion of the twenty-second birthday and of the moving to new, "bigger and better" premises of *The Wireless World*, I wish to convey my sincere congratulations. I hope that the date of April 17th, 1933, may mark the beginning of a new and very prosperous era to *The Wireless World*, that it may be "bigger and better" still, and may remain to the real amateur and experimenter what it has always been, a real encyclopædia on wireless, the herald of new ideas, a champion for better reception, and always a stimulus to those who seek the real scientific lines and principles of wireless. Being myself a "victim" to "that wireless craze," as some say, since 1922, and a regular reader of *The Wireless World* since 1927, I, and with me many of my old-timer friends, have profited by it.

I can tell you frankly that among all radio periodicals I know I consider *The Wireless World* to be the best of all. No other

Broadcast Stunts

I WAS interested in the notes under "Broadcast Brevities" in *The Wireless World* of April 24th, but would suggest that the complaint that there are "no novelties" nowadays is hardly fair to Midland Regional, in view of the following recent facts.

A series of County Week Broadcasts—the first of their kind—was begun in October. There were actual relays of cattle on a Hereford farm and of big power presses and heavy stampers at various factories, and records by blattnerphone (Stille) process of trawlers arriving and departing, of a fish auction and of a thousand-ton quarry blast.

To take next week only, we are fading-in to our Pageant of Gloucestershire, a blattnerphone record of Dr. Hayes' tune from Gloucester Cathedral Chimes, taken in the Tower on a windy day last week, and we are broadcasting the arrival and departure of the Cheltenham Flyer.

Stunts obviously lose their value if they are carried out too frequently, but I do claim that the B.B.C. staff here realise their value and the amount of appreciation accorded them. It probably won't be very long before an announcement will be made of another stunt which our Programme Department and O.B. Engineers have in view.

PERCY EDGAR,

Midland Regional Director,
British Broadcasting Corporation.

BLUE PRINTS

For the convenience of constructors full-sized blue prints are available of the following popular *Wireless World* sets that have been recently described, price 1s. 6d., post free.

- Monodial A.C. Super.** (Booklet, price 1s. 8d. post free.)
- Short Wave Two.** (November 4th and December 23rd, 1932.)
- Straight Three.** (December 16th, 1932.)
- Modern D.C. Three.** (December 30th, 1932, and January 6th, 1933.)
- All-wave Monodial Super.** (January 27th and February 10th, 1933.)
- Modern A.C. Quality Amplifier.** (February 17th, 1933.)
- Ferrocart III.** (February 24th and March 3rd, 1933.)
- * A.V.C. Monodial Super.** (March 17th and 24th, 1933.) With 2.5 watt or 5 watt amplifier. State which is required when ordering.
- The Class "B" Ferrocart Receiver.** (April 17th, 1933.)
- Universal A.C. Short-wave Converter.** (April 28th, 1933.)

* Price of this blue print is 2/6.

These can be obtained from the Publishers, Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

NEWS of the WEEK

Current Events in Brief Review

Short Waves and Politics

GERMAN short-wave amateurs desiring transmitting licences must not only pass a rigorous technical test, but must satisfy the authorities as to their political integrity.

In Palestine

AT the end of 1932 there were 900 licensed wireless receiving sets in Palestine, according to the American Consul at Jerusalem. Empire broadcasting is stimulating interest, and new receivers have been reaching the country during the last few weeks.

How France Would Win

WE understand that the French delegates to the Lucerne Conference will present an attractive little scheme for the apportionment of wavelengths. This is based on the geographical size of each country, and the French engineers have calculated that on this basis France, Germany, and Great Britain would obtain waves in the ratio of 6:5:3. Thus France would secure double the number of wavelengths owned by Great Britain.

The Conference opens on Monday next, May 15th.

A Helping Hand

PAPA STEPHAN, the famous president of the Radio Circle of Katowice, who has correspondents all over Europe, has earned the sincere thanks of *Radio Toulouse*. In a public statement the management of *Radio Toulouse*, after thanking listeners for the innumerable messages of sympathy received after the recent fire at that station, recall with gratitude the gesture of sympathy with which M. Stéphan Tymniecki (Papa Stéphan) has not hesitated to put his station at the disposal of *Radio Toulouse* for answering questions over the ether.

Toulouse is hoping to reopen regular transmissions in the very near future.

Programmes from the Empire: Indian Suggestion

THE Western India Wireless Association is anxious to reciprocate in the matter of broadcast programmes with transmissions from India for distribution over Great Britain. The Association offers to prepare a typical Indian programme for transmission from Poona. This would be picked up at Rugby and sent to London and thence relayed by the B.B.C. stations. The entertainment would consist of a *potpourri* of Indian sounds—musical, vocal, street, and jungle—together with a running commentary by an English-speaking announcer. These transmissions would have to begin about 11 p.m. Indian time.

This strikes us as an admirable idea, and, with the completion of the Post Office Empire telephone services, there should be no obstacle to the reception of programmes from all parts of the Empire.

New Swiss Regional

MONTE CENERI, the Italian-speaking regional station at Tessin, Switzerland, started tests on April 18th with a power of 7 kW, and a wavelength of 680 metres.

Bisamberg in a Fortnight

WE understand that the new 100-kW transmitter at Bisamberg, near Vienna, will open with a special programme on May 26th. Vienna's wavelength is 507.2 metres.

The First Radio Play

TO Britain belongs the honour of broadcasting the first microphone play, according to M. Paul Berger, Editor of the *Antenne*, who declares that this first effort was the broadcasting of a scene from Rostand's "Cyrano de Bergerac" from the experimental station at Writtle, England, more than ten years ago.

A Popular Short-wave Station

SHORT-WAVE listeners will be interested to hear that W2XE, the short-wave station of the Columbia Broadcasting System, has returned to the ether with considerably increased power. The daily schedule is as follows: 4-6 p.m. on 19.64 metres; 8-10 p.m. on 25.36 metres; 11 p.m. to 4 a.m., 49.02 metres. The times are G.M.T.

Midgets in Spain

MIDGET sets are a craze in Spain, where, it is reported, thousands have been sold during the last few weeks.

Lectures on Television

THE first of a series of four lectures on television was given by Mr. H. J. Barton Chapple, Wh.Sch., B.Sc., on Wednesday last, May 10th, at the Polytechnic, Regent Street, London, W.1, and the three remaining lectures will be given on May 17th, 24th, and 31st. The lectures are illustrated by experiments, lantern slides, and demonstrations of television receivers. Full particulars can be obtained on application to the Polytechnic.

Faraday Building

"FARADAY Building can well be described as the switch board of the world," said the Postmaster-General, the Rt. Hon. Sir Kingsley Wood, M.P., at the opening of the International Telephone Exchange, Faraday Building, Queen Victoria Street, London, on Thursday, May 4th. Inspection of the exchange confirms the appropriateness of the remark. Faraday Building not only serves as the converging point for Post Office radio telephone services from Montreal, New York, Buenos Aires, Rio de Janeiro, Cape Town, Cairo, Sydney, Bombay; it is also the exchange for linking-up these centres with each other and with the capitals of Europe. It is, in fact, known as the Overseas Telephone Exchange. Although the actual telephone circuits or channels themselves are a



THE PACE THAT KILLS.

This amusing cartoon from the New York trade journal *Radio Retailing* has a serious significance for all who value quality more than quantity. Mass production methods in American radio have led to continual price cutting, and the race to produce the cheapest set has had dire results on tone quality and craftsmanship. Is the process to be repeated over here?

Where the Rainbow Ends

THE "European Zone" over which the forthcoming Lucerne Conference will have jurisdiction actually comprises all countries as far as 40° east of Greenwich and extends southwards to the southern shores of the Mediterranean. Countries on the outskirts include Northern Africa, Palestine, Turkey, the Irish Free State, and part of Russia as far as Moscow.

N.P.L.'s New Radio Department

WE understand that, with effect from May 1st, a new Radio Department has been formed at the National Physical Laboratory, under the superintendence of Mr. R. A. Watson Watt. The new Radio Department includes the former Wireless Division of the N.P.L. Electricity Department, and also the Radio Research Station at Slough, which will continue its present work.

Short Waves and Signal Crashers

TWO wireless vans now leave Scotland Yard daily under sealed orders. Their purpose is to trap motorists who ignore traffic lights. Arrived at the chosen spot, one van is stationed close to the traffic light, while the other van waits 100 yards farther along the road. When a car driver disobeys a signal the nearer van transmits a short-wave message to the one in front, and the offender is intercepted.

May Day Millions

THE May Day celebrations in Berlin were distinguished by the fact that on the Tempelhofer field there was assembled a crowd of over 1,000,000 persons—probably the largest collection of individuals the world has ever seen. That the majority of them were able to hear the Chancellor's speech could only be ascribed to the 112 Telefunken loud speakers.

The broadcasting of the event, says a correspondent, meant a very busy day for the Technical Staff of the Radio Reichs Gesellschaft, which employed a special new O.B. van for the first time. This housed half a dozen amplifiers fed by five groups of microphones distributed throughout the great Berlin port.

highly complicated engineering undertaking, the Overseas Exchange differs very little in appearance from an ordinary inland telephone exchange, though special arrangements have been made to exclude extraneous noises. Sound-absorbing and echo-suppressing materials have been provided for the floor and ceiling of the switch room.

The exchange is coupled up with Rugby, which is the outward transmitting station for all the Post Office overseas radio telephone services. Reception is effected through Cupar, in Fife-shire, which deals with long waves from America, and Baldoak, Hertfordshire, for all the short-wave services.

It is now possible to speak from this country to any one of thirty-two million telephone subscribers.

UNBIASED

What Lancashire Thinks To-day . . .

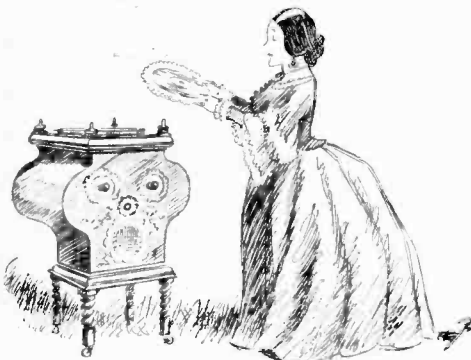
I AM very surprised to learn that "wired-wireless" does, after all, exist in this country. Not only are programmes being relayed to subscribers' houses via this system, but my informants (Community Radio, of St. Anne's-on-Sea) tell me that at the Hotel Majestic, at St. Anne's, the incoming radio programmes are being distributed to the various rooms by this method. I presume that they use either the electric light wiring or the electric bell wiring. It says much for this Lancashire city that they are pioneers in using this system instead of the ordinary loud speaker extension.

A "Period" Set

THE other day I was dragged, much against my will, to visit a futuristic-looking dwelling which was supposed to represent the sort of place in which we shall all be living in 1950.

Being neither an architect nor a furniture designer, I do not feel justified in commenting upon the general ugliness of the place and its lack of comfort, to say nothing of the old-fashioned dirt-collecting corners, which I should have thought would have been rounded off by the year mentioned. Concerning the radio set exhibited in the house, however, I feel I can let myself go. It was a real "period" model.

Naturally the instrument was also supposed to be of the 1950 period, and quite properly it was shown as a combined "sound and sight" instrument; in other words, it was a radiophone-cum-radioscope, or radio-phonoscope, as I suppose the combined instrument will be called in days to come. No snag was encountered until I lifted the lid and dived into the innards, despite the protests of a uniformed and much-bewhiskered attendant, who smacked of 1850 rather than 1950.



A real "period" model

Now it is, of course, quite impossible to predict what radio developments will have come along by 1950, and in the circumstances, therefore, I think that the

designer (?) of the set might have left it to our imagination. He had, however, thought otherwise, but so far from attempting to project his mind into 1950, he had retrojected it into the early part of 1931. As for the television part of the apparatus, I could not help thinking that he must actually have borrowed the instrument which is usually on show in the Science Museum.

The most ridiculous part of the whole affair, however, was the radiogramophone. Not only had the sponsor of this instrument failed to perceive that the disc type of record will have sung its swan song long before 1950, but he had forgotten that, with the perfection of television,

By FREE GRID

gramophone records will incorporate sight as well as sound. When that time comes the name of this all-embracing home entertainer will, no doubt, be "radiogramophonoscope," or "radiogramoscophone," or perhaps even just "phonoscope" or "scophone" for short.

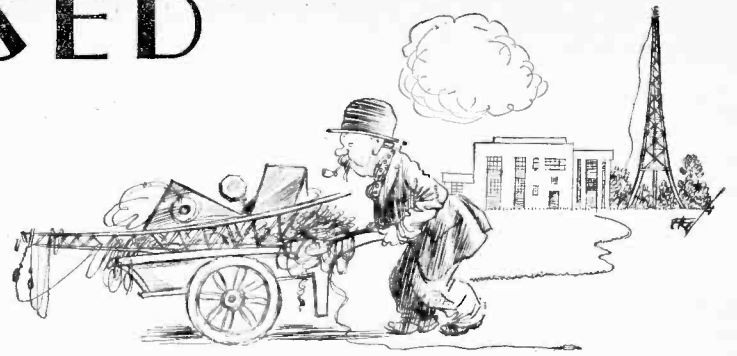
To crown all, this wretched travesty of a house contained no provision for reception in rooms other than the one in which the receiver was operating.

Old Iron at Brookmans Park

I SUPPOSE that all of you have heard the preliminary efforts of the new West Regional station, and I hope that you are all as delighted as I am with the excellent results obtained, more especially from the point of view of quality.

The point to which I wish to call attention, however, is the *relatively* inferior results of the London transmitter when compared with this later station. (I have quality in mind more than anything else.) In other words, isn't it about time that the London transmitter was modernised; rebuilt, in fact? It must be remembered that the proposed Droitwich station is not expected to be in operation before the middle of 1934, and by the time the B.B.C. has dealt with the Belfast area, thus completing the Regional scheme (*circa* 1935), London will be much behind the times; in fact, we shall have the ludicrous spectacle of the capital of the Empire having a transmitter which is more antique than any other in the country.

I am perfectly well aware that the B.B.C. Engineering Department will immediately deny that London will then



Any old iron?

be out of date, just as they did recently when certain journals suggested that it was high time that 5XX (which was opened in 1925) was handed over to the old-iron dealer.

The London station is over three years old, regular transmissions from the Regional transmitter having commenced on March 5th, 1930, and by the time the Regional scheme is finished it will have whiskers on it. A five-year-old broadcasting station (which will be London's age when the Regional scheme is complete) is just about as antique as a one-year-old broadcast receiver; more so, in fact.

Just as in the case of large metal structures like the Forth Bridge the painters are never finished, one gang beginning all over again before the old gang is finished, so ought the B.B.C. to deal with the Regional scheme. At least *one* station should always be in a process of demolition and reconstruction.

It Works

I MUST thank the many readers who sent me such helpful advice in regard to my difficulties in the matter of a hospital radiogram some little time back. You may recollect that one of my greatest problems was to devise a record changer which would keep up a continuous programme of gramophone records in the hospital throughout the night and at such other times when there was no broadcasting.

As one reader remarked, the problem was quite simple, as all that was necessary was to get hold of half-a-dozen or more playing desks fitted with the usual "eight-record" changing gear, and to devise mechanism so that when the first instrument had done its stuff it operated a relay which started the second one, and so on.

My correspondent states that he has already filed his patent, and that if he can't manage to get some manufacturer to take it up soon he will have to file his petition also. I must confess that the apparatus sounds rather cumbersome, and I shall need a complete room to house all the playing desks, but, nevertheless, I am assured that it works, and that is the great thing. I must confess, however, that I think it very remiss of our manufacturers not to tackle the problem of giving us a record-changer which will hold more than a miserable eight records.

The Wireless World

THE
PRACTICAL RADIO
JOURNAL
23rd Year of Publication

No. 716.

FRIDAY, MAY 19TH, 1933.

VOL. XXXII. No. 20.

Proprietors: ILIFFE & SONS LTD.

Editor:

HUGH S. POCOCK.

Editorial,

Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E. 1.

Telephone: Hop 3333 (50 lines).
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.

Telegrams: "Cyclist, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:

Guildhall Buildings, Navigation Street, 2.

Telegrams: "Autopress, Birmingham." Telephone: 2970 Midland (3 lines).

MANCHESTER: 260, Deansgate, 3.

Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.

Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:

Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other countries abroad, £1 3s. 10d. per annum.

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.

CONTENTS

	Page
PROGRAMMES FROM ABROAD, pp. I—XXIV	
Editorial Comment	351
H.T. for the Car Set	352
Unbiased	354
The Double Diode Triode	355
News of the Week	357
Practical Hints and Tips	358
Laboratory Tests	360
Ferranti Class "B" Band-Pass Four	361
Broadcast Brevities	362
Letters to the Editor	364
More About the Catkin Valves	365
Readers' Problems	366

EDITORIAL COMMENT

Location of the Speaker

The Case for a Separate Unit

ON many occasions in the past we have questioned the advisability of the slavish adoption on the part of manufacturers of the common arrangement of incorporating the loud speaker in the same cabinet with the receiver itself. As a matter of *their* convenience, this arrangement has a good deal to commend it, but from the *listener's* point of view there are very strong arguments which can be put forward to support a departure from this policy in favour of the separation of the speaker from the set.

Where the speaker is housed with the set designers are confronted with a serious problem in trying to stop the vibrations set up by the speaker from influencing the valves, and the higher the efficiency of the set the greater is the risk that this trouble will develop.

In discussing this subject in January 1932, we urged that manufacturers should consider the advantages of a design where the speaker could be located in some position other than that chosen for the set, and we said it must very frequently happen that the user wishes to place his speaker in some particular position in his room but that this position might be, and very often would be, a most inconvenient spot for the set as a whole.

But our recommendation at that time did not bear much fruit as manufacturers were so firmly rooted in the idea of self-contained models, and we recollect that one manufacturer, in particular, expressed the view that to follow such a proposal would be a distinctly retrograde step. Whether or not such a view is justifiable may shortly be put to the test, for American designers are now freely discussing separation of the speaker from the receiver as likely to prove an out-

standing attraction for their sets of next season, whilst still enabling the dimensions of the set itself to be kept down without the inevitable impairing of quality which results from confining the dimensions of the speaker within fine limits. The idea is heralded in America just now as if something entirely new had just been thought of and no doubt salesmen will find plenty of points to bring home to the public the advantages of the new style radio sets.

A well-known authority in America, discussing this subject recently, has stated "Clearly the loud speaker must be separated from the set, equipped with sufficient baffle area and placed, inconspicuously perhaps, in some other part of the room." And again, "the very advantage of tuning and adjusting volume and tone from the point in the room where the listener will sit is of great importance."

West Regional

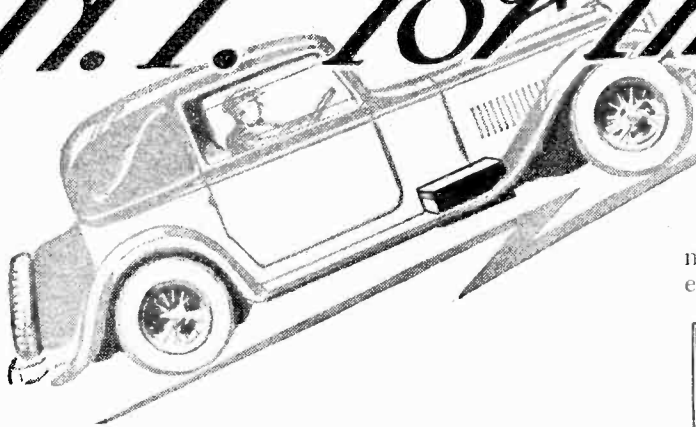
A Technical Achievement

WE congratulate the B.B.C. on the completion of the West Regional station, which is located at Washford Cross, a few miles from Minehead, in Somerset.

The station is built to practically the same plan as Brookman's Park and constitutes the last of the regional transmitters as originally planned in the Regional Scheme.

West Regional and Brookman's Park are destined to share a common wavelength of 261.5 metres for the transmission of the National programme, and it is expected that tests will be started about June 1st. If these stations of high power and comparatively close proximity can be linked successfully it will indeed be a technical achievement of first-rate importance to broadcasting. We wish the engineers every success in their tests.

H.T. for the Car Set

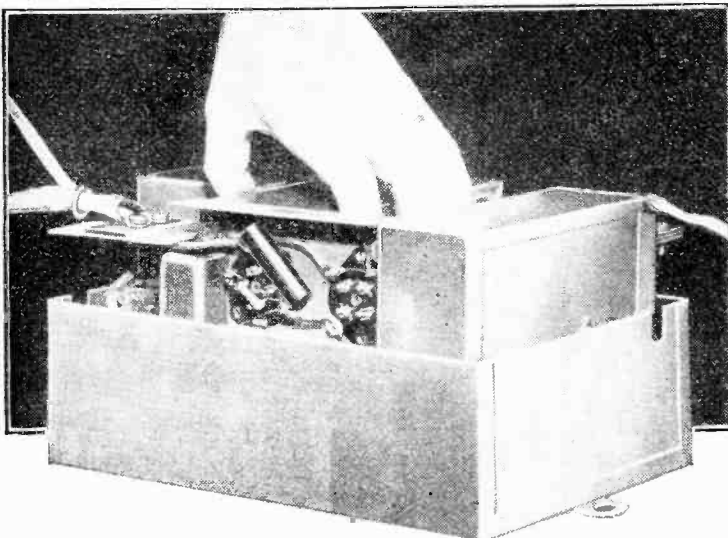


Stepping-up the Starter Battery Voltage

By A. DINSDALE

THE "Tuned Vibratory Transformer" was used during the war to obtain a high voltage from an L.T. accumulator battery. Now an American correspondent describes a modernised and improved device of this nature which operates from the car battery and gives a liberal supply of H.T. current for the receiver.

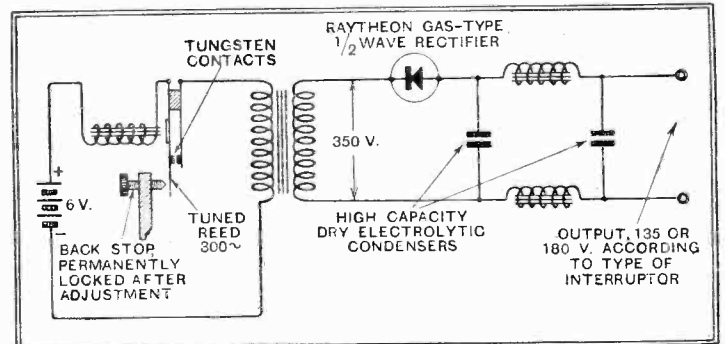
TWO years ago, in an effort to introduce an innovation in their respective industries, American radio and automobile firms got together and proceeded to introduce radio sets into motor cars. The early sets, as may well be imagined, were scarcely "a joy for ever"; in fact, they are known to have caused many headaches for those who produced them. And this is not to be wondered at, for engineers who for years had been fighting to perfect the all-mains receiver



The American Elkonode H.T. Unit is easily removed from its metal case. Power is derived from a 6-volt car battery.

suddenly found themselves called upon to dig out the long-forgotten technique of the battery-operated receiver. In addition, interference from car ignition and other sources had to be tackled and eliminated.

The situation to-day is that it is estimated that 175,000 automobile radio sets were in operation last year, and the trade expects to sell 200,000 more this season. At recent automobile



Schematic circuit diagram, showing the separate interruptor unit.

shows in various parts of the United States automobile manufacturers found that one out of every ten car buyers is interested in "auto radio." There are at least twenty-four motor car radio sets on the market, made by leading radio manufacturers. Some of these sets can be adapted for motor-boat use, some are dual-purpose, and some are designed almost exclusively for motor boats. Sixteen leading car manufacturers now build aerials into their current models as standard equipment.

It is noteworthy that the public, in taking an interest in this new development, has become so accustomed to good-quality reception that it has demanded equally good reception in its motor car, taking no interest whatever in the difficulties involved. Thus, manufacturers have been forced to supply good-quality reproduction and simple, trouble-free operation in quick time, in order to satisfy the market. Sets make use of from four to eight valves, with a dynamic speaker of the permanent-magnet type fitted under the dashboard. Operating controls are often mounted on the steering column. These consist of a key-operated switch for turning on the set, and two small knobs, one for tuning and one for volume control.

The car or boat battery provides the L.T. power for these sets. It may be noted here that American cars still use 6-volt batteries almost exclusively. The H.T. supply has, up to now, been supplied from H.T. batteries—and that is the weakest link in the chain.

Eliminating the Short-lived H.T. Battery

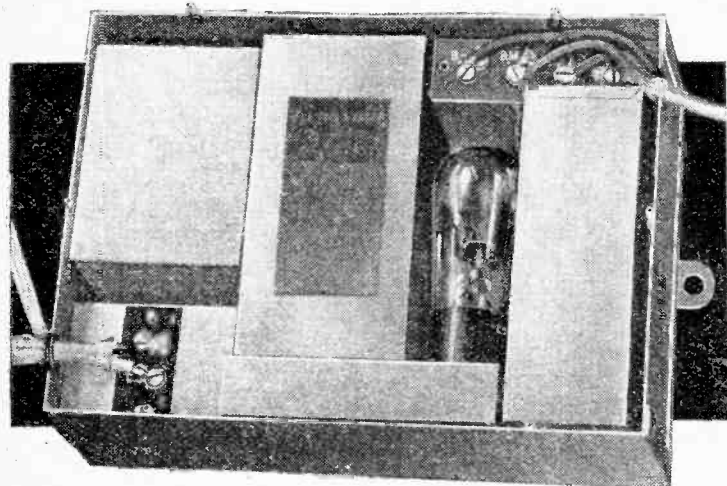
When automobile radio began to be introduced two years ago the Elkon organisation, makers of metal rectifiers, turned its attention to the problem of eliminating the expensive and short-lived H.T. battery. The final result is an eliminator which consists essentially of an H.T. transformer, the primary of which is supplied by the car battery through a mechanical interruptor; the output of the secondary is rectified, smoothed, and fed to the radio receiver. The unit, which measures 10in. x 7in. x 3½in., is enclosed in a sturdy steel case, cadmium plated to prevent rusting. It may be fitted in any convenient position anywhere in the car—under the bonnet, under the chassis, under or behind seats, in the dicky or luggage compartment. Armoured input and output leads of ample length are supplied, and with the armoured covering adequately earthed at every point of contact with the frame of the car the position of the unit is immaterial.

H.T. for the Car Set—

Within the outer casing of the device are mounted the various units which comprise it, these units also being enclosed in cadmium-plated steel cases, thus following out the American "shield within a shield" policy of radio receiver design. The vibrator is of simple but sturdy design, and consists of a single magnet coil and a tuned reed vibrator with tungsten points. The reed is carefully tuned to a vibration frequency of 300 cycles exactly, and when finally set up all adjustments are permanently locked up immovably. The vibrator has a guaranteed life of 2,000 hours without adjustment. When it finally wears out the manufacturers recommend its replacement at a cost of nearly \$5. To facilitate replacement, the connections to the vibrator emerge from the case in the form of standard valve legs, so that the unit plugs into a valve socket.

Replaceable Interruptor

The pulsating output current of the transformer (which is also a separate unit) has a voltage of 350, and is fed to a standard Raytheon filamentless, gas-type, half-wave rectifier. Thus, ordinary driving or heavy road shocks can cause no rectifier damage. The output of the rectifier is then fed to the final unit, a well-built and generous filter system which completely eliminates ripple, noise, and any radio frequency (ignition) disturbances from the plate supply circuits. High-capacity, dry electrolytic condensers form part of the smoothing circuit.



Interior of the unit, showing principal components. Top left : transformer ; centre : interruptor unit and rectifier ; right : smoothing equipment.

The heart of the device is, of course, the interruptor, and this largely determines the permissible D.C. output voltages and current. Also, it determines the eliminator load on the car battery. In the interests of economy and flexibility, therefore, the manufacturers supply six types of interruptor, any one of which may be plugged into the eliminator without changing the other units. The characteristics of these six types are as follows:—

	Watts Output.	Amps. Input.	180 Volts at mA.	135 Volts at mA.
Type 1	2.2	1.1	12	16
Type 2	2.7	1.2	15	20
Type 3	3.6	1.5	20	27
Type 4	4.5	1.8	25	33
Type 5	5.4	2.1	30	40
Type 6	6.3	2.45	35	46

Thus, for any given receiver, it is only necessary to select the appropriate interruptor. Because of the bulk and expense of H.T. batteries, most auto radio manufacturers have restricted themselves to 135-volt valves. Only a few of the more progressive have gone in for 180-volt valves. With this new eliminator available, however, it is likely that higher voltage valves, with

consequent increased output power from the receiver, will shortly be used, although a great deal of volume is not necessary within the confines of a motor car.

Connected to the shielded input cable is a small relay placed in series with the receiver filament circuits. Thus the eliminator is switched on or off automatically with the receiver.

Interference Suppressors

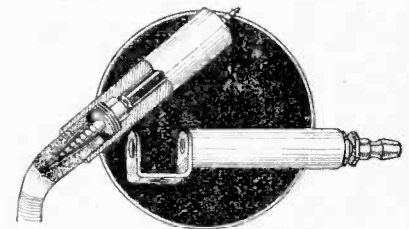
The market price of the unit in America is \$20, which is a reasonable price to pay for freedom from the H.T. battery nuisance. It is interesting to note that the unit is suitable for use on aircraft and for low-power transmitters; it should prove an especial boon to those whose homes are not yet provided with electrical supply mains.

Various types of interference have, of course, been encountered in the operation of radio sets in motor cars, but all these have been successfully overcome. The principal source of trouble, the ignition system, has been rendered completely harmless by the insertion in each H.T. lead, as close to the sparking-plug as possible, of a simple resistance. The value of this resistance is too insignificant to cause any appreciable H.T. voltage drop, and yet it is sufficiently high to kill completely any H.F. oscillations set up by the spark; without the resistance the spark-plug leads form oscillatory circuits which radiate H.F. energy.

Another annoying type of interference is similar to, and as difficult to locate, as our old friend "body rattle." It is usually indicated by "bumps" and "pops" in the loud speaker as the car moves, especially when travelling over a rough road. This type of interference is usually eliminated by thoroughly tightening all parts of the chassis and body. In some extreme cases it will be necessary to earth parts of the body that are "free" or "floating"—i.e., metal parts that are not in good electrical connection with other parts of the chassis.

A Simple Code

The interruptor itself is silent in operation, even when the car is stationary, for its case is generously lined with sound-proofing material. Electrical interference from this source will not be experienced so long as all leads are thoroughly shielded, including the aerial lead-in up to within a few inches of the aerial.



Although "car wireless" has not yet made much headway in this country interference suppressors for the ignition equipment are already available. These special Erie resistors are encased in porcelain tubes.

It is interesting to note that the cars of many American broadcasting station officials are radio equipped, so that they may at all times be in touch with their stations. Some stations have developed special codes for communicating with their executives in an emergency, when all other means of communication fail to locate them. For example, when all is well, station WOR will identify itself simply as "WOR—Newark." When the Chief Engineer is wanted in a hurry and nobody knows where he is the identification is changed to "WOR—Newark, New Jersey." And when the Station Manager is wanted the announcement reads "WOR—the Bamberger Broadcasting Service in Newark, New Jersey." When one of the engineering department executives of the Columbia Broadcasting System is badly wanted, the System's key station, instead of identifying itself simply as "WABC—New York," will announce "This is Station WABC, in the City of New York." These code announcements never fail to bring the wanted person to the 'phone within a matter of seconds, or maybe a few minutes if he is out on the road and has to find a 'phone.

Yachting enthusiasts find a radio set not only entertaining but also valuable, in that it enables them to receive weather reports, and since dry H.T. batteries do not thrive in a moist, salty atmosphere, an eliminator is a highly welcome substitute.

UNBIASED

BY FREE GRID

Sealed Lips

YOU will probably remember that the other week I gave you an account of how I sat in a talking theatre and heard the running commentary from the screen *via* a radio receiver and the usual talkie amplifier. Interest was added by a large map of the course thrown on the screen, and I expressed the hope that something similar would be done in the case of the Derby and similar important outside broadcasts.

I am now told that the whole thing is illegal, as it was a deliberate flouting of the B.B.C.'s oft-repeated warning that outside broadcasts must not be communicated to the public.

A large number of readers have written asking me the name of the cinema, but in the interests of humanity I cannot reveal it, as the powers that be are waiting to pounce on the unfortunate manager of the place with an outsize in summonses. I myself have been harassed, cajoled and brow-beaten by the authorities in an endeavour to get the name of the place from me, but my lips are sealed.

My Noisy Flat

FOLLOWING the prevailing fashion, I have recently taken up my abode in one of the many palatial flats which are now springing up everywhere. But I have bitterly repented my move, and am negotiating for a return to my old haunts.

The main trouble is the confounded noise of the traffic coming up from the London streets—so different from the peace and quietness of the sylvan retreat to which I have been accustomed. The



Against my midriff.

first morning I found the noise too nerve-racking even for the dictation of correspondence. No matter how loudly I bawled I was unable to make the light of intelligence dawn in the eyes of my female secretary.

With that grain of resourcefulness which never entirely deserts me I took a taxi across London to the "W.W." laboratories, and, with the aid of one or two minions who live and have their being there, was able to sling together a

passable amplifier which I interposed between a microphone and a pair of headphones clamped on my secretary's head.

Alas for my lack of foresight; the noise was amplified as much as my speech. I was compelled, therefore, to resort to my old trick of holding the microphone against my midriff. The noise problem is now solved. As a matter of fact I have mounted a very flat microphone on a special belt which presses against my midriff next to my skin, the connecting lead coming down my trouser leg.

The idea is not an entire success, however, as I find that when dictating letters I can no longer follow my custom of pacing up and down the room without constantly tripping over the lead. This necessitates the repeated readjustment of the microphone position, and much loss of time results, it being obviously necessary for my secretary to retire during this process. Frankly, I can see nothing to relieve the situation but a dignified withdrawal to the country, there to link my microphone to my secretary's headphones via the Post Office land lines, or, alternatively, to equip myself with a short-wave transmitter.

A Chance for the Government

OVER a year ago I expressed the opinion that television (or radioscropy, as I prefer to call it, being strictly brought up to prefer all-Greek words and to eschew Latin and Greek hybrids) would never make headway while the present system of moving mechanical parts was persisted in. Since that date several eminent authorities have endorsed my opinion.

It almost seems as though the whole business ought to be handed over to radio amateurs, who might be able to put the same sort of jerk into it that they did in the matter of broadcasting in 1922 and in short-wave pioneering during the decade following. Government departments and commercial interests, hovering over the work of amateurs like vultures, as they have done in the past, could then follow their custom of swooping down and taking all the credit, as is their wont, and then radioscopy would take its place on an equal footing with its twin sister, radiophony.

Hanky-panky at Pangbourne

IT so happened that the other day I was on a hiking tour in the neighbourhood whence the B.B.C. nightingale broadcasts emanate, and, happening to turn into a local hostelry for refreshment, I had the

good fortune to drop into a seat next to an ancient rustic who looked as though he might be a companionable conversationalist.

After I had caused his tankard to be refilled he began to give me the current gossip of the hamlet in the broadest "Berkshire." It was not until he touched upon the subject of the nightingale broadcasts, however, that I really began to sit up and take notice. Hastily calling for his tankard to be replenished once more, I began judiciously to pump him, and soon learnt some interesting but hitherto unpublished facts concerning the B.B.C.'s activities in the neighbourhood.

The clock which we have heard chiming-in so appropriately during the broadcasts is not situated in the old village church, nor is its striking spontaneous, as we have been led to believe. The striking of the



Had typed out the dope.

hour actually emanates from a long disused clock over certain stables, the B.B.C. engineers prodding it into unwonted activity for the occasion. Another fact which I learned from my rustic friend was that a whole day had been devoted by the B.B.C. myrmidons in trying to induce the oldest inhabitant to say his little piece in front of the "mike."

They had typed out the dope for the old man to read in order to avoid any "technical hitch" which might result from an impromptu performance. Unfortunately, however, it was found that he and punctuation were strangers to each other, and it was thought that lack of intelligibility might lead listeners into the wicked belief that they were hearing a captive nightingale, languishing in some foreign zoo. In the end, therefore, the B.B.C. callously discarded him and the little stronghold of rustic histrionics which he was endeavouring to uphold.

With a bitter pang, born of regret that such an unfortunate state of affairs should exist in such a lovely part of the country where, as Heber puts it, "Every prospect pleases and only man is vile," I left the "Nightingale and Needle" and wandered off sadly but steadily into the night.

The Double Diode Triode

Practical Data for the New Osram MHD4 Valve



*T*HERE is no doubt that the double diode triode, in the same way as the "variable mu" of two years ago, introduces a new phase in set design. Without the "variable mu" the double diode triode would have an extremely limited field of usefulness; without the double diode triode the full advantages of the "variable mu" are not realised. The two valves together form a complementary combination with fascinating possibilities particularly in the direction of automatic volume control.

By C. N. SMYTH, B.Sc., and J. STEWART, M.A., B.Sc.

Technical Staff, The General Electric Co., Ltd.

THE use of the double diode triode¹ as a means of providing automatic volume control has recently been described, and it is the purpose of this article to give practical operating data for the first British example of this new type of multiple valve. As the various circuits for quiet, amplified and delayed A.V.C. have already been given, it remains to put forward the detecting and amplifying aspects of the valve.

valve and cause loss of efficiency or bad quality reproduction.

The screening is obtained by shrouding the small anode with a metal cover and, additionally, by taking the grid out at the top of the bulb and thus having no grid lead within the pinch of the valve. In order to accommodate the increased number of electrode connections in the MHD₄—as the new valve is called—the new type of seven-pin base which has been standardised in this country for multiple valves will be employed.

The characteristics of the valve are shown in Fig. 2, average values being as follows: The amplification factor is 40, the A.C. resistance 16,600 ohms, and the mutual conductance 2.4 mA/volts, these constants being measured at an anode voltage of 100 and zero grid volts.

The use of a diode followed by a triode, thus separating the functions of detection and amplification, is now well known. The advantages of this scheme over other forms of rectifier are threefold. First, the input impedancce of the diode rectify-

ing circuit is high, secondly, the diode provides nearly perfect rectification, and thirdly, no high-frequency voltages are passed on to the triode amplifying valve. Thus it is able to handle a much larger input than a similar triode used as a grid detector.

The Osram MHD₄ comprises diode and triode elements in the same bulb, thus giving increased convenience and decreased cost with no loss in efficiency. Two separate diode anodes are provided in order to render possible full-wave rectification or various different types of A.V.C. circuits.

The advantages of diode detection in giving a linear response are well known. It is not, however, commonly realised that

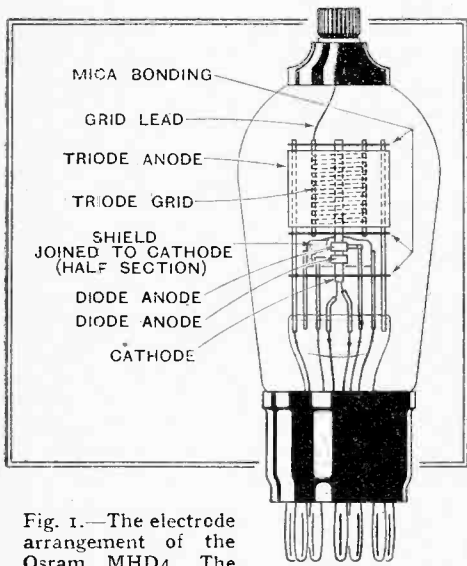


Fig. 1.—The electrode arrangement of the Osram MHD₄. The grid connection of the triode is at the top of the bulb and the other electrodes are brought out to a 7-pin base now standardised for multiple valves.

The general layout and construction are shown in Fig. 1. It is seen to consist of a normal triode with the grid connected to a terminal on top of the bulb, and small auxiliary anodes placed round the lower end of the cathode. These auxiliary anodes are very carefully screened from the grid and anode of the associated triode in order to keep the capacities between the two sets of electrodes as small as possible. If this is not done H.F. voltages or high audio frequencies may be passed through the

¹ See article entitled "Automatic Volume Control," *The Wireless World*, February 17th, 1933.

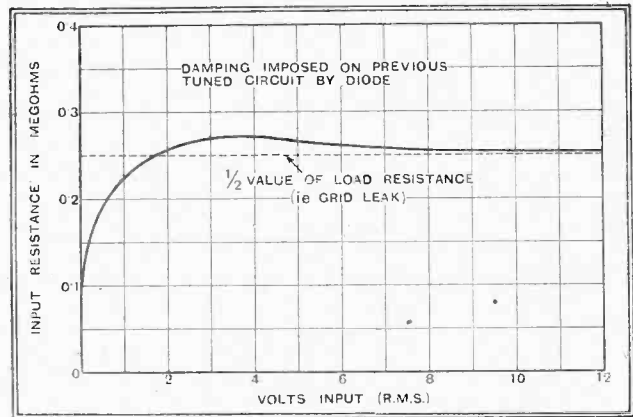


Fig. 3.—Damping imposed on preceding tuned circuit by one diode.

a diode detector imposes very little damping on the preceding tuned circuit. In fact, in this respect, diode detection has only one rival—an anode-bend screen-grid detector. This latter rectifier is only of practical utility when it is of the self-biased type, and even then it is non-linear for small inputs.

Fig. 3 shows the effective input shunt resistance of one diode of an MHD₄ valve, measured by the damping produced on a tuned circuit connected across the input. In this case the load resistance (corresponding to the grid leak in the case of a triode valve) was 0.5 megohm, and it will be seen that, except for very small inputs, the damping produced by the diode valve is approximately 0.25 megohm for a diode load resistance of 0.5 megohm. It can be shown theoretically that, for large inputs, the effective input resistance of a diode rectifier circuit is one-half the value of the load resistance.

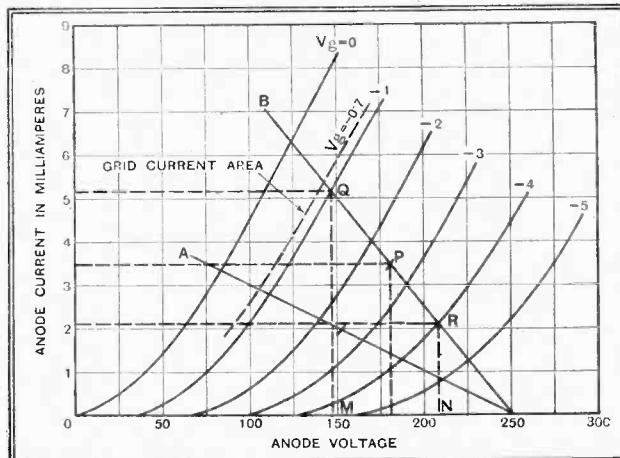


Fig. 2.—Anode volts/anode current characteristics for the MHD₄ valve. Two load lines have been drawn (A) for 50,000 ohms and (B) for 20,000 ohms.

The Double Diode Triode—

The effective input resistance of the MHD₄ valve does not at any time fall below 70,000 ohms, and only reaches this minimum value for very small inputs.

Figs. 4 and 5 give the rectifier characteristics of an MHD₄ valve operated as a

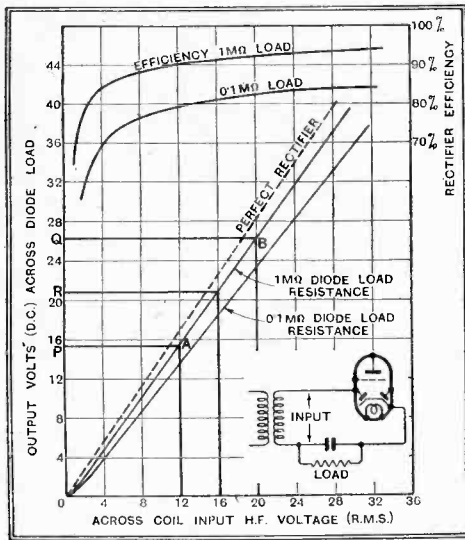


Fig. 4—Rectifier characteristics of the MHD₄ valve operated in a half-wave circuit.

half-wave rectifier and as a full-wave rectifier, using either one diode or two diodes in parallel. As an example in the use of these curves, consider a single diode rectifier with a 1 megohm load resistance and an H.F. input of 16 volts carrier, modulated 25 per cent. Thus the H.F. input swings between the voltages 12 and 20, and the working point moves between A and B, giving a peak L.F. output developed across the load resistance ($\frac{1}{2}$ voltage PQ) of 5.4 volts. The D.C. bias available for A.V.C. purposes is represented by the point R, or 20.8 volts. It will be seen that greater efficiency and linearity are to be obtained when using a 1 megohm load resistance, but this gain is only obtained at the expense of some high-note loss, owing to the larger time-constant of the load resistance condenser combination. The use of

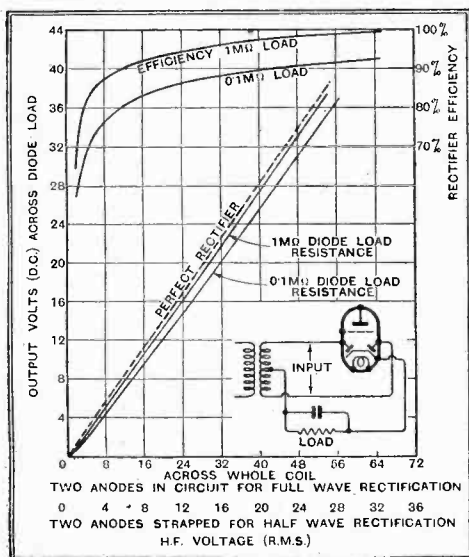


Fig. 5.—Rectifier characteristics when both diodes are used.

an 0.5 megohm load resistance is recommended with the MHD₄.

Leaving the question of rectification behind, we have to consider the most effective way of utilising the triode of the MHD₄ in order to obtain faithful reproduction and the necessary overall sensitivity, together with any A.V.C. action which may be required.

Amplified A.V.C.

To obtain this performance the following three factors must be carefully considered: the value of the anode load resistance, the value of the auto-biasing resistance, and the output obtainable from the valve. The signal-handling capacity of the valve must not be forgotten, and special attention must be paid to this point if amplified automatic volume control is to be used. These points can be determined directly from the anode voltage/anode current characteristics of the valve which are shown in Fig. 2 for several values of grid voltage. Two load lines have been drawn (A) for a 50,000 ohm resistance load and (B) for a 20,000 ohm load, assuming an H.T. supply of 250 volts in each case.

Taking line (B) as an example, it can be seen that a grid bias of 2.5 volts will bring the working point of the valve to P. If a 1.5 volt peak value audio frequency is applied to the grid, the grid potential will vary from Q to R, and the voltage across the output load from M to N. This represents 62 volts; therefore the output will be 31 volts peak.

In the case of the 50,000-ohm load the maximum output becomes 37 volts peak.

If amplified A.V.C. is being employed no biasing resistance is required, for the grid bias on the triode is supplied by the rectified radio-frequency signal, and is, in fact, approximately equal to the peak value of the signal applied to the detector. In practice, the bias will vary from 0.7 volts to 5 volts, and if distortion is to be prevented care must be taken to ensure that anode-bend rectification does not take place. This may occur with large signals unless the D.C. voltage across the load resistance in the anode circuit is more than 2.5 times that required for full A.V.C. action. This point is illustrated in Fig. 6, which shows the relation between grid volts and anode

current with a 20,000 ohm load resistance in the anode circuit. If appreciable distortion is to be prevented the grid must not be allowed to run more negative than point R on the curves. The steady bias on the valve should not exceed half the value corresponding to R, or, if it does, care must then be taken not to apply too large an audio-frequency signal to the grid.

For large signals sufficient output is obtainable to drive a pentode (PT₄ or MPT₄), or even a power triode (PX₄) directly off the MHD₄ by means of resistance coupling, but if the set is not very sensitive or has not a very large range of A.V.C. control, then it may be advisable to employ a parallel-fed transformer coupling. A suitable circuit for this is shown in Fig. 7.

When simple A.V.C. is employed the audio-frequency voltage obtained across the anode resistance is ample to load a PX₄ fully without a transformer coupling, due to the higher radio-frequency amplification which is employed in this type of set. From the foregoing it will be seen that the MHD₄ has fascinating possibilities.

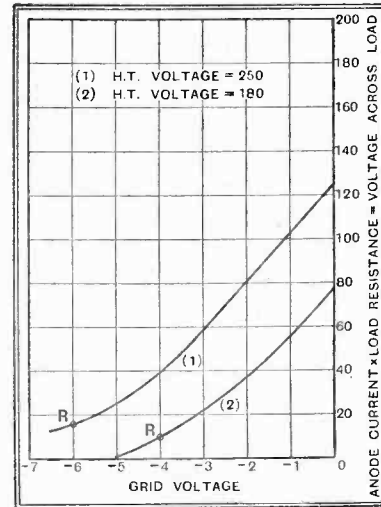


Fig. 6.—Graph showing variation of voltage across anode load resistance with change of grid voltage. Curve (1) is taken at 250 volts H.T. and curve (2) at 180 volts.

Matching R. & A. Reproducers

REALISING the importance of correct matching between the loud speaker and the valve in the output stage of a receiving set, Reproducers & Amplifiers, Ltd., of Frederick Street, Wolverhampton, have just issued an informative leaflet in which full particulars of all the output valves in common use are set out in tabular form. In addition, the correct

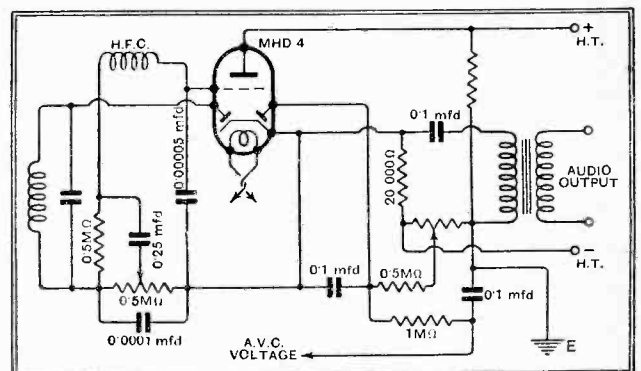


Fig. 7.—The double diode triode may be coupled to the output valve of the receiver by means of a parallel-fed transformer when the range of A.V.C. control is not very large.

transformer ratio or, alternatively, appropriate tapings on the output transformer are given for the three principal moving coil loud speakers manufactured by the company, namely, the "Bantam," "Challenger," and "Victor" units.

All owners of R. & A. loud speakers should find this leaflet of great value, and copies may be obtained from the above address on receipt of a 1½d. stamp to cover postage.

News of the Week.

Events of the Week in Brief Review.

Still They Come

JUGOSLAVIA has two new broadcasting stations "on the stocks." One at Uszkub is nearing completion, and work is beginning on the new station in Spalatao, Dalmatia.

More Kilowatts

THAT Spain has no intention of falling behind in the race for broadcast power is evident from an announcement by the Spanish Ministry of the Interior, which states that a new 100-kW broadcasting station is to be erected shortly in Madrid. It will be entirely under State control.

Queer Calculations

NOW that the licensing of French radio receivers is about to take place, the officials are trying to estimate the number of receivers in the country. The most conservative calculation has been 350,000—a figure that is laughed at by the majority of wireless traders, who consider that a million would be nearer the mark. This atmosphere of doubt shows how nebulous and chaotic radio conditions are in France.

New Hitler Move?

IT is rumoured that the entire German broadcasting system will shortly be taken over by the new Ministry for Propaganda. At present the service is controlled by the Post Office and the various State Governments.

"That-will-doodle-do"

CONNOISSEURS of the fowl run have declared that the cock-crow used as an identification signal by the Czechoslovakian stations denotes a bird long past its prime, so the broadcasting authorities have recorded the note of a young cockerel.

To Oblige the Ships

MONTE CENERI, the Italian speaking regional station at Tessin, Switzerland, has changed its wavelength from 680 to 720 metres. The station, which has been testing for the last month, has interfered with ships' stations when working on the original wavelength.

The Highest Mast

VIENNA'S new 100-kW transmitter at Bisamberg will have Europe's highest aerial mast, even exceeding in height the famous Eiffel Tower which is 1,000 feet high. The mast itself constitutes

60 kW from Lyons

LISTEN for loud signals from Lyons la Doua on 465.8 metres. We learn that the new 60 kW transmitter is nearing completion, and that tests will begin in the very near future.

New German Interval Signals

MUNICH now whistles away the intervals with the "Song of the Bells" from Wagner's "Parsifal." Breslau initiated a new interval signal on May 1st consisting of the first bars of the well-known "Hohenfriedberger-Marsch."

The Useful Super-Het

FROM our contemporary *Le Petit Nicois*:—
First Friend: "Oh, a super-heterodyne, with push pull amplifier. That must have cost you a lot?"

Second Friend: "On the contrary, I have saved money; it has enabled me to buy the neighbouring house at half price."

"Ultra Shorts" from the Crystal Palace

FIVE - METRE transmissions will emanate for the first time from the North Tower of the Crystal Palace, Norwood, on Sunday next, May 21st, when Mr. L. H. Thomas (G6QB) begins regular tests with a power of 10 watts.

The North Tower is 550 feet high, and commands a view over eight counties. It should thus make an ideal jumping-off point for "optical" waves.

The British Radio Annual

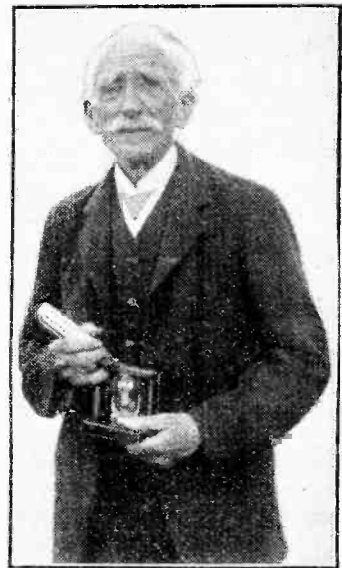
THE British Radio Institution has just issued Volume II of the British Radio Annual, comprising a number of interesting papers dealing with various phases of wireless, which have been written by members of the Institution. The subjects covered include "The Electrical Condition of the Upper Atmosphere," "Considerations in Antenna Design," "Selectivity," "Weather Forecasting by Atmospheric," and "Echo Sounding." The Hon. Secretary of the Institution is Mr. J. D. Fox, 25, Kingswood Drive, Kings Park, Glasgow, S.4.

An "Autocar" Offer

IN its issue this week our associated journal, *The Autocar*, makes an announcement of great interest to all motorists. Briefly, *The Autocar* is offering at a purely nominal cost to all its readers a complete Bartholomew map of the whole country divided into twenty sections.

Each section is drawn to a scale of eight miles to an inch, is printed in colours, with main roads in red, and with mileages between towns clearly marked.

These maps are of the highest quality. A sample section is included in every copy of *The Autocar* printed this week. Full particulars regarding this offer will be found in this week's issue.



TWENTY-NINE YEARS AFTER. Sir Ambrose Fleming photographed last week with a Catkin valve and his original "Fleming valve" of 1904.

For Blind Listeners

BLIND listeners in Germany are to have the benefit of a special radio newspaper, printed in Braille, which is to be regularly published by the State.

Propaganda Banned

RUSSIAN broadcast programmes are tabooed in the German radio papers. The broadcasting authorities have just issued a request that all German journals should abstain from giving publicity to items broadcast from foreign stations in the German language for propaganda purposes.

Marconiphone Model 254

IN connection with the review of this receiver in last week's issue it should be noted that the price in radio gramophone form is 32 guineas, not 24 guineas as stated.

18-Centimetre Telephony

THE 18-centimetre wavelength transmitter and receiver illustrated on page 307 of our issue of April 28th was used in a demonstration by International Telephone and Telegraph Laboratories in conjunction with Les Laboratoires L.M.T. of Paris.

"Practical Short Wave Reception"

THE author of this article in our issue of May 5th regrets an error in the diagrams of Figs. 2 and 3. These should be shown with an aperiodic aerial winding, and not a direct coupled circuit.

In the same article, on page 317, lines 38 and 39, the words "oscillator" and "signal" should be interchanged.

Class "B" Ferrocart

READERS interested in *The Wireless World* Class "B" Ferrocart receiver described in our issue of April 7th last should note that a complete reprint of the constructional article is issued in handy form by the City Accumulator Co., Ltd., 4, Surrey Street, Strand, London, W.C.2, from whom copies can be obtained, free and post free.



THE GRANITE CITY TEST. This Catkin valve did the double journey by post between London and Aberdeen. At the end of its travels it was tested on a standard receiver in *The Wireless World* Laboratories and functioned perfectly.

U.S. Asks for King's Speech

THE World Broadcasting System, an American organisation which is establishing a "library" of electrical transcriptions of broadcast speeches for the U.S. National Museum, has asked the British Museum to send a copy of the recording of King George's Empire Speech last Christmas. In return the British Museum is offered a transcription of President Roosevelt's inauguration address.

Wide-awake Japan

JAPAN has just celebrated her eighth anniversary of the founding of the broadcasting system. Tremendous advances have been made in the last two or three years, as can be gauged from the fact that the number of licence-holders has been doubled since 1930, and now stands at 1,400,000. Of these 600,000 are in Tokio.

the aerial, and the uppermost parts operate on the telescopic principle for rough tuning purposes. The station is to open on Sunday, May 28th, using a wavelength of 507.2 metres.

PRACTICAL HINTS AND TIPS

SOME of the latest screened cable for aerial down-leads has remarkably low capacity, but even so, its use will generally result in the addition of several hundred micro-microfarads to the aerial capacity. Of this extra capacity, a proportion—but, in a modern set, usually only a small one—will inevitably re-appear across the tuned input circuit of the receiver.

Screened Aerial Down-leads

The moral of this is that, after fitting a screened down-lead, the aerial circuit of a "ganged" set should always be re-trimmed; less trimming capacity than originally will be required, and so the adjusting screw must be turned in an anti-clockwise direction.

A GOOD deal of experimental work in Class "B" amplification is being carried out, and it has already been found out that the circuits originally put forward do not by any means represent the only possible methods of application. Where it is desired, modifications may be introduced in various ways without impairing results. For instance, the circuit reproduced in Fig. 1 may suggest possibilities to those who are faced with the problem of adapting the new system to an existing set.

Class "B" Conversions

The diagram is prepared on the assumption that the original output valve will be converted to act as a driver; it emanates from the Technical Department of the Cossor valve concern, which has done a great deal of development work both with regard to the Class "B" valve itself and to methods of using it.

In the diagram a resistance of 50,000 ohms is shown as being connected in shunt with the L.F. transformer primary; in addition, there is a stopping resistance in series with the L.F. grid. One or other of these resistances will generally be necessary, but both of them will seldom be required.

At first sight the 0.02-mfd. tone cor-

Simplified Aids to Better Reception

rector condenser across the driver transformer secondary may appear to be on the large side; its capacity is subject to alteration in some cases, but the value given will seldom be excessive where a transformer with a step-down ratio is employed.

The purpose of the pair of 0.005-mfd. condensers in shunt with each half of the output transformer primary is to prevent parasitic oscillations in this stage.

A NUMBER of mains transformers made a year or two ago were provided with a 7.5-volt centre-tapped wiring for feeding the filament of a power rectifying valve consuming 2½ amps. These valves are no longer in common use, but it does not follow that for this reason the transformer is valueless. In many cases, one-half of the 7.5-volt winding may be used to supply a modern 4-volt rectifying valve, particularly of the type consuming 1 amp.

Although the voltage existing between the centre tap and either end of the winding amounts theoretically to 3.75 volts, this figure is often exceeded, at any rate

Old-type Mains Transformers

IT has already been stated that the fitting of a gramophone pick-up to a "straight" set will almost always necessitate a readjustment of the trimming condenser which controls the tuned circuit immediately preceding the detector.

The same applies to most superheterodynes, but as the tuned I.F. couplings are not fitted with auxiliary trimmers, the readjustment must be effected by means of the semi-variable condensers which are usually shunted across the windings. The only condenser that will need adjustment is that which tunes the secondary of the I.F. transformer preceding the detector valve.

It may be added that these remarks do not apply to sets which include anode bend detection; in such cases the pick-up is usually connected to the low-potential end of the detector grid circuit.

REPAIRS to the windings of a defective L.F. transformer are usually beyond the scope of the amateur, and if the manufacturer is unable to put matters right, the component must usually be scrapped. But before discarding it, it is

always worth while to remove the external protecting shield, and to make sure that the fault is not due to

a defective connection between the leading-out wires and the inner ends of the terminals. Such faults are by no means uncommon, and they are usually quite easy to repair. It is also worth while to examine the joint between the heavy leading out wire and the finer wire of the winding proper.

A HOT electric soldering iron, if laid carelessly on the bench or table between jobs, may cause more or less serious damage, and it is wise to provide a stand or other form of support which will keep the business end of it well clear of woodwork, etc. A bracket, shaped more or less as shown in the accompanying sketch, serves this purpose admirably; it may be attached to the wall plug base as shown, or even to the wall.

For constructing this bracket, sheet aluminium was originally employed. Almost any metal will do, but the use of a substance of high heat conductivity (and, incidentally, enough surface area)

Workshop Hints

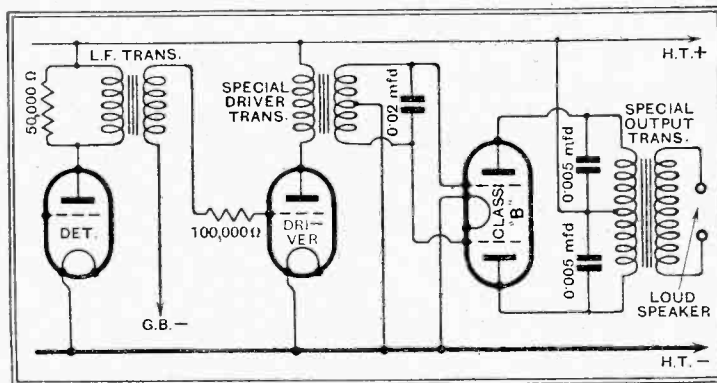


Fig. 1.—Skeleton diagram showing tone-correction devices, etc., for Class "B" amplification. Decoupling may be added where necessary.

under light loads, and if the precaution of using short and heavy leads be observed, sufficient voltage will usually be available.

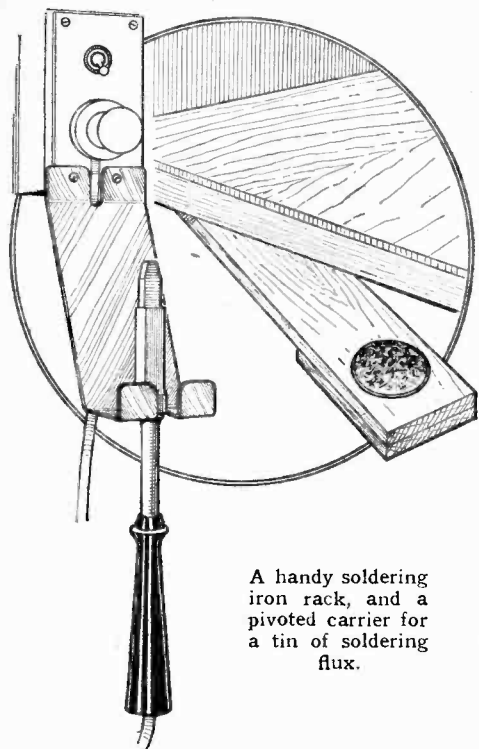
The fact that the centre tap can no longer be used as the rectifier output connection when this scheme is adopted need not be a deterrent. Almost always the connection may be made to either end of the rectifier filament without increasing hum.

Practical Hints and Tips—

helps to maintain an even temperature when the iron is out of use, but with current switched on, for long periods.

One of the advantages of a bracket mounted in this way is that accidental burning of the leads is rendered almost impossible.

Soldering flux can seldom be found when wanted; after a long search, the



A handy soldering iron rack, and a pivoted carrier for a tin of soldering flux.

open flux tin has, on more than one occasion, been found adhering firmly to the elbow of the would-be user's jacket! This and other messy possibilities are avoided by fitting a holder on the under side of the bench in the manner illustrated. The board in which a hole is cut as a receptacle for the tin is arranged to pivot on a screw, so that it may be swung out of the way when not required.

IN experimental work involving a layout of gear spreading over a considerable area, it is convenient to have an earth wire running under the edge of the bench to which various parts of the apparatus may be connected by crocodile clips.

For the Experimental Bench

Experience shows that a solid wire sooner or later gets stretched or accidentally broken and it will be found that a flexible spiral valence rod, as sold by the one-price stores, is neater and more permanent. With this arrangement it is also possible to dispense with the use of crocodile clips, for by pulling out the spiral slightly the ends of the earth leads may be effectively nipped between adjacent turns.

It may be asked whether the inductance of the spiral wire is likely to be detrimental. This can be safely neglected on all but ultra-short wavelengths as the diameter of the turns is only of the order of 2 mm.

ALMOST everyone knows by now that the anode current consumed by a Class "B" or Q.P.P. output stage depends on the extent of modulation of the incoming carrier wave. During programme intervals, when modulation is not taking place, current is almost negligible. Although it is a natural corollary of the foregoing, it does not seem to be always appreciated that anode current consumption is also influenced by signal strength; by "turning down the wick," the amount of H.T. energy consumed for reproduction of a given programme will be much less than

Payment by Results

when it is reproduced at full blast. In a fairly modern set, the economy effected by reducing signal strength will be two-fold, as with a variable-mu H.F. stage the current of this valve will also be reduced.

When utmost economy is needed, provision might also be made for simultaneously applying rather more negative bias to the driver valve as well when volume is reduced. From the point of view of quality, this would be quite permissible, as with artificially weakened signals less than the maximum output is needed from this valve. Perhaps, however, this is carrying economy too far, as the saving would be small, and hardly worth while.

PARMEKO 25-WATT AMPLIFIER KIT

Two-stage A.C. Power Amplifier for Home Construction

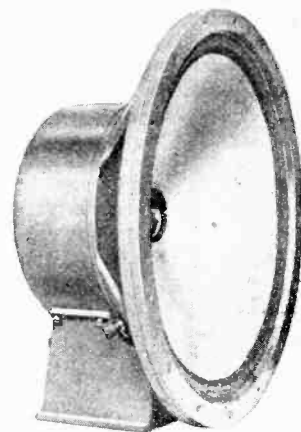
THE name "Parmeko" has for long been associated with high-class public address equipment, and now, in order to meet the demand for a moderate-priced power amplifier, Partridge and Mee, Ltd., Percy Road, Aylestone Park, Leicester, have introduced a 25-watt unit in kit form. It is A.C. operated and will deliver about six watts undistorted power output, this being sufficient to operate several moving-coil loud speakers at full volume. Two stages are employed; the circuit consists of an input volume control, a Mazda AC/HL valve transformer coupled to a Marconi PX25 and a choke capacity output filter. Interposed between the L.F. transformer and the output valve is a small unit consisting of an H.F. choke, a resistance and a grid leak, its function being a parasitic oscillation suppressor.

In the Parmeko amplifier the input volume control has a resistance of 500,000 ohms, a somewhat higher value than usual, but it is fitted so that when following the detector valve of a wireless receiver it can be used as a variable grid leak in a resistance- or choke-capacity inter-valve coupling.

The high tension supply is derived from a

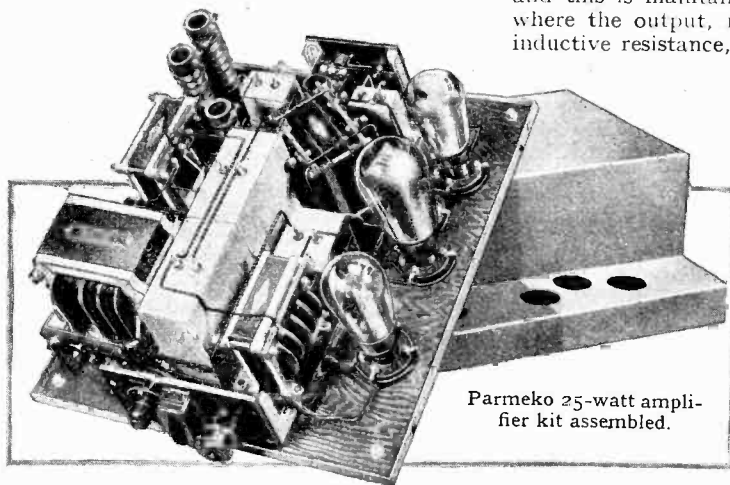
range of permanent-magnet moving-coil loud speakers particularly good results were obtained on test. The output is well balanced with an adequate treble response to give brilliance to the reproduction without accentuating record surface noises. Despite the good response at the lower end of the frequency scale, very little mains hum was noticed.

A more detailed investigation of the amplifier reveals that between 70 and 4,000 cycles the amplification is sensibly constant, but above this there is a slight falling off. At 6,000 cycles, however, an improvement occurs, and this is maintained up to 8,000 cycles, where the output, measured across a non-inductive resistance, was found to be about eleven decibels lower than at 1,000 cycles.



"Parmeko Senior" loud speaker.

Included with the kit are two blue prints, one showing the theoretical circuit and the other a full-size wiring diagram. The latter could be employed as a template for laying out the components if desired. The price of the complete kit, excluding valves, is £14 10s. For those who wish to enclose the amplifier totally,



Parmeko 25-watt amplifier kit assembled.

full-wave rectifying valve of the "C" class, giving some 450 volts after smoothing on full load. Good quality components are employed throughout, the mains transformer, smoothing choke and output choke are the firm's own make, while the various resistances are wire-wound and all condensers have an adequate factor of safety.

Using a high-grade gramophone pick-up, and one of the latest models in the Parmeko

a 22-gauge steel case, cellulose enamel finished, is available, the price being 21s.

The loud speaker used throughout our tests with the amplifier was the new "Parmeko Senior" model. It is a permanent-magnet type fitted with a 12in. diameter cone and handles a large input. An input transformer is contained in the base, giving two alternative ratios, viz., 1:11 and 1:22, and the price, in chassis form, is £7.

LABORATORY TESTS

NEW RADIO PRODUCTS REVIEWED



"Peak" aqueous-type 4- and 8-mfd. electrolytic condensers.

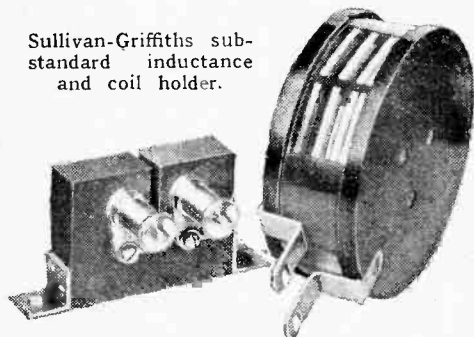
"PEAK" ELECTROLYTIC CONDENSERS

WILBURN & CO., 23, Bride Lane, London, E.C.4, have extended their range of "Peak" condensers, and now include two of the wet electrolytic type rated at 450 volts D.C. working. These are obtainable in 8-mfd. and 4-mfd. sizes, the prices being 5s. and 4s. 6d. respectively. The customary style of construction is adopted, a cylindrical metal container forming the negative electrode with the positive pole, or anode, passing through an insulated bush in the centre of the large fixing screw. Being of the aqueous type these condensers must be mounted in an upright position, only, however, to maintain the liquid in contact with the electrodes, since there is no possibility of leakage, for a leakproof vent is fitted on top of the container. Tests made with some specimen condensers show that the average leakage current is less than 0.5 mA. at 450 volts D.C. The condensers can be subjected to an overload of about 30 per cent. without damage, but it is advisable not to exceed the working voltage other than for short periods.

SULLIVAN-GRIFFITHS SUB-STANDARD INDUCTANCE COILS

INDUCTANCE coils accurately adjusted to certain known values form an essential part of laboratory equipment, but in view of the work involved in manufacture and measurement their prices have, of necessity, hitherto been high. With the view to bringing these within the reach of many of the smaller laboratories in the country, H. W. Sullivan, Ltd. Leo Street, London, S.E.15,

Sullivan-Griffiths sub-standard inductance and coil holder.



have introduced a new range of inductances classed as second-grade coils. They are, in effect, inexpensive copies of their high-grade standard inductances, being constructed on exactly the same principle, and but for the

exceptionally high standard attained in all Sullivan laboratory equipment would otherwise be described as first-grade coils. They have a high degree of constancy and are suitable for use in laboratory calibrated resonance circuits and for all apparatus in which a coil of known inductance is necessary.

Although the accuracy of the initial adjustment to nominal value is not high, the stated actual inductance of each coil as marked on its carton is measured to within fine limits. Coils of low inductance have an accuracy better than 0.5 per cent., whilst an accuracy of 0.05 per cent. is given for coils of 2,000 mH. and over. If a higher order of accuracy is required it is suggested that an N.P.L. certificate be obtained, for the coils are fully worthy of this, as their constancy is quite as good as the accuracy to which such measurements can be effected.

The price of these sub-standard inductances is 25s. each, and the special coil holder costs 5s. 6d.

DALLOW MONODIAL CABINETS

DESIGNED especially for the Monodial superheterodyne receivers, these radio-gramophone cabinets bear the hall-mark of the craftsman, being in every respect high class pieces of furniture. Two models simi-



Dallow radio-gramophone cabinets for the Monodial Super receivers.

lar in general outline and size were submitted for our examination. Both are made of walnut, handsomely grained and finished with a high polish.

The receiver compartment, which is in the upper part of the cabinet and just below the motor board, will accommodate a chassis measuring 18½ in. x 13 in., and provides 12 in. head room. Below this is the loud speaker compartment, and here there is ample space for the power pack. A baffle board, cut from ¾ in. thick wood having a hole 7 in. in diameter, is fitted. The back is removable and acoustically open.

Including the recess in the lid the gramophone compartment allows 3½ in. head room, which is ample for all pick-ups and tone arms in general use. A long piano-type hinge is fitted, also a strong supporting arm to hold the lid open. The motor board is ¾ in. thick and made of nine-ply wood walnut finished on top. In view of the thickness of the wood we do not anticipate any trouble arising from cabinet resonance.

Two models similar in general outline and size were submitted for our examination: one is provided with side pillars inlaid with thin strips of brass and costs £6 6s., while the other is relieved with bands of a darker veneer down the sides and round the edges of the lid. This model costs £5 19s. 6d.

The makers are The Dallow Manufacturing Co., Ltd., Forge Mill, Milford, near Derby.

McDANIEL MAINS TRANSFORMERS

TWO mains transformers both of the "A" type and designed for use in receivers having up to three valves in number, but excluding the rectifier, have been received from G. C. McDaniel and Co., 154, Hainault Road, Romford, Essex. One comes within the category of the "constructor's type," being fitted with terminals, while the other is a manufacturer's model, or stripped type, in which the various windings are brought out for direct connection to their respective components or other convenient anchorage points.

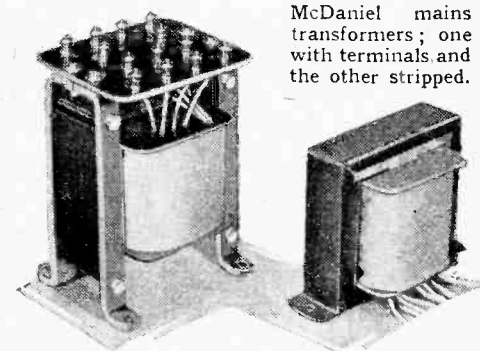
Both designs allow for supplying heater current to three A.C. valves, the filaments of a one-amp. rectifier valve and 250-0-250 volts, nominal, for the H.T. supply. The primary winding is tapped for mains of 200, 230 and 250 volts A.C. at 50 cycles.

Although both types employ the same size stampings the core in the finished model contains nearly 50 per cent. more iron than the stripped type and, as a consequence, is the more efficient of the two. Nevertheless, there is no trace of overheating in the smaller transformer; indeed, both run perfectly cool.

On test the constructor's model provided the following H.T. voltages after smoothing and using a choke of 100 ohms D.C. resistance.

Current.	D.C. Volts.	Current.	D.C. Volts.
10 mA.	340	40 mA.	281
20 "	315	50 "	265
30 "	297	60 "	246

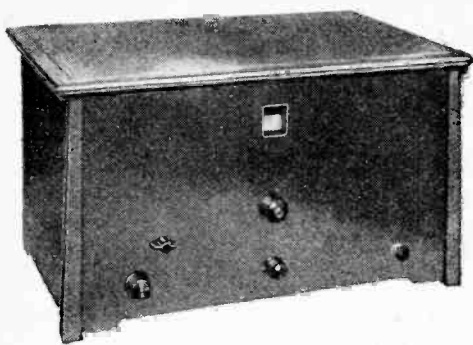
On full load the output from the 3-amp. L.T. winding was 3.82 volts, while the rectifier filament was operated at 3.92 volts.



McDaniel mains transformers; one with terminals and the other stripped.

The high voltage A.C. output was slightly higher in the case of the stripped model, being 276 volts as compared with 254 volts for each half of the winding on full load. The L.T. supplies were not materially different, for with 3 amps. flowing in one case and one amp. in the other the measured voltages were 3.88 and 3.85 respectively.

The price of the finished model is 22s., and that of the stripped type 12s.



FERRANTI Class "B" Band-Pass Four Constructors' Receiver

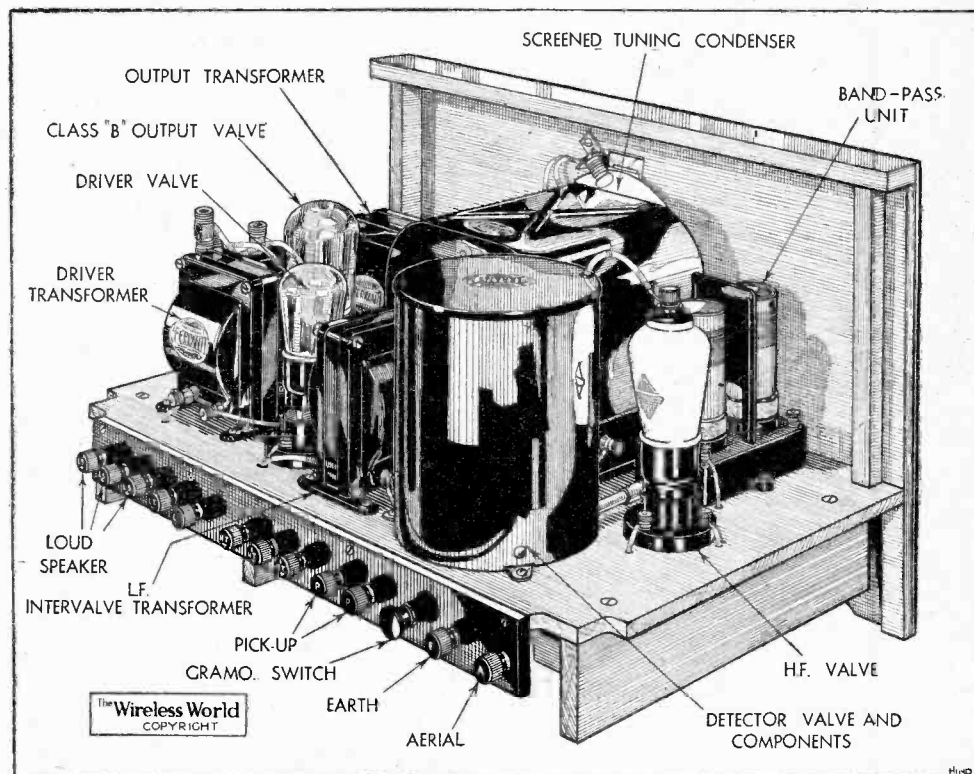
Four-valve Battery Set Embodying the Latest Technique

FEATURES. Four-valve circuit with one H.F. stage transformer coupled to regenerative grid detector, which in turn is linked by a driver stage to a Class "B" output valve. Undistorted output, 2 watts; average H.T. consumption about 10 milliamperes. Single-tuning control with illuminated dial and wavelength calibration. **Price:** Set of components, with valves, £12 17s. Without valves, £10 10s. 9d. Cabinet and baseboard, 30s. extra. **Makers:** Ferranti Ltd., Hollinwood, Lancs.

THE straight set with one H.F. stage boasts an easily understood technique, and this is, at least, one of the reasons why it still has many adherents. It is sensitive enough to provide good entertainment from a large number of foreign stations, and leaves nothing to be desired on the score of quality of reproduction. In the matter of selectivity, however, it can very easily fall short of the required standard unless the tuning scheme contains a filter designed on scientific lines. The band-pass circuit of the Ferranti Constructors' set under review is particularly well conceived, and with regard to its adjustment nothing has been left to chance.

The three-gang condenser and the tuned circuits which it controls are accurately balanced by the makers before being sent out, and no trimming is necessary. As a result, there are no "initial" adjustments, and as soon as the set is put into commission it will give of its best, and the selectivity will be found to be unusually high for this type of circuit.

There are other virtues. The power output from the Class "B" valve is enormous, although the H.T. current consumed is com-



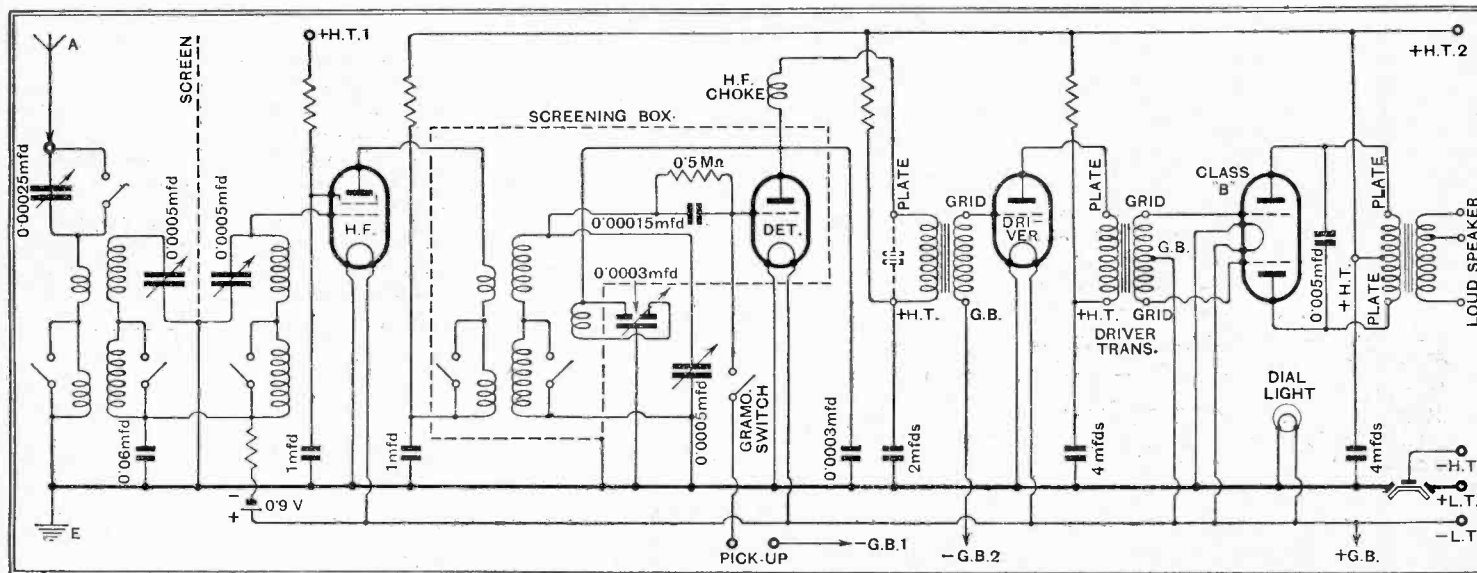
paratively small. A silver voltmeter test indicated that during a 7½-hour programme of typical composition the total current taken by the receiver averaged under 10 mA., showing that quite a modest-sized H.T. battery can be used, even when about 1½ watts speech are being dissipated.

The circuit is straightforward, and there are no economies which might lead to instability when the H.T. battery begins to age. A lavish decoupling scheme is to be found in the H.T. feeds, and double-wound transformers are used in the band-pass primary and the H.F. intervalve coupling. Reaction applied to the intervalve coupling was found to be progressively effective,

and practically no backlash was observed.

An AF5 intervalve transformer links the detector to the driver valve, and the latter feeds into a 1-to-1 ratio Ferranti driver transformer with a secondary of commendably low D.C. resistance (80 ohms per half). The output transformer provides three ratios for use with low-resistance speech coils, and correct matching is best found by trial and error. The four valves required are the Cossor 220SG, 210HL, 215P, and the new Ferranti HP2.

For excellence of components and general high standard of performance the Ferranti Class "B" constructors' receiver can be recommended with confidence.



Complete circuit diagram. Comprehensive decoupling in the anode feeds ensures absolute stability.

Broadcast Brevities



An Exciting Test

THERE is quite a stir in the B.B.C. Engineering Department over the forthcoming tests in synchronising West National with the National transmitter at Brookmans Park on a common wavelength of 261.5 metres. I understand that the first test may be made on or about June 1st.

Mr. Ashbridge's Secret

The two transmitters will, of course, employ tuning-fork control in order to maintain absolute synchrony. The system works quite satisfactorily where distant stations on low power are concerned, and I have heard of no complaints regarding the synchronising of Scottish National and Bournemouth on the 288.3 wavelength; but two 50-kW stations within 150 miles of each other offer a more formidable test. Mr. Ashbridge, Chief Engineer of the B.B.C., declined to prophesy when I asked him whether the forthcoming experiment was likely to prove successful. "What if it should fail?" I queried. "Even then," said Mr. Ashbridge, "we have something up our sleeves."

Possibilities

The remark suggests limitless possibilities, but the Chief Engineer declined to disclose his plans in advance.

Is it possible that the B.B.C., aided by their good friends from the Post Office, will secure another wavelength for Britain at the Lucerne Conference? Or will the B.B.C. engineers try first one wavelength and then another to synchronise with West National? I think we must look upon this problem as another of those secrets which the B.B.C. Chief Engineer must always be "holding up his sleeve."

By Our Special Correspondent

Listeners Abroad

When the B.B.C. embarks on a wavelength experiment interest is not confined to listeners in this country. Who knows how many zealous Czechs in Moravska-Ostrava may be profoundly agitated by the synchronisation tests on 261.5 metres? If the engineers decide to synchronise with North National instead, it might mean misery in Tallinn or Zagreb.

A Pious Hope

By the way, the new West Regional station stands on quite the most picturesque

Our title illustration shows the new West Regional Twin Wave Station of the B.B.C. at Washford Cross near Minehead, Somerset. Regular transmissions are now made on the Regional wavelength of 309.9 metres and tests will shortly begin on the National transmitter, which is to share with London National the wavelength of 261.6 metres.

of the sites occupied by the B.B.C. high-power stations, and I sympathised with the courteous engineer who escorted me round the building last week when he breathed the hope that one day he might be given a resident appointment!

Cardiff Dwarfed

As the photograph on this page shows, the new station is situated in rich pastoral country. Half-way up the 500ft. masts one can see the Bristol Channel, and, to judge by appearances, the transmissions should have a wide sweep over a service area which will make the range of the present Cardiff transmitter seem insignificant. Wales should

certainly have nothing to grumble at either on the transmission or programme sides.

From the remarks of the West Regional director, Mr. E. R. Appleton, during the Press visit, it really looks as if the B.B.C. will please everybody!

Ironical

By the way, while Mr. Appleton was uttering words of cheer for the benefit of listeners in the West, I understand that his house in Cardiff was being burgled, thieves making off with his wireless set. I wonder why?

A Chat with Control

ONE of the most modest of all departments at Broadcasting House, the Balance and Control Section, has suddenly found itself in the full glare of notoriety, in consequence of the misdirected energies of certain critics whose musical knowledge is probably far in excess of their technical attainments.

Last week, determined to get at the truth, I dived down into the bowels of the earth in Portland Place and chatted with the engineer who was then engaged in rehearsing for the evening's vaudeville concert.

"Musicians First"

Yes, *rehearsing*. For the Balance and Control Department rehearse just as conscientiously as conductors, singers and vaudeville stars. It was interesting to note the psychological reaction when I quoted to the engineer the remark of one of my correspondents: "The truth about Balance and Control is that it is in the hands of engineers, not musicians."

Speaking (as they say in the police courts) very slowly and in tones of great emotion,

the Balance and Control official said: "We in this section are musicians first and engineers afterwards."

The Ear Test

If certain critics could have stood with me beside the official at the control desk they would immediately have realised the truth of this remark. Balance and Control officials do not employ the meter, but rely entirely upon what they hear on a moving-coil loud speaker.

Two members of the section are ex-musical directors of the B.B.C., and every one of them is trained to read a full orchestral score.

Two Sections

Actually, the work of Balance and Control in the B.B.C. is divided into two big sections, the first dealing principally with the musical programmes such as opera and orchestral concerts, while the other branch covers the production side and is concerned with vaudeville, drama, and even talks. But both branches observe the same technique.

In the Silence Room

As we sat in the little Silence Room looking on to the vaudeville studio while Danny Malone and Ronald Frankau were heard in turn on the loud speaker, the official described just how the job is carried on.

Actually, there is truth in the rumour that more than one hand is at work controlling the music on its journey from the microphone to our loud speakers, but the main responsibility lies on the shoulders of the man in the Silence Cabinet who controls the minute currents which are passed to the A amplifier.

The Man Upstairs

The engineer in the control room upstairs watches the input to B amplifier, checking modulation by the familiar ammeter needle. At times some adjustment may be necessary at this stage, but, in the main, it is the Balance and Control official who narrows down the microphone output to the 28-decibel range which is the maximum which can be comfortably handled by a modern transmitter.

Marking the Score

The whole art of Balance and Control consists in securing a proportionate increase or decrease in volume. This is one reason why musical scores are carefully marked in advance so that when a moderately loud portion of the music is being handled there is still a sufficiently large decibel range in reserve to cope with the double sforzando which may suddenly leap out ten bars later.

Co-operation

One cannot fail to be struck by the atmosphere of co-operation between producer, artistes, and the Balance and Control section. The artistes seem to realise that the man in the Silence Cabinet has one aim in view: to produce the best possible results, and this is why, at the end of every "turn," the performer looks enquiringly through that little oblong window to see how his or her efforts have "got over."

For the Disgruntled

When I returned to ground level and daylight I felt more than ever convinced that listeners have nothing to worry about where Balance and Control is concerned, and that

the disgruntled few would learn a bitter but salutary lesson if they were compelled to listen to an uncontrolled concert with the 'phones padlocked and immovable.

The Late Mr. Stobart

THE death of Mr. J. C. Stobart has aroused real regret among the B.B.C. staff, among whom this strong, quiet, humorous man moved as a genuine friend.

Mr. Stobart was in Broadcasting House only a day or two before he died.

A Great Worker

Most people will remember him as the author of the "Grand Good Night," the last of which he gave at the beginning of this year in rather poignant circumstances, the microphone being installed beside his sick-bed. But, of course, the "Grand Good Night" was only a side issue in Stobart's activities; he put in an immense amount of work for the furtherance of the B.B.C.'s religious aims, in the general supervision of the Children's Hour, and the "Week's Good Cause" appeals.

Opera from Munich

I HEAR the B.B.C. are negotiating for relays of grand opera from the Munich National Theatre during the latter half of July and the beginning of August.

Until, in fact, the "Proms" begin.

Music and Drama from Canterbury

THE Festival of Music and Drama which is to be held in Canterbury Cathedral in June will provide two relays, one for Regional listeners, on the 7th, and the other

Does this Help?

PEOPLE are still trying to solve that eternal riddle: the identity of A. J. Alan. Here is another clue. The famous raconteur signs his cheques "A. J. Alan."

Tunes from the Talkies

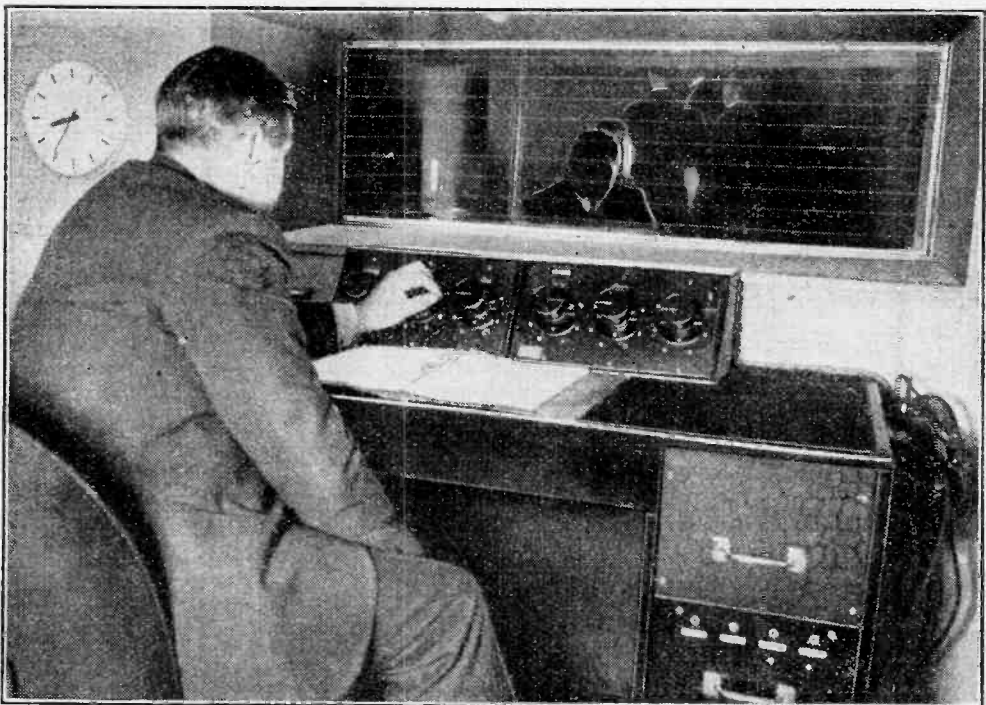
ANOTHER special programme is under discussion by Henry Hall and the B.B.C. Dance Orchestra for May 27th. Its title, "Tunes from the Talkies," reveals its nature, and, as the theme songs of many famous talkies are the daily backbone of a large number of dance-band performances, Henry's programme is certain to be well received.

Forty Years On

BOURNEMOUTH Municipal Orchestra will broadcast a special programme on May 21st to mark the completion of forty years' unbroken service under Sir Dan Godfrey. The orchestra's record includes 32,000 concerts, of which 2,600 have been symphony concerts, 600 performances of Beethoven symphonies, and 300 of the symphonies of Brahms. Ben Davies, who first sang with the Bournemouth Municipal Orchestra in 1893, will be the soloist on May 21st, and the programme will include Festival March from Tannhäuser, the first item played by the orchestra on May 22nd, 1893.

The Archbishop's Blessing

FROM the Empire Day luncheon at the Junior Carlton Club, London, on May 24th, a speech by Mr. J. H. Thomas, M.P., will be broadcast in the National programme. The Archbishop of Canterbury's blessing on the Empire will also be heard.



BALANCE AND CONTROL. The Chief of the "Productions" department of the B.B.C. Balance and Control Section is here seen in his silence cabinet adjoining the vaudeville studio in which a Ridgeway Parade is being broadcast.

for National listeners, on the 8th. The Regional relay will consist of a Serenade performance and the National relay of an orchestral concert. Adrian Boult will on both occasions conduct Section F of the B.B.C. Orchestra, which will be led by Arthur Catterall.

Why Engineers Look Stern

THE other day a B.B.C. engineer sent an enquirer brief instructions for calibrating a receiver. In the course of his remarks he said: "Place 180° on the dial at 3 o'clock." By return of post came the query: "Do you mean G.M.T. or B.S.T.?"

Correspondence

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

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

British Sets in Egypt

I AM curious to know how it is that here in Egypt it is so difficult to obtain British-made radio sets. American, German, and French sets are easily obtainable at reasonable prices.

With sterling so low, it seemed that the English-made sets would flood the market, particularly as the Empire broadcasting scheme had proved so successful.

One explanation might be that until recently the home manufacturer was not interested in short-wave development, and that therefore the Egyptian market offered no scope.

Although Egypt is not an ideal country for reception on long or medium waves, it is within reasonable distance of a number of European broadcasting stations, in addition to having its own local stations. Short-wave reception is excellent, and the British community is demanding the medium-short wave set which is supplied satisfactorily by the American article. It seems a pity that the Britisher here must receive the Empire broadcast on an American or German set.

Is it the matter of royalties which brings about this state of affairs? Certainly the British manufacturer has to pay no more duty than the foreign competitor to export sets into Egypt, yet here we may purchase a 1933 short and medium, all mains superhet receiver of American manufacture at £25. In view of the fact that the new 20 kW. Marconi-built station will be operating here in the near future, British manufacturers should seize the opportunity of gaining the business thus opened.

V. G. RUSHWORTH.

Cairo, Egypt.

Automatic Volume Control

MR. BISSET seeks to justify the present use of the term Automatic Volume Control, and bids us stick to it. As regards the sticking to it I am afraid there is no option, for anybody who attempted to rule otherwise would provide a first-class revival of the Canute comedy. But I, personally, shall use the term under protest, for I think that Mr. Bisset has failed to make out a case for it.

He admits that the manual volume control, where no other is fitted, serves two purposes: (1) To compensate for inequalities in the signal strength at the aerial end, and (2) to set the volume to the desired level (e.g., to prevent the gentle voice of the announcer from being reproduced at the same volume as a brass band).

Although these functions are often both performed by the same knob, logically they are quite distinct, and are preferably carried out by separate knobs, even if they are both hand operated. The reason is that the detector valve works best at one particular amplitude. The first duty should, therefore, be done by a predetector control, which reduces the signal from all stations to the level that suits the detector, and which would, if there were no further control, work the loud speaker at the greatest volume of which the output stage is capable.

The first control, then, does not alter volume at all, because a constant voltage at the detector means a constant volume from the loud speaker. It is therefore wrong to call it a volume control, even though it may be possible to control volume by it.

The true volume control is preferably a post-detector one, so that even if only sleeping-baby volume is required the detector is still working as before.

Owing to the fact that, except for comparatively nearby stations, it is necessary to have

one hand always grasping the first knob, in the tiresome attempt to compensate for fading, it has been found much better to let this department be looked after automatically. Its sole purpose being to adjust the gain of the pre-detector portion of the receiver to the amount necessary for the station which is tuned, far or near, it is not unreasonable to distinguish it by the term Automatic Gain Control.

The description A.V.C. strictly refers to a device which, as Mr. Bisset rightly suggests, is yet in the remote future, namely, one which automatically adjusts the volume to suit divers circumstances, such as baby's bedtime. The risk of the term being actually required for this purpose would appear to be so remote that there is not much reason for hesitating to pilfer it for application to automatic gain control.

M. G. SCROGGIE.

London, S.E.19.

DISTANT RECEPTION NOTES

SOME time ago I expressed in these notes doubts regarding the possibility of operating, without serious mutual interference, two high-powered stations only a few hundred miles apart simultaneously on the same wavelength. I had particularly in mind the B.B.C.'s scheme for working the London National and the West National on 261.5 metres; but the matter is important to long-distance enthusiasts, for were the system successful here it would probably be tried elsewhere. It was believed that the West National would have so short a range in an easterly direction and the London National in a westerly that, in service areas at any rate, no trouble would be experienced by listeners. The West Regional station has been in action for a week or two now on 309.9 metres and it is possible to form an idea from its doings of the way in which the scheme is likely to work out. A recent trip to the West Country has enabled me to compare the strength with which this station and the London Regional and National are received in different places.

At fifteen miles from Brookmans Park, the field strength of the local stations is, of course, enormously greater. At forty-five miles from Brookmans Park and rather more than a hundred from Washford Cross all three stations are good, though the two London transmitters are still the more strongly received. Tests at these distances lead one to feel that there would certainly be mutual interference between transmissions on the same wavelengths. The most interesting tests were those made at Marlborough, which is almost exactly half way between the West and London centres, being approximately seventy-five miles from each. Here the London Regional is strong and steady, though both the West Regional and the London National fade to some extent at times. With a three-valve set (S.G.-Det.-Power) neither of the last two normally requires any reaction. They are received at equal strength, and there can be no question that one-wave transmissions from Brookmans Park and Washford Cross could not be received satisfactorily.

Good reception is being obtained from the following: Radio-Paris, Warsaw, Motala, Luxembourg and Oslo, whilst Zeesen and Kalundborg are considerably below par at the moment. On the other hand, Moscow RVI (Old Komintern) and Moscow WZSPS (Trade Union) are to be received very well.

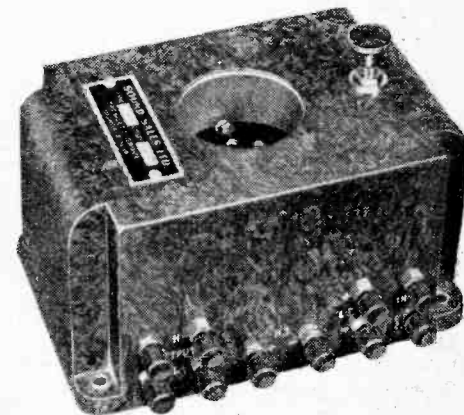
On the medium waves the pick of the stations at present are: Brussels No. 1, Florence, Prague, Langenberg, Lyons Doua, Rome, Stockholm, Leipzig, Strasbourg, Brussels No. 2, Milan, the Poste Parisien, Breslau, Göteborg, Hilversum, Heilsberg, Turin, Trieste and Nürnberg. Other stations which occasionally give a good account of themselves are Hörby, Belgrade, Madrid, Berlin Witzleben, Stalino, Hamburg, Brno, Bratislava and the new Milan transmitter.

D. EXER.

SOUND SALES CLASS "B" UNIT

THERE must be a large number of constructors who contemplate converting their existing battery sets to Class "B" amplification, but who do not wish to make much alteration in the layout or wiring. It is to these that the new Unit, made by Sound Sales, Ltd., Tremlett Grove Works, Junction Road, Highgate, London, N.19, incorporating Class "B" amplification, should make special appeal. The necessary equipment is contained in an attractive brown bakelite case with clearly marked terminals.

Connecting the unit to a receiver is simplicity itself as the existing loud speaker is disconnected and the output terminals of the



Sound Sales "Sound" Unit. The recess is a seven-pin valve holder for the Class "B" valve.

set are taken to the input terminals of the unit. By this means the last valve of the receiver becomes the driver and all the necessary coupling components, including the output matching device, are provided.

This development should prove attractive to battery set users in view of the fact that nearly seven times the normal output is obtained for a small increase in H.T. consumption. The price of the unit is 35s.

The Catkin Valve

More About Construction—A Practical Test



Catkin valves when packed occupy about one sixth the space of their glass counterparts.

If one were to penetrate the fastnesses of any of the service departments of the large wireless set manufacturers and were to enquire what was their chief activity, the answer would undoubtedly be "valve replacement." Although called upon to fulfil the most complicated function in a receiver, the valve, unfortunately, is one of those component parts which lend themselves least to modern manufacturing methods.

The use of glass for the bulb and "pinch" makes close tolerances for these parts difficult, and so from sample to sample there may be slight variation in performance. The glass container, with its irregularly gettered surface, provides a source of electric charges of indeterminate value which may influence to a slight extent the fields between the electrodes. Incidentally, the glass bulb is fragile, increases bulk, and is a hidden source of gas. The glass pinch of orthodox design has to accommodate so many leads in such a small space that there are measurable capacity effects. Furthermore, the capacity is not "pure," and can be looked upon as a condenser having a resistance of high value shunted across it.

Details of the unshielded S.G. valve showing the rubber mounting.

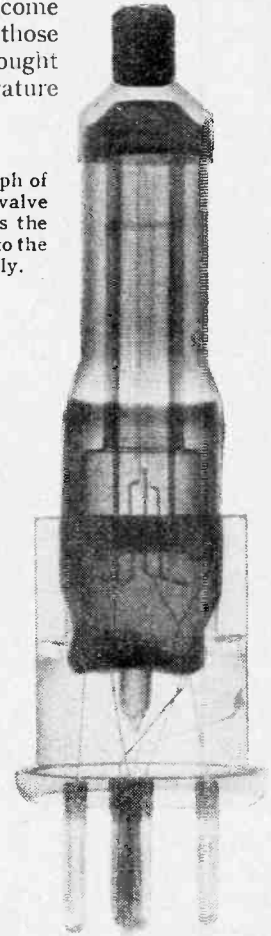
By almost entirely eliminating glass and introducing an all-metal construction into their new Catkin valves, the Marconi and Osram companies have instantaneously removed these and a num-

ber of other disadvantages. Not content with this complete breach of tradition, the makers have also made radical departures from the conventional in electrode assembly which have resulted in a hitherto unattainable consistency of characteristic and a considerably greater robustness.

A Catkin screen-grid valve without any packing whatsoever (photographed elsewhere in this issue) has survived the return journey by post from London to Aberdeen—an ordeal which, without

number of whistles had been reduced, pointing to a welcome reduction of those harmonics brought about by curvature

An X-ray photograph of the screen-grid valve which clearly shows the rigid support given to the electrode assembly.



of characteristic. Each valve in the set could be tapped with the metal end of a screwdriver and practically no microphony was observed. As an oscillator the MH4 gave normal results, and the reasonably long grid base of the VMS4 proved quite satisfactory for A.V.C. General sensitivity was above normal, this being probably due to reduced valve base losses and therefore decreased damping of the various tuned circuits. The Catkin pentode was a distinct improvement over the glass type, and approximately 3 watts speech output could be safely extracted from it owing to the greatly improved cooling of the anode.

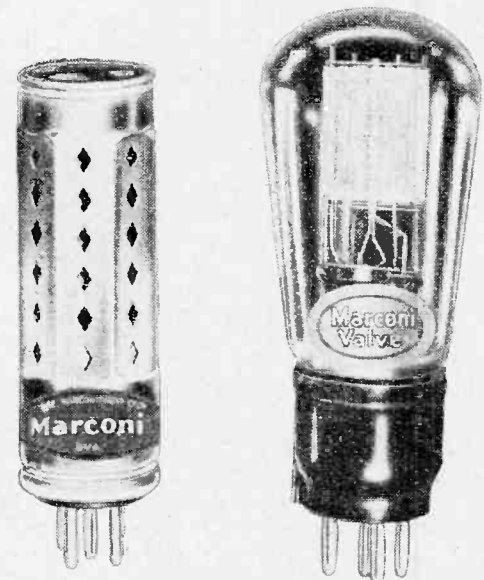


The triode and pentode (unshielded). The rapid cooling of the anode in the case of the pentode gives an increased A.C. watts dissipation.

offence to the Post Office, involved more man-handling and rough usage than an ordinary listener would give it during its life.

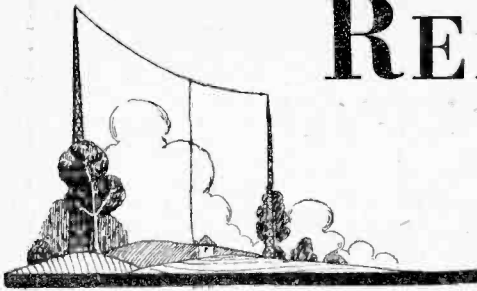
Tested in a Receiver

Although the electrical characteristics of the new valves are nearly the same as those of their glass counterparts, it was anticipated that the collective result of so many mechanical improvements would mean that a receiver in which these valves were substituted would give a better all-round performance. An experimental superhet. was fitted with Catkins, and it was at once apparent that the



A screened Catkin compared with a glass-bulb valve of similar type.

READERS' PROBLEMS



Grid Circuit Decoupling

IN the "Hints and Tips" section of *The Wireless World* for April 14th it was suggested that high-capacity low-voltage condensers of the dry electrolytic type might with advantage be connected in shunt with the self-bias resistance of an L.F. or output valve. The object is to avoid loss of bass, more particularly with resistance-coupled or resistance-fed auto-transformer amplifiers, with both of which ordinary decoupling systems are ineffective.

Some uncertainty seems to exist as to the precise type of circuit for which this method of decoupling is applicable, and a querist asks us to give a circuit diagram.

The arrangement in question is illustrated diagrammatically in Fig. 1 (a). The use of a condenser in this manner must not be confused with that shown in diagram (b), which represents the ordinary decoupling condenser, which, in the case of parallel-fed auto-transformer coupling, would not have the desired effect.

Until we become more accustomed to the use of electrolytic condensers, it will perhaps be as well to emphasise the fact that the correct polarity of the terminals of these condensers must be observed when making connections. In grid bias circuits the negative terminal must, of course, be connected to the earth line of the receiver, the positive

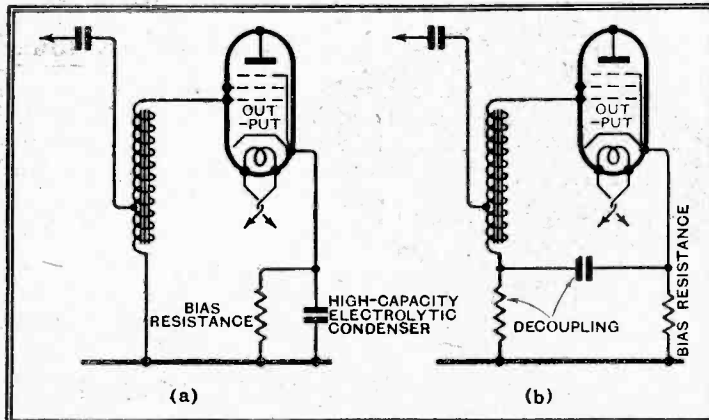


Fig. 1.—Diagram (a) shows the use of a high-capacity electrolytic condenser for grid-circuit decoupling. The more conventional resistance-condenser decoupling circuit is shown in diagram (b).

terminal being joined to the cathode, or (what amounts to the same thing) to the centre point of the potentiometer or filament transformer, where a directly heated mains-operated valve is employed.

S.G. Voltage

WHEN variable-mu battery valves are used, it is generally best to feed their screening grids directly from a suitable tapping point on the H.T. battery. The use of a potentiometer network, as in mains sets, is uneconomical, for the reason that, if reasonably constant voltage is to be maintained, the potentiometer must be of such a low resistance that it consumes considerably more current than the valves.

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.

This is in answer to a reader who asks whether it would be worth while to fit a potentiometer for feeding the screening grid of his single H.F. stage. The only advantage to be gained by doing this is that the number of leads to the H.F. battery would be reduced, and so perhaps the operation of replacing batteries would be simplified. It is worth while observing that the designers of commercial sets, who have to study these matters, do not apparently consider that the extra current consumed by the potentiometer is justified, even when the set is to be used by the uninitiated, for whom everything must be made as simple as possible.

Insulation and Capacity

WE are asked to repeat the method of procedure for testing condensers by means of head telephones and a dry cell.

Although not entirely conclusive, this method of testing is to be recommended, as it gives an indication of satisfactory insulation in the condenser, and also shows in most cases that at least some capacity exists in it—in other words, that the condenser is not disconnected internally.

The procedure is to join the phones and battery in series across the terminals of the condenser under suspicion. On completing this testing circuit, a click should be heard in the phones, but if everything is in order there should be no appreciable sound on breaking the circuit.

The click at "make" is produced by the flow of charging current into the condenser; its loudness will depend on capacity, and it will be barely audible when dealing with small mica condensers. Any click that may be heard on breaking the testing circuit is

an indication that direct current is flowing through the condenser, and so its insulation is defective.

One Set : Two Speakers

A CORRESPONDENT, who normally uses a moving-coil loud speaker with his receiver, finds that, as a result of temporarily connecting a moving-iron instrument in parallel, the reproduction of the original speaker is adversely affected; there is a serious falling off in both quality and quantity. We are asked to say whether it is possible, by adopting a special method of connection, to obtain good results from both loud speakers simultaneously.

In practice we are afraid that it will be

found virtually impossible to obtain normal quality from both of the loud speakers. However, as it is probable that the highest quality of reproduction will not be expected from the moving-iron instrument, we suggest that it should be joined in the manner indicated in Fig. 2. Provided that the impedance of the moving-iron loud speaker is high at all frequencies, as compared with

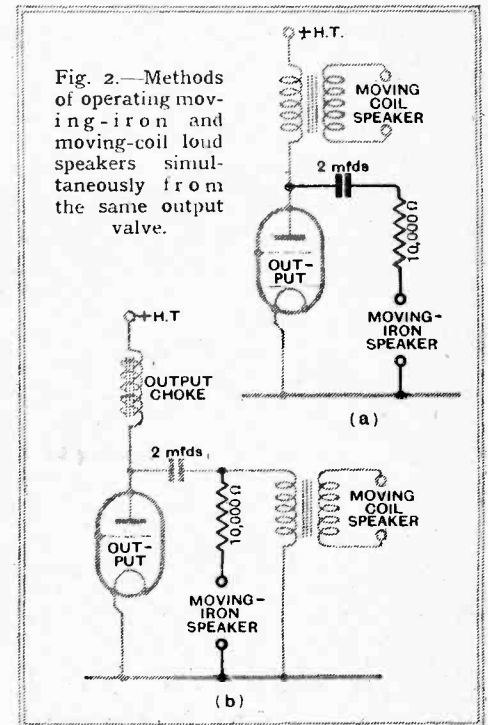


Fig. 2.—Methods of operating moving-iron and moving-coil loud speakers simultaneously from the same output valve.

that of the original instrument, the quality and volume of the latter should not be noticeably affected. The impedance of the extra loud speaker is increased artificially by inserting a resistance as shown; the value of this resistance is best determined by trial, but it will probably be in the neighbourhood of 10,000 ohms.

Although this arrangement will generally prove to be a practical one, it cannot be put forward as perfect; bass reproduction of the moving-iron loud speaker is bound to suffer. The general volume level will be reduced as well, but this may not matter, as this type of loud speaker can seldom deal with anything like the full output of a modern high-power valve.

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.

The Wireless World

THE
PRACTICAL RADIO
JOURNAL
23rd Year of Publication

No. 717.

FRIDAY, MAY 26TH, 1933.

VOL. XXXII. No. 21.

Proprietors: ILIFFE & SONS LTD.

Editor:
HUGH S. POCOCK.

Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1.

Telephone: Hop 3333 (50 lines).
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.

Telegrams: "Cyclist, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:

Guildhall Buildings, Navigation Street, 2.

Telegrams: "Autopress, Birmingham." Telephone: 2970 Midland (3 lines).

MANCHESTER: 260, Deansgate, 3.

Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.

Telegrams: "Iliffe, Glasgow." Telephone: Central 1857.

PUBLISHED WEEKLY. ENTERED AS SECOND CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:

Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other countries abroad, £1 3s. 10d. per annum.

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.

CONTENTS

	Page
PROGRAMMES FROM ABROAD, pp. I—XXV	
Editorial Comment	367
Five-metre Work for Amateurs	368
Unbiased	370
Choosing the Right Resistance	371
"Plan de Lucerne"	373
Laboratory Tests	374
News of the Week	375
Practical Hints and Tips	376
Broadcast Brevities	377
How the Superhet Works	378
Letters to the Editor	380
Alba Superheterodyne	382
Readers' Problems	384

EDITORIAL COMMENT

Empire Broadcasting

Reception Lags Behind

EMPIRE Broadcasting is not making the progress which it was hoped would result as soon as regular programmes were inaugurated.

Although the service is undoubtedly appreciated in many parts of the Empire, the station is not so consistently and satisfactorily received on individual sets as to encourage any but the more enthusiastic sections of the population to invest in a short wave receiver and try to get the programmes regularly.

Frankly, our sympathies are largely with the people who, although they would like to hear home transmissions, do not feel justified in acquiring a special set for the purpose until they can be satisfied that reception will be reasonably satisfactory.

The B.B.C. has gone to considerable expense and effort to establish the short wave transmitter and distant reports indicate that the station is capable of giving a very good average account of itself.

It seems to us that the next step is really up to the broadcasting organisations situated locally throughout the Empire. If it is for them to arrange for adequate reception facilities so that the Empire programme can be relayed on their local transmitters as required. Reception on a proper basis, where space and facilities are not restricted, can be very much more satisfactory than reception by private persons on individual short wave sets.

If in the Empire local broadcast authorities are apathetic towards the Empire station in principle, then it is not of much use to try to flog the scheme into activity from this end. If the nature of the programmes is responsible for lack of enthusiasm, then let us know about it so that

something may be attempted to remedy the state of affairs.

Whatever may be the cause of the apparent lack of warmth of reception accorded to the Empire station in some places, let us get to the bottom of it and not allow apathy to kill a scheme so long projected and of which such great things were hoped.

International Broadcasts

A Good Example

WE may, we hope, be entitled to take to ourselves some small measure of credit for certain recent activities of the B.B.C. In February of this year we called attention to the motto of the B.B.C. "Nation Shall Speak Peace Unto Nation" and asked whether the Corporation were living up to this motto as fully as they might.

We said that there was ample scope for the B.B.C. to make their motto effective by arranging for talks to be broadcast in languages other than those of the country of origin.

The B.B.C. gave us, last week, another excellent example of what can be done in this way when they relayed from Berlin a description, in English, of the scene at the assembly of the Reichstag on the occasion of the pronouncement by the German Chancellor, Herr Hitler, of the German Government's policy and an account of the speech itself. We congratulate the B.B.C. on the truly excellent way in which this broadcast was conducted, although we regret that as, no doubt, this broadcast was fixed up only at a late hour, insufficient publicity for it may have resulted in the speaker having a far more limited audience than would otherwise have been the case. May we hope that the B.B.C. will do all in its power to encourage more broadcasts of this nature.

Five-Metre Work for Amateurs

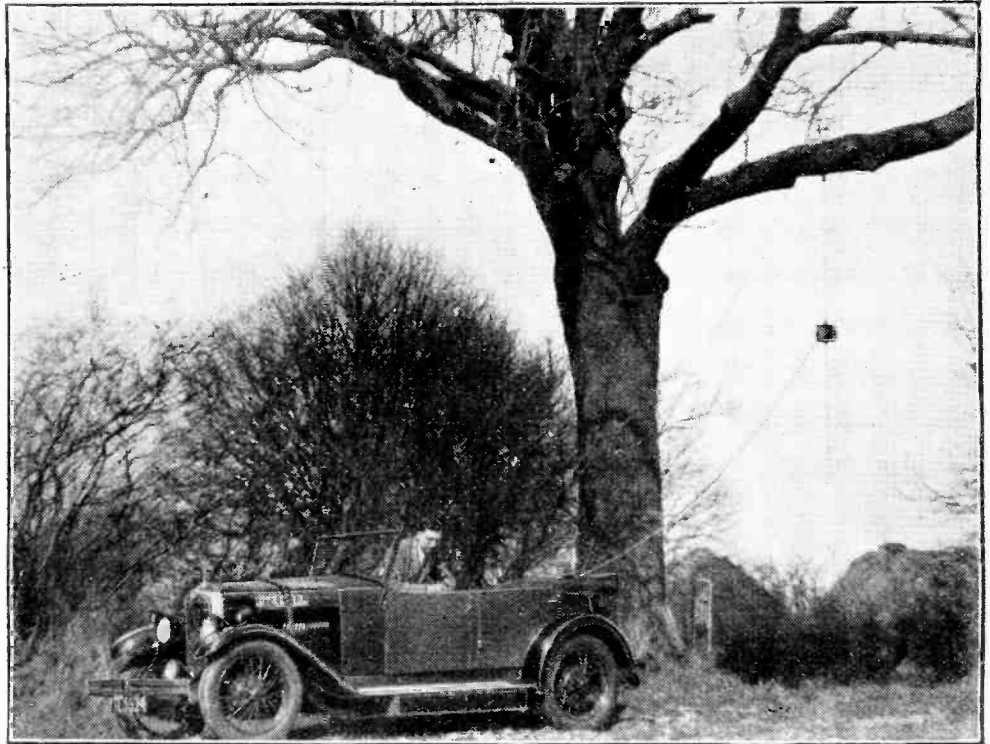
THE approaching summer will offer great opportunities for amateur tests on the ultra-short waves in the open air. The writers of this article, who have done much pioneering work on the 56 megacycle band, here describe some practical arrangements both for transmitters and receivers. The super-regenerative receiver, in their experience, is the pre-eminent type for work on the very high frequencies.

Practical Hints on Ultra-Short Wave Operation

By H. L. O'HEFFERNAN (G5BY)
and S. G. MORGAN (G6SM)

THE ultra-short waves offer to the amateur experimenter such a tempting field of research that it is thought that it would be appropriate to give a brief outline of some of the major problems tackled by the writers during their work on the 56 megacycle (5-metre) band. It is only possible, within the scope of this short account, to touch lightly upon these features, and practicalities are chiefly dealt with in order to encourage others to emulate our example.

Let us begin, in logical sequence, with modulating systems. The method used almost exclusively up to the end of 1932 has been the straightforward Heising, or constant current, system (Fig. 1a). Until recently the great bugbear of field work has been the need for the provision of an adequate source of H.T. current for such modulation, which imposes a steady, heavy drain on the H.T. supply. Moreover, to secure 100 per cent. modulation of the high-frequency carrier, the modula-



An impromptu aerial which has been found effective. It consists of a half-wave antenna with the transmitter mounted in the centre, fed with filament and modulated high-tension current through a three-wire cable.

by somewhat expensive dry batteries. Both of these disadvantages are removed at one fell swoop by the employ-

ment of Q.P.P., or Class "B" amplification. As has already been explained in *The Wireless World*, the H.T. consumption of these systems is proportional to the depth of modulation handled. The writers have used Class "B" with marked success; and now that British manufacturers are producing special valves for this purpose, it should prove extremely popular for the modulation of low power transmitters. (Fig. 1b.)

The push-pull circuit described in an earlier debasing of the valves, and by keeping down stray capacities to the minimum, still greater efficiency has been obtained. (Fig. 2.) The use of such self-excited oscillators, in conjunction with the aerial system mentioned later, is the only practicable apparatus for a mobile station; but for a fixed station something more stable is desirable. Self-excited oscillators are very susceptible to fluctuations in supply

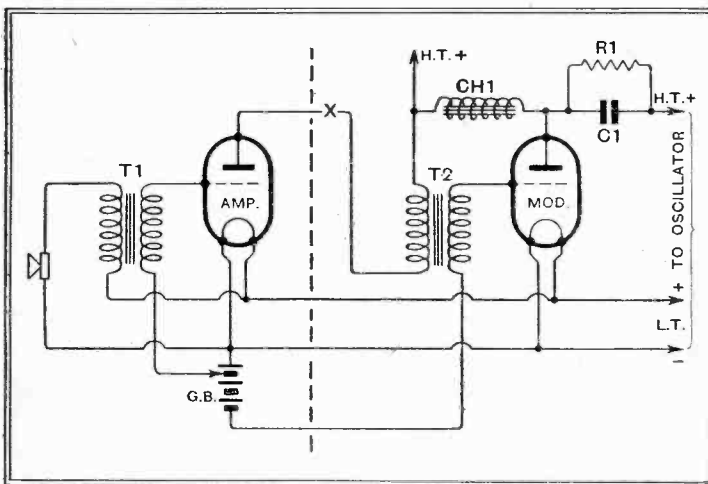


Fig. 1a.—Heising modulation, as used up to the end of last year. C1, 2mf.; T1, microphone transformer; T2, intervalve transformer; CH1, heavy duty 30-henry choke; R1, 1,000-5,000 ohms, according to oscillator load characteristic.

tor valve has to be operated at a higher mean anode potential than does the oscillator; hence the resistance R1 (Fig. 1). Here we have two sources of waste of very valuable H.T. current, especially if—as is generally the case—it be supplied

article¹ has proved itself a firm favourite, and by the insertion of radio frequency chokes in the filament leads, the

¹ "Practical Five-Metre Working," by H. L. O'Heffernan and S. G. Morgan, *The Wireless World*, June 8th, 1932.

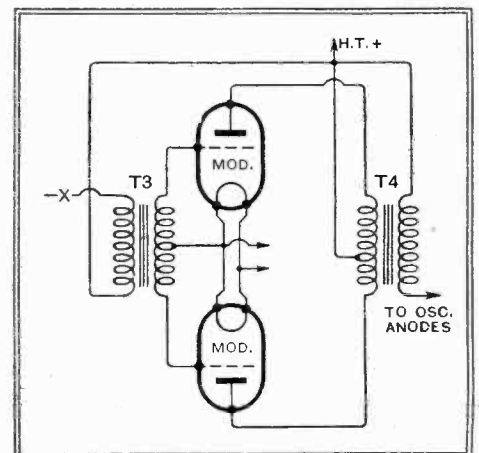


Fig. 1b.—Class "B" modulation. This arrangement is substituted for apparatus shown to the right of the dotted line in Fig. 1a. T3, Class "B" input transformer; T4, output transformer.

Five-Metre Work for Amateurs—

voltages; quite a low percentage of modulation, for instance, causes the emitted frequency to swing between wide limits.

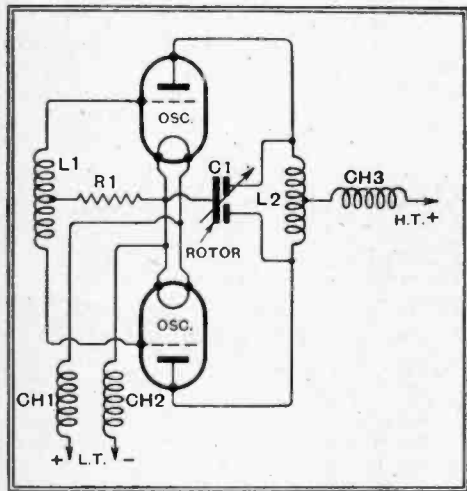


Fig. 2.—Push-pull self-excited oscillator. C1, double stator variable condenser, approximately 50 mmfd. each section; R1, 10,000 ohms; L1, 20 turns 16 S.W.G. copper wire, 1 in. diameter; CH1, CH2, 30 turns each 20 S.W.G. 1/2 in. diameter spaced; CH3, 50 turns 32 S.W.G. D.S.C. 1/2 in. diameter spaced.

The ideal method of frequency stabilisation, crystal control, becomes a most cumbersome business at 56 mc/s.

Electron-coupled Oscillators

The solution seems to lie in the employment of "electron-coupled oscillators," which are becoming very popular in the United States. This system produces oscillations and strong harmonics which

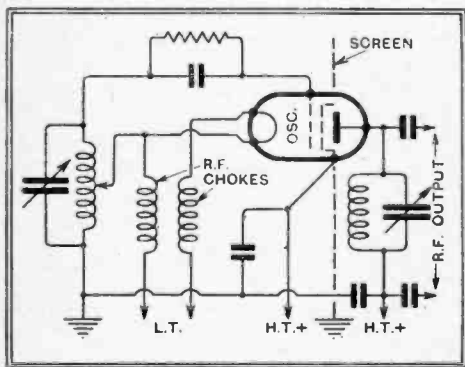


Fig. 3.—"Electron coupled" (screen-grid) oscillator.

possess a degree of frequency stability comparable with that of the crystal oscillator. This development employs a power type of screen-grid valve in a circuit such as Fig. 3. Wide variations of anode voltages and loads have little effect on the generated frequency. While the writers have not yet heard of the employment of this system on the ultra-high frequencies, and have hitherto been prevented from acquiring first-hand knowledge on the subject, because these special valves are not available to British amateurs, the evidence suggests that there is no reason why its utilisation should not be attended by complete success.

The aerial that has been most employed

in the past has consisted of a half-wave antenna with the transmitter mounted in the centre, the whole outfit being hoisted up in the air and fed with filament and modulated high-tension current through a three-wire cable. This has proved most adaptable. The half-wave aerial gives, however, a high-angle radiation, which is undesirable in short-wave work. An ideal

low-angle radiator would consist of a vertical wire, as in many half-waves long as possible, carrying a uniform current in the same phase. The current distribution in aerials of various lengths is shown diagrammatically in Fig. 4. It must be borne in mind that the middle portions of each half wave (i.e., those portions carrying the greatest current) are productive of most of the radiation. In (b), (c) and (d) the currents in adjacent half-waves are in phase opposition,

and thus tend to neutralise each other at low angles. If, therefore, some means of suppressing the radiation from alternate half-waves could be devised, the desired low-angle radiation would result. This can be done by folding up alternate half-waves as in (e), but the best plan is to fold them as in (f). Now, the previously unwanted currents actually assist the radiation from adjacent sections. This, the "Uniform" aerial, is the nearest approach to the idea mentioned above, and is due to the genius of C. S. Franklin. It will form the basis of a great deal of work by the writers this summer.

Super-regenerative Sets

And now for a few words regarding receivers. The super-regenerative receiver has firmly established itself as the pre-eminent type for work on the 5-metre band. Its only drawback is the high

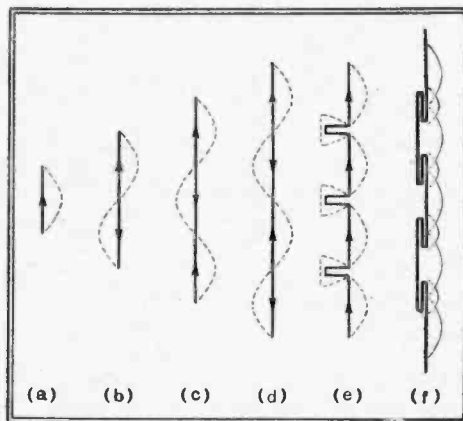


Fig. 4.—The current distribution in aerials of various lengths. The lengths of wire, from left to right, are respectively 1/2, 1, 1 1/2, 2, 3 1/2, 4 1/2 wavelengths.

noise level due to the quenching action and consequent terrific amplification of valve noises. When a transmission is tuned in, however, the noise ceases and the station is heard comparatively free from background! In addition, the broadening effect which negative resistance, like positive resistance, has on positive tuning is a great advantage, as

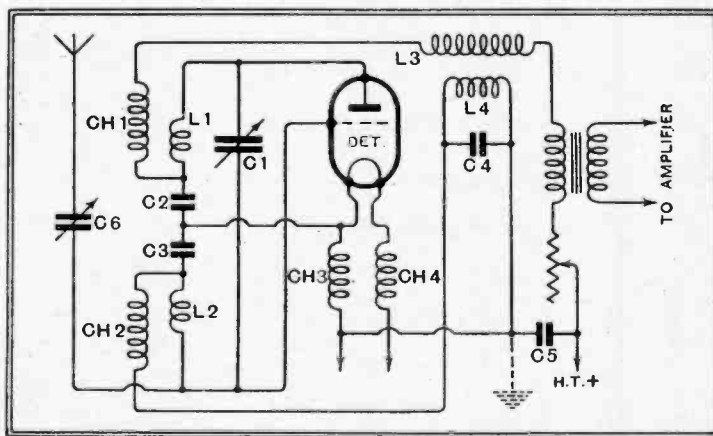


Fig. 5.—A super-regenerative ultra-short wave detector. C1, 50 micro-mfd.; C2, C3, .0001 mfd. each; C4, .002 mfd.; C5, 1 mfd.; C6, 50 m.mfd.; L1, L2, 5 turns 16 S.W.G. 1/2 in. diameter; L3, 1,500 turns of 38 D.S.C. on 1 in. core; L4, 800 turns of 38 D.S.C. on 1 in. core; CH1, CH2, 50 turns of 38 D.S.C. 1/2 in. diameter spaced; CH3, CH4, 30 turns 20 D.S.C., 1/2 in. diameter spaced.

it makes the otherwise tricky task of tuning, in the vast frequency band under consideration, an easy matter.

At G6SM a single valve is made to serve the dual purpose of detector and quencher without any noticeable difference from the results obtained by the use of separate valves. The circuit developed is shown in Fig. 5, and, provided that the radio frequency end of the set is carefully laid out, nobody can fail to obtain good results. An HL type of valve is the most suitable. The anode voltage, which will be found to be fairly critical, is about 50 or 60, and the aerial coupling should be adjusted until regeneration can be controlled over the whole dial. Regeneration is characterised by the commencement of the loud rushing noise, at which point the receiver is in its most sensitive condition. An aerial about 16 feet long is all that is necessary provided that it is fairly high and clear; otherwise, a normal broadcast receiving aerial can be employed.

"THE WIRELESS ENGINEER"

THE June number of *The Wireless Engineer* is of special interest to the more technically minded readers of *The Wireless World*. A contribution of particular practical value deals with the design of a valve voltmeter for audio-frequencies calibrated by direct current.

A new point of view on Ferrocarril coils is discussed in the leading article.

In addition to other contributions, the issue contains abstracts of the world's wireless literature and patents of importance.

Order your copy now from your news-agent, or direct from the publishers of *The Wireless World*.

UNBIASED

Painful

IS it, or is it not, the duty of a newspaper Editor or his underlings to correct errors of spelling and grammar perpetrated by readers in letters intended for publication?

The thought is prompted by the continued misuse by correspondents in the lay press of the verb "to oscillate," which is too often regarded as transitive. Thus, in a newspaper from a western land there appears an indignant letter from a reader complaining that his listening is spoilt because his neighbours on either side persist in "oscillating his set."



Oscillating his set.

Now, in the first place, the obvious grammatical error should have been corrected. In the second place, the letter should have been passed along to the B.B.C. for transmission to the P.M.G. who, with his customary helpfulness where complaints are concerned, would have speedily sent a detector van down to track down the delinquents and haul them before the beak. I must confess, however, that it is the grammatical rather than the technical aspect of this matter which pains me most.

"The Light that Never was on Sea or Land"

FROM America comes a truly astonishing story which only shows, as my Aunt Matilda used to say anent the aeronautical experiments of the Wright brothers in 1903, what happens when mere man attempts to meddle with the affairs of Providence.

It appears that a well-known radio amateur who spends his life delving deeper and deeper into the realms of higher and higher frequencies, had suddenly tired of transmitting and receiving on such childish long wavelengths as a centimetre or so, and had determined to build a *real* short-wave receiver capable of tuning down to a micrometre and below. What a micrometre is I don't know, my education in the decimal system of weights and measures having been sorely neglected, but I presume that it is some sort of poor relation of the metre.

At any rate, the results which he obtained were so astounding that I feel I must quote the actual words of the

By

FREE GRID

American journal from which I learnt this startling news.

"No sooner," says the writer, "had the bozo got everything hunky dory and sat on the key than he was almost blinded by a glare of light rivalling in candle power even that which, as Willie Shakespeare, a well-known British publicity man, reports, B.B.C. engineers use to flood-light the throne of England when King George is sitting there doing his stuff."

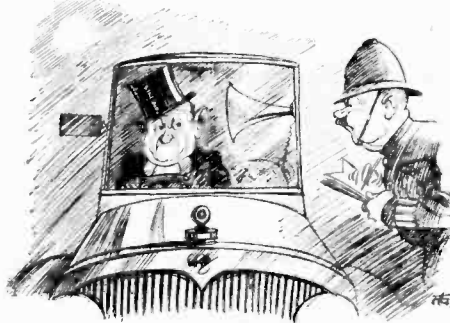
The paper goes on to say that, despite the glare of the light, no part of the apparatus was found to be in a state of incandescence "when investigated by the liquor squad, who scrambled up from the nearest precinct station to see why the old shack was all lit up."

As far as I can see, the whole thing seems to have been a newspaper stunt so beloved of our friends over the water, as I can scarcely believe that the youth can have successfully constructed a transmitter of light waves, using the ordinary principles employed in radio.

Record Runs

THE other day I was beguiled into taking a ride in an outside in cars. The only thing that induced me to accept the invitation was the fact that the car was fitted with all the latest gadgets, including "built-in" wireless, which I had not hitherto had a chance to try out.

I was disappointed at not being able to find anything amiss with either the receiver itself or with its performance, which was really excellent. At the last moment, just as I had despaired of discovering a fault and was about to give a grudging assent to the joyful pæans sung by its owner, I found the chink in his armour and thrust hard home.



In the early hours.

"And how," I remarked, "do you amuse yourself in the early hours of the morning when nothing is on the air, for I perceive that no folding turntable and automatic record changer are provided to fill in these awkward gaps?"

He was, of course, forced to admit that this had not been thought of, but so far

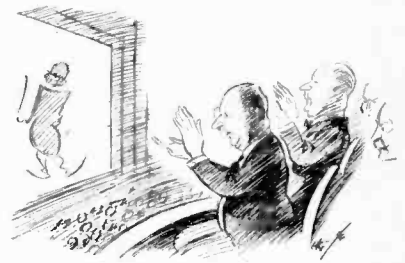
from being depressed about it, the idea seemed to brighten him up. He said that he would get into touch with the makers forthwith, and so be the first motorist with a complete radiogramophone installation in his car.

I was able (as I thought) to take the wind out of his sails once more by pointing out that the motion of the car would joggle the needle off the record. He countered by saying that this would undoubtedly be true of some cars to which average members of the public are accustomed, but would scarcely hold good in the case of his own.

He is now negotiating with the gramophone manufacturers, so prepare for the worst.

Loud Clapping

SAY what you will, nothing can convince me that the land of hooch and hustle does not take the cake, the waffle or whatever other offensive article of food is customary over there, when it comes to ideas.



Couple of large clappers.

It appears that the manager of a local leg-show, tiring of paying out high fees to the members of his claue, evolved a scheme whereby he might reduce their number to two. He first fixed up a large number of loud speakers at strategic points in the theatre and coupled them to the input of a large amplifier. The input of the latter device was hooked up to a small microphone cunningly concealed at the back of two stalls behind which sat a couple of large clappers who were the remnant of the original claue.

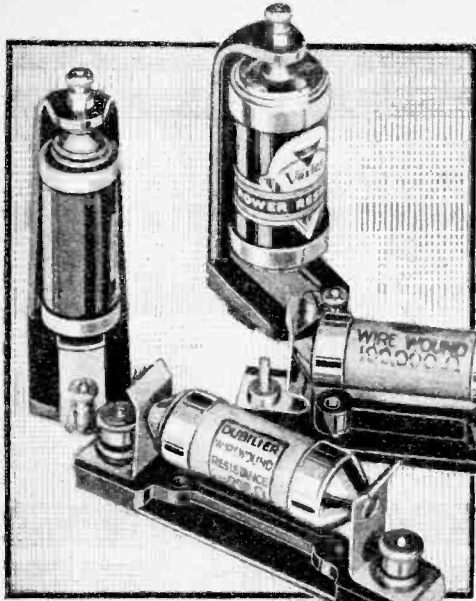
The efforts of these puppets were, of course, amplified and distributed to the various loud speakers, which owing to their aforementioned scientific positioning gave to the assembled mob the impression that a large number of people were applauding, and naturally the mob, with the yes-men complex associated with all crowds, vigorously followed suit.

Now I cannot fathom why they still retained *two* of the original claue unless they went to extreme limits, as they usually do across the Atlantic and insisted on providing an understudy even for the professional applauder.

The thing that really sticks in my gullet, however, is why they couldn't have fed the loud speakers from a gramophone record.

Choosing the Right Resistance

The Importance of the Current-carrying Capacity



A MODERN mains receiver may contain more than thirty resistances and the choice of the correct watts rating for each of them is often a laborious process. By the use of the table accompanying this article, calculation becomes unnecessary and the current carrying capacity and voltage rating of a large range of 1, 2, 3 and 5 watt resistances are to be found at a glance.

THE recent introduction of inexpensive fixed resistances chiefly of the composition type has made necessary a knowledge of watts rating. In the old days almost all fixed resistances were of generous proportions and would carry all currents likely to be met in wireless, but, of course, this meant a very great waste in many cases because one found that one was using a resistance made to carry quite large currents for a purpose in which a very small current only passed through it. For instance, a well-made wire-wound resistance of 100,000 ohms will carry up to about 6 milliamperes, as will be seen by referring to the catalogue of any well-known maker such as Varley or Ferranti, whose names are household words in these matters.

Now more often than not, a high resistance such as 100,000 ohms is only required to carry one or two milliamperes, so that clearly a resistance made on less generous proportions can be used, and it will usually have the advantage of economy in size as well as price. However, to derive full value from the advan-

tages of the new types of resistances, which are usually made to stand a maximum dissipation of either 1 watt, 2 watts, 3 watts, or 5 watts, it is clearly necessary to be able to find quickly and easily the wattage from either the voltage or the current alone, as usually only one of these will be known without making a calculation for the other.

In the usual way, if one of them is known the other can be calculated and then their product gives the wattage. When one is working on a set and there are numerous resistances to be provided, it is better to be able to take a short cut in each case from the known quantity to the wattage. This can best be done by evolving a table of maximum currents and

voltages for all the usual values of the resistances of the 1-watt, 2-watt, 3-watt, and 5-watt types, and then merely choose the component so that it does not exceed the specification for wattage dissipation. The writer has found such a table to be extremely useful, and he suggests that those who, in any case, find calculations rather a nuisance will welcome it.

It is interesting

By
L. E. T. BRANCH,
B.Sc.

to note how such a table is compiled, and the following simple application of Ohm's Law gives this in full. At the same time it is at once obvious why the

maximum wattage dissipation of a resistance does not vary in the same proportion as the voltage or current; thus a 2-watt resistance will not carry double, but only 1.4 times the current that a 1-watt resistance of the same value will carry. Likewise the maximum voltage is only increased 1.4 times for double wattage. These are small points and quite obvious when pointed out, but they are frequently overlooked, no doubt because they are small. The practical man cannot be too familiar with Ohm's Law and its numerous applications which arise at every turn in set designing and frequently in their upkeep. The present case is a very interesting and instructive example of such use of Ohm's Law, and it will pay many new readers to study it.

Application of Ohm's Law

Now Ohm's Law is nothing more nor less than a simple relationship which is found to exist *always* between current, voltage, and resistance; thus, if a voltage E exists across the ends of a resistance R ohms the current in amperes which will flow through the resistance is E divided by R: that is to say, if I is the current in amperes, then $I = \frac{E}{R}$. Hence, since there are 1,000 milliamperes in one ampere we can work this formula for milliamperes by using I for milliamperes and then $I = \frac{E}{R} \times 1,000$. Now power or heat, generated electrically as when a current flows down a resistance, is expressed in watts and is found simply by multiplying the

MAXIMUM CURRENTS AND VOLTAGES

Ohms Resistance	CURRENT CAPACITY (in Milliamperes).				VOLTAGE CAPACITY.			
	1 Watt.	2 Watts.	3 Watts.	5 Watts.	1 Watt.	2 Watts.	3 Watts.	5 Watts.
1,000,000	1	1.4	1.7	2	1,000	1,400	1,700	2,200
500,000	1.4	2	2.5	3	700	1,000	1,200	1,600
250,000	2	2.8	3.5	4.5	500	700	870	1,100
100,000	3	4.5	5.5	7	315	450	550	710
50,000	4.5	6.5	8	10	220	315	390	500
30,000	6	8	10	13	170	250	300	390
20,000	7	10	12	16	140	200	240	310
10,000	10	14	17	22	100	140	170	220
7,500	12	16	20	26	87	120	150	200
5,000	14	20	25	32	70	100	120	160
3,000	18	26	32	41	55	78	95	120
2,000	22	32	39	50	45	63	78	100
1,000	31	45	55	70	31	45	55	71
750	37	52	63	82	27	38	47	62
500	45	63	78	100	22	32	39	50
300	59	82	100	130	17	24	30	39
200	72	100	120	160	14	20	24	32
100	100	140	175	220	10	14	17	22
50	140	200	250	320	7	10	12	16

Choosing the Right Resistance—

voltage across the ends of the resistance by the current in amperes flowing through it. Hence if W is the wattage we have simply $W = E \times I$. Now we know that according to Ohm's Law I is E/R , which is only another way of saying that $E = I \times R$, so that $W = I \times R \times I$: that is, $W = I^2 \times R$. From this formula we can, therefore, find very easily the wattage which a resistance must be capable of carrying if the current is known, and the table conveniently

given here is obtained in this way. If W is one watt the permissible current is $\frac{1}{\sqrt{R}}$, while for a two-watt resistance the permissible current will be $\sqrt{\frac{2}{R}}$; and so on.

Similarly, since $W = E \times I$ and $I = E/R$, we see that $W = E^2/R$, which enables us to find the wattage immediately providing we know only the voltage across the ends of the resistance.

DISTANT RECEPTION NOTES

Are Atmospherics on the Wane?

A GOOD many readers, I expect, have heard Vienna's new Bisamberg transmitter during the last week or two without knowing that they were doing so. I did not at first realise what was happening when Vienna after many evenings of feeble reception suddenly appeared with about the same strength as Langenberg, relapsing on the next night into weakness. The powerfully received programmes were undoubtedly experimental transmissions from Bisamberg. The official opening of the new station is due to take place on the day on which this issue of *The Wireless World* appears. Bisamberg should be a very popular station this summer, for some fine programmes are to be sent out, including not a few relays from the State Opera House.

That troublesome giant, the new Moscow transmitter, has been a real nuisance on several recent occasions. On one evening it was working apparently right on Huizen's wavelength and practically blotted out the Dutch station. On others it has caused trouble by using wavelengths from 1,480 metres upwards. A 500-kilowatt broadcasting station is a monstrosity which should not be tolerated within the limits of either the medium- or long-wave broadcasting

bands. The output rating is, of course, vastly in excess of the maximum agreed upon at the recent Madrid Conference.

I am sorry to hear that the French Government has dropped the Broadcasting Bill of which so much was expected. The situation is rather complicated, but, so far as I understand it, the abandonment of the Bill means that the Government has now no powers to prevent the erection of new private stations or to control the doings of those which are already in operation. Apparently, though, it can prevent a station built without permission from broadcasting regularly.

"All Dressed Up . . ."

This is what has happened in the case of Radio Toulouse. The new station at St. Agnan appears to have been built without the Government's sanction. The old one was burnt down some weeks ago and permission to broadcast is still refused to the new one, though it is ready in every respect to take up the full programme service at a moment's notice.

France was the first country in the world to give a regular broadcasting service. Old hands will remember the daily transmissions from the Eiffel Tower at a time when there

was nothing else to listen to in the way of wireless telephony with the exception of airways messages from Croydon, Lympne, St. Inglevert and Le Bourget, the conversations (usually highly technical) between enthusiastic amateurs, and the Tuesday evening programmes, lasting just one hour, from the old half-kilowatt station at Writtle. It is both curious and unfortunate that despite her pioneer work France should have caused so much trouble in European broadcasting by the uncontrolled and apparently uncontrollable wavelength wanderings of her small private broadcasting stations.

We have had rather a large dose of atmospherics in the course of nearly three weeks of unsettled and rather thundery weather. At the moment of writing the signs are that conditions are improving in this respect, and by all the indications a quiet spell is approaching. Except for the fact that some of the smaller and more distant stations are not worth bothering about, long-distance reception is little affected by summertime conditions. Daylight reception of several stations is still possible on the medium waveband, and in the evening the choice is far wider than it was in winter-time two or three years ago.

The Pick of the Foreigners

Radio-Paris, Zeesen, Huizen, Warsaw and Motala are the best long-wave stations at the moment. Kalundborg is still not too good and Oslo is unaccountably weak.

The two Brussels stations, Florence, Langenberg, Lyons Doua, Rome, Katowice, Strasbourg, the Poste Parisien, Breslau, Göteborg, Hilversum, Heilsberg, Turin, Trieste and Nürnberg are the pick of the medium-wave stations.

D. EXER.

MAKING FERROCART IN BRITAIN

Licences for Coil Manufacture

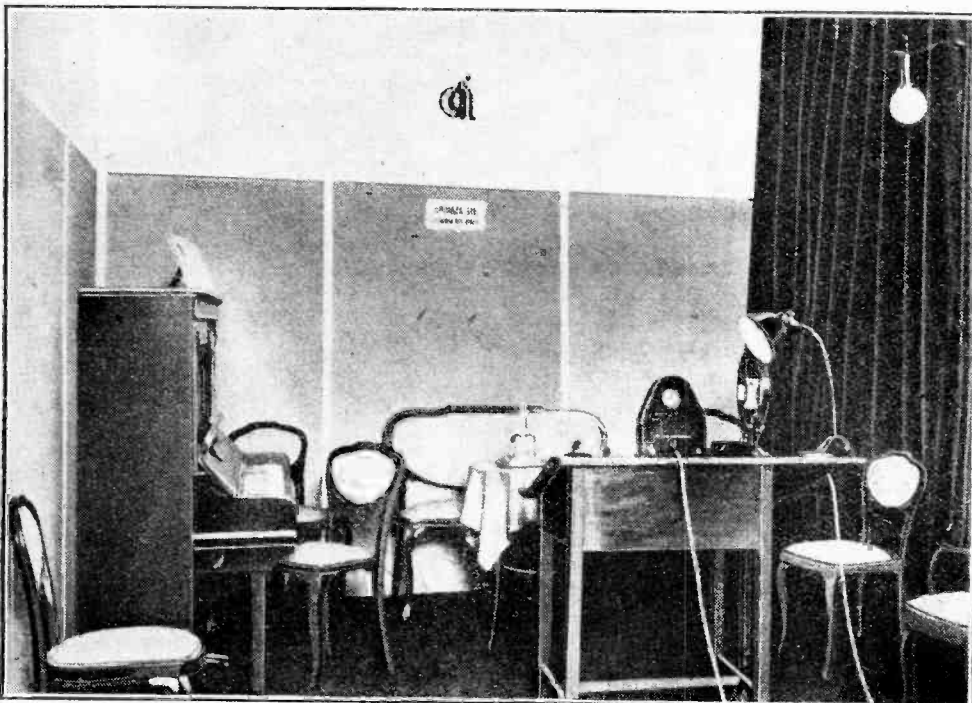
READERS will be interested to learn that Ferrocart, the material which has revolutionised radio coil design, is to be manufactured in this country by the General Electric Co., Ltd.

Definite arrangements for the commercial development of Ferrocart in this country have now reached an important stage. Messrs. Colvern, Ltd., Mawney's Road, Romford, Essex, have acquired the sole right for making and selling Ferrocart components and kits. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, have acquired (a) the sole right of manufacturing Ferrocart material; (b) the sole right to use Ferrocart material for electric communication by wire; and (c) a licence for making Ferrocart coils for their own receivers.

More Licences Pending

A licence for making Ferrocart coils for their own receivers has been acquired by Electrical and Musical Industries, Ltd., Blyth Road, Hayes, Middlesex, while a licence for the use of Ferrocart material for radio transmitting purposes and commercial receivers has been obtained by Marconi's Wireless Telegraph Co., Ltd.

We understand that licence agreements for Ferrocart receiver coils are under negotiation with other prominent firms.



IN POLAND. Space is at a premium in the small studio at Lwow (Lemberg) which serves mainly as a relay to the famous high-power station at Warsaw. Lwow's wavelength is 381 metres and the power is 16 kW.

"Plan de Lucerne"

Secrecy at Europe's Biggest Wavelength Conference

By Our Representative at Lucerne

WITHOUT doubt the Lucerne Conference is the most important yet held in the history of European broadcasting. Significant though it was, the Prague Conference was an affair of European administrations; Lucerne is one of Governments. The Prague Conference tried to sort out existing stations, whereas Lucerne has asked all countries to make their maximum demands as regards stations, waves and power. The countries have responded, and what Lucerne decides will "stay put" until the next world-wide conference five years hence, unless somebody discovers a new type of wave.



The badge worn by delegates at the "Conférence Européenne des Radiocommunications."

The Lucerne Plan is to be a solemn Government undertaking which will be adhered to, not to be discarded at will like the Prague Plan. *No station will be permitted to change its power or its wave without due notice of from three to six months and without the approval of all concerned.*

The Conférence Européenne des Radiocommunications opened on May 15th and will, it is hoped, close on June 1st. The first formality was the appointment of M. Muri, head of the Swiss delegation, as president. M. Keller, head of the radio department of the Swiss Post Office, is vice-president.

Five Committees at Work

The work of the Conference is being done by five committees. The first, presided over by Mr. Philipps, head of the British delegation, is considering the fundamentals of wavelength distribution; the second, under the Italian head delegate, is discussing which stations shall be placed outside the broadcasting band. The third committee, presided over by the Czech chief delegate, is concerned with power limitation. Ministerialdirektor Giesecke, the German chief delegate, is president of the fourth committee, which is actually apportioning the wavelengths; while the fifth committee, under the chief Russian delegate, is looking after juridical questions.

It is regrettable that the Conference has decided to meet almost in secrecy. The Press representatives have to rely largely on official communiqués, which are more formal than informative.

So that readers may be prepared for the "Plan de Lucerne" when it is published in a fortnight's time, I append the tentative plan which was prepared by the Union Internationale de Radiophonie at their last meeting. I understand that the new plan will conform very closely to this proposed list, which clearly indicates that practically every

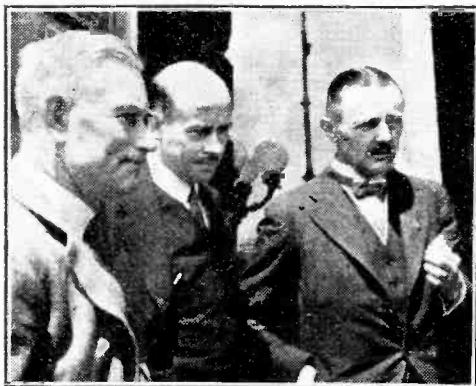


Admiral Sir Charles Carpendale, President of the U.I.R., sharing the optimistic outlook of Dr. Giesecke (Germany) and the Danish delegate, M. Lerche (on right).

European station will undergo at least a small wavelength modification.

PROPOSED ALLOCATION OF FREQUENCIES

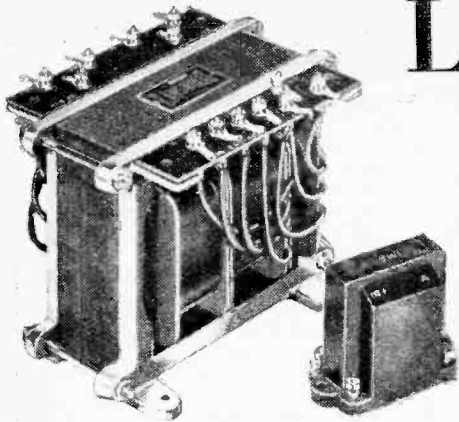
kc s	Stations	kc s	Stations
152	Moscow R.V.I.	895	Toulouse PTT, Simferopol
161	Huizen	904	Bno
170	Radio Paris	913	Sofia
179	Lahti	922	Brussels II, Oukhta
188	Zeesen	931	Barcelona, Moscow
198	Daventry	940	Breslau
207	Moscow RV19, Madrid	949	France, Leningrad
216	Warsaw	958	Göteborg, Groysni
226	Motala	967	West Regional, Gomet
235	Bucharest, Reykjavik	976	Geneva, Torun
244	Oslo	985	Hilversum, Elista
253	Kiev, Boden, Porto	994	Zagreb
262	Kalundborg	1003	North National, Dnepropetrovsk
271	Minsk, Porto	1012	Viiipuri, Valencia
279	Leningrad, Ankara	1021	Heilsberg
287	Moscow, Beromünster	1030	Rennes PTT, Louhkarola
340	Smolensk	1040	Scottish National, Smyrna
349	Kharkov, Finnmark	1049	Bari
358	Petrozavodsk, Budapest II.	1058	Bratislava
367	Samara	1067	France
376	Saratov	1076	Naples, Falun
385	Sverdlovsk, Austria	1085	Madrid
394	Varonej, Monte Ceneri	1094	Kosice, Oran
403	Slovakia	1103	Limoges PTT
412	Moscow	1112	Cernatti
421	Rostov, Osteraund	1121	Härby
430	Oulu	1130	Turin
520	Ljubljana, Krakov, Hamar	1139	Moravská-Ostrava
528	Slovakia, Bolzano	1148	Lille PTT
536	Lwow, Grenoble, Skoplje (Serbia)	1157	Copenhagen
546	Budapest	1166	London National, Alexandrie
555	Ivanovo, Athlone, Palermo	1175	Trier, Frankfurt, Cassel, Freiberg
564	Munich	1184	Nice PTT
573	Madono (Riga), Seville	1193	Prague II.
583	Vienna	1202	Belfast (249.6 metres)
592	Sundsvall, Rabat, Cairo	1211	Trieste
601	Brussels I, Astrakhan	1220	Gleiwitz
611	Florence, Orenburg	1229	Montpellier PTT, Istanbul
619	Trondheim, and Norway relays	1238	Albania
628	Prague	1247	San Sebastian, Kuldiga
638	Lyon PTT, Archangelsk, Valdikavkaz	1256	Nürnberg
647	North Regional, Stalingrad	1265	Norwegian National Common Wave, Salonika
657	Langenberg, Kazan	1274	Belgian N.C.W.
666	Stockholm	1283	Austrian N.C.W.
675	Beromünster, Makhatch Kala	1292	North German N.C.W.
684	Beograd	1301	Luxembourg
693	Paris PTT, Oufa	1310	Hungarian N.C.W.
703	Rome	1319	Swedish N.C.W.
713	Mühlacker, Mourmansk, Krasnodar	1328	Lodz
722	Tallinn, Lisbon	1337	Danzig, Sombor (Yugoslavia)
731	Marseilles PTT, Tchernigov	1346	Norwegian N.C.W.
740	Katowitz	1355	Swiss N.C.W.
749	Soltens	1364	French relays
758	Midland Regional, Odessa	1373	Warsaw II.
768	Bordeaux PTT, Vinnitsa	1382	Swedish N.C.W., Algarve
777	Leipzig	1391	Finnish N.C.W.
786	Helsinki, Coruna, Athens	1400	Roumanian N.C.W.
795	Scottish Regional, Nijni-Novg	1409	Spanish N.C.W.
804	Milan, Syktyvkar	1418	International N.C.W.
813	Bucharest	1427	French N.C.W.
822	Hamburg, Naltchik	1436	German N.C.W.
831	Wilno, Algiers	1444	British N.C.W.
840	Strasbourg PTT, Pokrovsk	1452	Hungarian N.C.W.
849	Poznan	1460	International C.W.
858	London Regional, Tiraspol	1468	International C.W.
867	Graz	1476	International C.W.
876	Boigen, Tunis, Norway relays	1484	International C.W.
885	Berlin	1492	International C.W.
		1500	International C.W. (200 metres)



The B.B.C.'s Chief Engineer, Mr. Noel Ashbridge (in centre), "snapped" with the British Post Office representative, Colonel A. S. Angwin (on right), outside the Conference Hall.

LABORATORY TESTS

NEW RADIO PRODUCTS REVIEWED



Rawswood mains and interval L.F. transformers.

RAWSWOOD TRANSFORMERS

THE mains transformer sent in for test by the Rawswood Electrical Co., Preston New Road, Blackpool, is designed for use in receivers with a maximum of four valves. It is intended to be used with a "C" class full-wave rectifying valve, and carries an H.T. winding giving 350-0-350 volts at a nominal load of 80 mA. The two L.T. windings are rated at 4 volts 4 amps. and 4 volts 2.5 amps. respectively. Tappings are provided on the primary to suit supply mains of 200, 230, and 250 volts at 50 cycles A.C.

The coil is of generous dimensions and rigidly clamped by cast aluminium end-plates with the terminal battens supported on projecting lugs.

Tested with a UU120/350 rectifying valve it provided the following H.T. voltages after smoothing, using a choke of 100 ohms resistance, the output being measured across the second 4-mfd. condenser in the smoothing circuit.

Current.	D.C. Volts.	Current.	D.C. Volts.
mA.		mA.	
10	460	60	382
20	442	70	378
30	423	80	370
40	408	90	362
50	397	100	354

The H.T. winding shows good regulation for a component of this type, and both L.T. windings are satisfactorily adjusted for the respective loads. For example, on full load the 4-amp. winding gave 3.9 volts while the rectifier filament was operated at 3.95 volts. The price of this model is 29s. 6d.

We have tested also a small interval transformer made by this firm. It has a step-up ratio of 1 to 3, and the primary inductance was found by measurement to be 13.7 henrys with no D.C. flowing, 10.6 henrys with 2 mA., and 8.6 henrys with 4 mA. passing through the primary winding. Whether connected in the anode cir-

Selection of Goltone components including H.F. coupling unit, push-pull switches and flexible lead-in strip.

cuit of the valve or used in a parallel-feed circuit, the best results will be obtained with valves of comparatively low impedance. It is available, also, with a 1 to 5 ratio and the price in each case is 4s. 11d.

PIX INVISIBLE AERIAL

EVEN where facilities permit the erection of an outdoor aerial, it is not uncommon to find this aid to reception dispensed with and one located within the building used in its place. For, owing to the high sensitivity of modern receivers, exceptionally good results are possible under these conditions. An aerial for indoor use, which is easy to install and quickly changed if need be, is the Pix Invisible aerial.

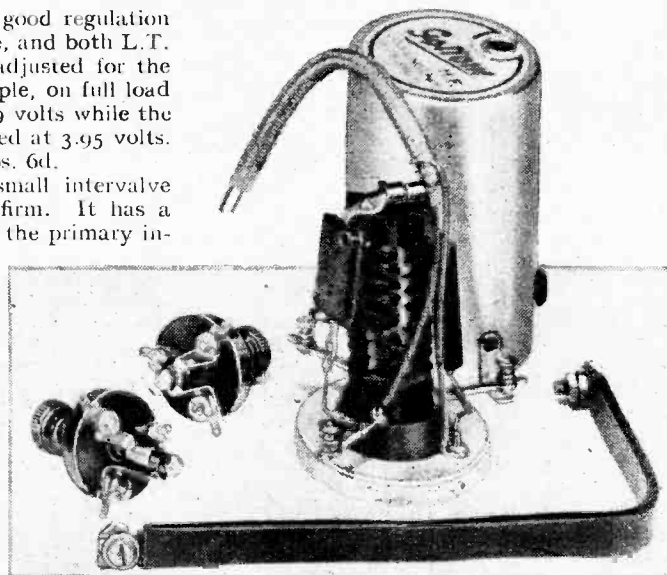
It consists of an adhesive ribbon one inch wide, having attached to its inside surface a strip of aluminium insulated on both sides and terminating in a flexible lead for connection to the receiver.

The Pix aerial should prove very useful in flats, for it can be installed in out-of-the-way corners or run just above or below the picture moulding. The makers are the British Pix Co., Ltd., 118-126, Southwark Street, London, S.E.1, and the price is 2s. for a roll containing 60ft.

GOLTONE COMPONENTS

THE Goltone H.F. coupling unit has been developed especially to simplify the assembly of receivers in which the tuned grid or parallel-feed H.F. transformer circuits are employed. It consists of an H.F. choke of high inductance, a 0.0003 mfd. mica coupling condenser, a 600-ohm decoupling resistance, and a non-inductive 0.01-mfd. by-pass condenser, the whole housed in a cylindrical screened container. In addition, the lead joining the high potential end of the unit to the anode terminal of the H.F. valve is fully screened and earthed. The unit is very compact and requires no more baseboard space than a single valve holder, and the price is 9s.

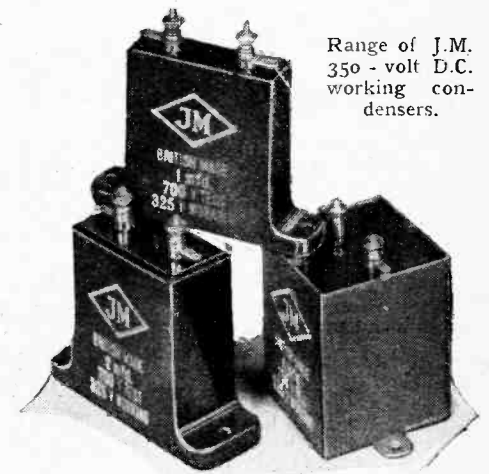
Goltone push-pull switches are now obtainable in several types; all, however, embody a similar style of fitting. A single-hole fix-



ing bush is used with a screwed shank for mounting on panels varying in thickness from 1/32in. to 1/2in. Fibre insulating washers for use with metal panels are included. The contact springs are particularly

robust, and are maintained in correct alignment by shoulders moulded on to the base plate. The single-pole on-off pattern costs 9d., a three-point switch 1s. 3d., and a four-spring single-pole change-over model retails at 1s. 6d.

The latest addition to their components is an insulated lead-in strip. This consists of a tinned wire-woven ribbon encased in tough rubber, and, since it is very flexible, can be located where the rigid-type tube lead-in could not be employed. It is available in 6in., 9in., and 12in. lengths; the price of the 6in. model is 6d. The makers are Ward and Goldstone, Ltd., Frederick Road (Pendleton), Salford, 6, Lancs.



Range of J.M. 350-volt D.C. working condensers.

J.M. CONDENSERS

A RANGE of condensers suitable for use in battery eliminators and mains sets has been introduced by J. Millet, 39, Farringdon Road, London, E.C.1. Known as the J.M. series, they are made in five values, namely, 0.01 mfd., 0.1 mfd., 1 mfd., 2 mfd. and 4 mfd. capacities, the prices being 1s. 3d., 1s. 7d., 1s. 9d., 2s. 6d. and 4s. 9d. respectively.

The normal working voltage is 350 D.C. and they have an adequate factor of safety for they are tested at double the working potential. Tests were made with a specimen of each value and in every case the condenser stood up, without a trace of leakage, to a D.C. potential of 700 volts.

The 4-mfd. size is mounted in a metal case finished green, while the smaller values are contained in moulded bakelite cases also coloured green. Soldering tags are provided in addition to small terminals.

IN NEXT WEEK'S ISSUE

will appear a review of components for Class "B" amplification. A table will be given classifying the driver and output transformers under suitable headings so that correctly matched components can be chosen for the various Class "B" valves now available.

News of the Week

Events of the Week in Brief Review

120 kW from Brittany

THE projected 120 kW. broadcasting station at Thourie, near Nantes, is expected to begin testing at the end of the year.

Short Waves from Uruguay

THE Republic of Uruguay has begun regular short-wave transmissions at midnight (G.M.T.) daily, telephony being on a wavelength of 26.39 metres.

Radio Saves Journeys

IN the Swiss canton of Vaud an Order has been passed prescribing broadcast lessons for certain categories of apprentices who cannot conveniently attend classes in the towns. Fifty receivers have been distributed to various radio educational centres.

More Power from Algiers

RADIO ALGIERS has always striven to be heard outside its own frontiers, and in order that the new European high-power stations shall not drown the programmes, steps are to be taken to increase the power of the transmitter, which at present works with 13 kW.

Better French Sets

NO real novelties were on view at the Paris Fair. Most modern trends in design were represented, including anti-fading devices and automatic volume control. According to a correspondent, the general standard of construction has noticeably improved, while prices show a downward tendency.

Unexpected Visitors

A FEW days ago, when the Belgian station, Radio La Louvière, was transmitting its afternoon programme, the Deputy Public Prosecutor, an examining magistrate, a court clerk, two Post Office technicians, and a police commissioner suddenly invaded the studio, stopped the transmission, and put seals on all the apparatus.

This drastic step might be incomprehensible but for the fact that Radio La Louvière is an unauthorised transmitter, operated in political party interests.

No Licences by Instalments

IN the House of Commons last week Colonel Baldwin-Webb asked the Postmaster-General whether he would be prepared to sanction the payment of the wireless licence fee by quarterly instalments in cases of persons registered as unemployed. Sir E. Bennett, the Assistant Postmaster-General, said, in reply, that the objection to a system of this kind was that it would very greatly increase the cost of collection and accounting. The suggested discrimination in favour of unemployed persons would also lead to difficulties and anomalies in practice. The Postmaster-General regretted that he was unable to make the desired concession.

Real Running Commentaries

ON the summer tourist trains in Belgium loud speakers are now used for running commentaries on the landscape.

Five and a Half Million

THE number of wireless licences in force at the end of April was 5,536,300, an increase during the month of 38,700. During the month 177 prosecutions of "pirates" were successfully undertaken by the Post Office, the total fines amounting to £166.

The R.A.F. Display

WIRELESS will play an important part at the fourteenth Royal Air Force Display, which will take place at Hendon on Saturday, June 24th. No fewer than 200 aircraft will participate, the principal novelty being a new Auto Gyro, in which control is obtained solely by the use of the rotating vanes. The fastest plane at the display will be an experimental high-speed Hawker "Fury," estimated to be capable of nearly 250 miles an hour.

Beer on the Ether

SHORT-WAVE receivers have been installed on 100 beer lorries in New York, the object being to enable orders to be transmitted from the central brewery, thus obviating the distressing spectacle of lorries returning with their tanks half full.

Honest Belfast

ACCORDING to the Belfast postal authorities, there are practically no wireless "pirates" in the Ulster area. In the past eighteen months the number of licence holders has increased by over 12,000, making a total for the Belfast area of over 35,000.

Should Valves be Marked?

WHETHER imported wireless valves and rectifying valves should be required to bear an indication of origin will be discussed at a public enquiry by the Board of Trade at 11.30 a.m. on June 19th and (if necessary) at 10.30 a.m. on June 20th. The enquiry will be held at the Board of Trade Office, Great George Street, London, S.W.1.

Radio and Riots

A NEW risk has been legislated against by the Czechoslovakian Minister of Posts and Telegraphs. The danger lies in the possibility that disturbance of the peace might result from collective listening to propaganda broadcasts from abroad. Therefore the Minister has forbidden reception on loud speakers in public places of speeches emanating from Germany. At present, presumably, listeners may tune in what they like in their own homes.

Echoes from Space

A CLEVER acoustic analogy demonstrating how wireless waves are reflected from the upper atmosphere was shown by the National Physical Laboratory at the Conversazione of the Royal Society at Burlington House on May 17th. At about four feet below a suspended metal plate, representing the Appleton Layer, a ticking device was placed close to a microphone. By means of a cathode-ray tube, the wave form was reproduced visually, and it could be seen at a glance how the wave produced by the direct pick-up of sound by the microphone was followed by the "echo" reflected from the plate above.

Outlaw Stations in U.S.

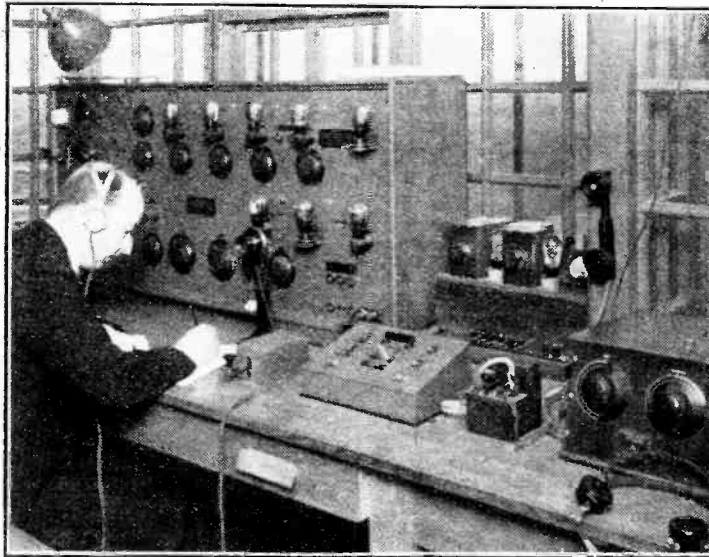
TEXAS is the land of wireless outlaws. According to the American Federal Radio Commission there are at least sixty unlicensed broadcasting stations in the U.S., and half are reported to be in Texas, with Pennsylvania a good second. Many of the stations are on very low power, and it is even believed that in some cases their owners are unaware of the regulations. But ignorance is no excuse, and the Radio Commission, armed with seven high-precision receiving sets and four recording units, intends to wipe out the outlaws and police the wavelengths more thoroughly.

New U.S. Radio Chain

ON or about June 1st America will have a third broadcasting network, the Amalgamated Broadcasting System, Inc., which will compete with the National Broadcasting Company and the Columbia Broadcasting System. The Amalgamated will comprise three New York stations—WCDA, WBNX, and WMSG—to be linked together under the call-sign WMET; WTNJ, Trenton; WPEN, Philadelphia, and other transmitters in Wilmington, Baltimore, and Washington.

"Small Ads." at Whitsun

THE advent of the Whitsun holiday necessitates slight alterations in our printing schedule. Miscellaneous advertisements intended for *The Wireless World* of Friday, June 9th, should reach the Advertisement Office, Dorset House, Stamford Street, London, S.E.1, not later than first post on Friday, June 2nd.



AN AERIAL TELEGRAPH OFFICE. The Marconi directional receiver installed in the control tower of the new Manchester Air Port at Barton Moss. Telegraph and telephone messages are picked up from aircraft in flight.

Eyesight Saving

THE Gramophone Company has solved a problem. Up to a few weeks ago the factories had experienced great difficulty in obtaining girls with fine enough eyesight to see the wire—0.0016 of an inch thick, finer than a hair—which is employed in the coils incorporated in H.M.V. receivers. Now a member of the staff has devised a machine in which the wire is passed through spring pulleys which fly back as soon as a breakage occurs enabling the coils to be wound twenty times quicker.

An official said: "It costs us over £50 per worker for training before the girl is efficient enough to be employed on coil winding. At the moment we have over 250 operatives engaged on this work."

India and the B.B.C.

NEW life has been given to many smaller broadcasting stations centred around the Empire since the inauguration of the short-wave programmes from Daventry. According to an Indian correspondent, the Calcutta and Bombay stations now frequently relay the Empire programmes, and have, in consequence, secured a larger audience. Out of twenty relayed programmes the Calcutta station director classified ten as being well received throughout, nine in which reception was good but marred by fading, and only one in which reception was definitely unsatisfactory. At Colombo, Ceylon, a new station is being erected specially to relay the B.B.C. programmes each evening.

Practical HINTS AND TIPS

AIDS TO BETTER RECEPTION

IN the Class "B" Ferrocarril receiver (*Wireless World*, April 7th) the reaction control condenser C₄ is inserted at the high potential end of the reaction circuit, and therefore its rotor must be insulated from the metal supporting

Reaction Condenser Insulation

bracket. This insulation is actually effected by means of a pair of bushes. Constructors who are using a different type of condenser should bear this point in mind, and if insulating bushes are not available must devise other means of preventing contact between the one-hole fixing bush and the bracket.

WHEN constructing a coil or similar component it is usual, if the job is to be nicely finished, to bring out the connections more or less in the manner shown in Fig. 1 (a). Separate single-ended soldering tags are used as terminal

Soldering Tags

points for the internal and external wiring. This procedure is correct enough, and makes for neatness, but for electrical continuity contacts made by a pair of nuts must be depended upon; it is possible that one or both of these may work loose, especially in a portable receiver, which may be subjected to vibration. To avoid this possibility the use of a double-ended soldering tag (Fig. 1 (b)) is recommended, although the finished job may not be quite so neat. When this type of tag is employed its fixing screw serves merely to anchor the tag in position, and does not have to carry any current; even if it works slightly loose, no harm will be done.

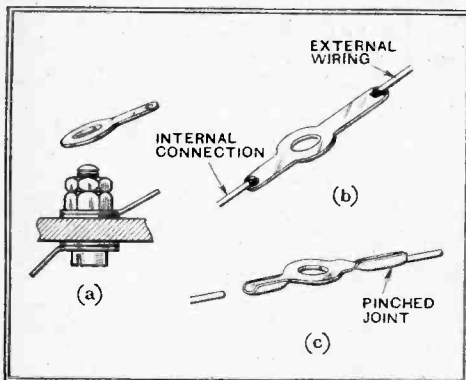


Fig. 1.—Types of commercially produced soldering tags.

To make an extremely strong and permanent joint, double-ended tags, with troughs pressed in their ends (see Fig. 1 (c)) may be used. Extra mechanical strength may then be given to the joint by "pinching" the wire into the trough before soldering.

IN dealing with a superheterodyne, there is a real risk of confusing instability (uncontrollable self-oscillation of H.F. or I.F. valves) with severe second-channel and similar forms of interference. The symptoms are similar, and it is none

Second- channel Interference

too easy to distinguish between them. Incidentally, it may be remarked that true instability is not a common fault in a superheterodyne; this is one of the advantages of that system of reception.

If it happens that instability is really the cause of the trouble, this fact can be confirmed fairly easily by manipulation of the volume control. As intensity is gradually reduced, whistling will stop suddenly, and will not occur again when other stations—at any rate, those operated at a higher wavelength—are tuned in.

WHEN the lowest wavelength to which a gang-tuned receiver may be adjusted seems to be excessively high, the first thing to do is to see whether it is not possible to reset the trimming condensers to a lower capacity all round.

Trimmer Adjustments

This should be fairly obvious, but it would appear that many amateurs, having made a satisfactory trimming adjustment from the point of view of alignment, do not realise that less capacity might be employed without prejudice to accuracy.

Experience shows that when this scheme is put into effect in a haphazard manner by adjusting one trimmer at a time, the final settings often come back to almost exactly the original values. It is sometimes better to slacken off each trimmer screw by an amount that will bring about roughly the same change in capacity before tuning to a signal and making the final critical adjustment.

WHEN it is observed that signal strength may be momentarily increased by touching the grid terminal of a valve or any of the high-potential wiring associated with its grid circuit, it may invariably be concluded that there is an

Accumulated Grid Charge

interruption in the leakage path of the grid circuit of that valve, and that a charge is accumulating. The reader may be reminded that the grid circuit of every valve, whatever its function, must be completed to cathode or filament through a path which is conductive for D.C. current.

As an example of what may happen in practice, attention may be drawn to

Fig. 2, which represents a fairly common type of input filter circuit with double-capacity coupling. A disconnection in the resistance R, through which bias is applied to the H.F. valve, will leave the grid "in the air," as the necessary con-

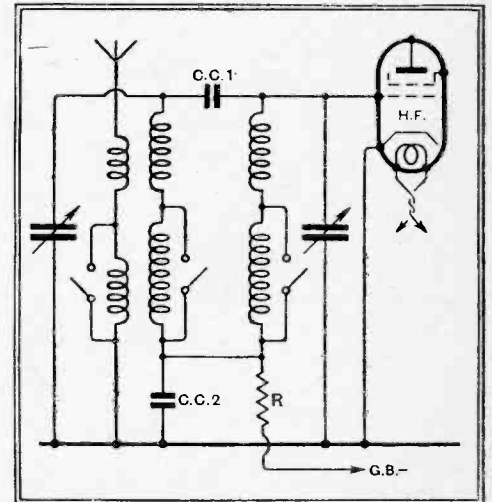


Fig. 2.—A typical arrangement in which interruption of the bias feed system results in a "choked" grid circuit. A charge will accumulate in the coupling condenser C.C.2.

dition laid down in the preceding paragraph no longer exists. Of course, the interruption might exist in any part of the grid-bias circuit.

IT is usually recommended that, when measuring voltage or current in a mains-operated set, all the valves should be working normally, in order that the power supply equipment loading may be the same as under ordinary working conditions.

More Accurate Voltage

Measurements

This is a good general rule, but there are occasions where a little finesse may be employed with advantage. If, for example, the voltmeter resistance is on the low side it will impose an appreciable excess load on the rectifier, etc., and so a reading of total H.T. voltage will be more or less inaccurate.

In order to compensate for the extra current taken by the meter, it is often a good plan to remove one of the receiver valves before making the measurement. Of course, the valve chosen for removal should be one which normally takes about the same current as the meter, but even if its consumption is not exactly the same the reading will be sufficiently accurate for all practical purposes.

The same idea may be applied with advantage to a battery set, especially when the H.T. battery begins to develop an increasing internal resistance with age.

Broadcast Brevities

By Our Special Correspondent

The Organ

ALTHOUGH, as first exclusively announced in *The Wireless World*, the inaugural concert with the new organ in Broadcasting House will be given on June 16th, the instrument has already figured unofficially in the programmes. The first chords were actually broadcast during the Epilogue on Sunday evening, May 14th, as a special tribute to the memory of the late Mr. J. C. Stobart.

Pipes Missing

Actually the organ is still incomplete, as a number of pipes have to be added, but between now and the inaugural concert it may be used for simple accompaniments.

Mr. Berkeley Mason, I hear, is likely to be the official organist.

The Fun Will Begin

SUNDAY next, May 28th, will see Western Regional take over the complete service on 309.9 metres and the consequent fade-out of the old transmitters at Cardiff and Swansea.

Within a week the first tests on West National should begin, the wavelength being 261.6 metres. We shall then see whether London National, on the same wavelength, will look kindly on this "little grey home in the West."

Mr. Gladstone Murray's Return

ACCORDING to the Press prophets, no one who sets out from Broadcasting House to cross the Atlantic is ever likely to return. When Mr. Gladstone Murray, the B.B.C. Publicity Chief, went forth on his recent mission to Canada, the pens at once got busy to show why he would find a Dominion post too alluring to let slip.

Mr. Gladstone Murray has crowded a tremendous amount of organising work into the last three months, and Canada, now equipped with the framework for an efficient broadcasting system, will be sorry to drop the pilot; nevertheless, the B.B.C. will have its Publicity Chief back again in a month's time. Mr. Gladstone Murray sails for England on June 10th.

Henry Hall's American Visit

And now we have these rumours anent Henry Hall, who has innocently planned a summer holiday in the States. It has been alleged that, once on American soil, Henry will be unable to turn his back on "God's own country."

Busman's Holiday

Henry Hall has no intention of leaving the B.B.C. Indeed, it is not even definitely settled that he will go to America, for much will depend upon whether the Corporation can dispense with his services for the four weeks which (quite rightly) he considers the minimum time necessary for a carefree vacation. At the best it will be a sort of busman's holiday, for he is determined to hear as many dance bands as possible, and to renew friendships with all the best-known American dance leaders and composers. Irving Berlin is a close friend of Henry Hall's.

"Say, Folks . . ."

It is, of course, quite probable that the B.B.C. Dance Band may take on a new flavour when its leader returns. It will probably be hotter than ever, and I guess that Henry's announcements may be infected with that Yankee flavour which seems to be inseparable from syncopation and saxophony.

Sir Charles Carpendale

ONCE more Admiral Sir Charles Carpendale has been re-elected President of the International Broadcasting Union, and he will hold this post until 1934, when, I understand, he will also be retiring from the Controldership of the B.B.C.



NATURE'S "EFFECTS" DEPARTMENT. B.B.C. officials conducting a rehearsal for last week's Zoo broadcast. The success of this venture suggests that a permanent "Zoo studio" should be installed.

A Master of Tact

Although some European countries would have liked to see a change in the Presidency, it is universally agreed that Sir Charles has filled his very difficult office with distinction; his admirable tact and understanding in ticklish situations has provoked general admiration.

The Great Share-out

It is likely that the next President will be a German. The new plan for securing fair representation on the Council provides for four Vice-Presidents, the positions of President and two Vice-Presidents being divided between the largest contributors to the funds of the Union. Great Britain and Germany both pay equal amounts, while France comes next, so that these three nations will invariably hold important positions. The two remaining Vice-Presidencies will be shared by nations which contribute smaller amounts to the funds; this year the Vice-Presidents are from Denmark and Italy.

That Theme Tune

MANY listeners have written and telephoned to Broadcasting House to enquire the title of the theme tune that has introduced the performances in the "Stars in their Courses" series on Saturday evenings. The chords that have been heard are excerpts from Gershwin's "Rhapsody in Blue," and a Paul Whiteman record is used for their reproduction. An exception was made on the evening when Fay Compton was the subject of Mr. Agate's talk. In this case the talk was introduced by the incidental music to "Mary Rose."

More "Stars in their Courses"

Future broadcasts by Mr. James Agate in the "Stars in their Courses" series will be as follows: May 27, Sir John Martin-Harvey; June 3, Hilda Trevelyan; June 10, Matheson Lang. Mr. Agate will probably select Marie Tempest as his subject for June 17 and Edith Evans for June 24.

An Ibsen Play

ELIZABETH BERGNER, the well-known cinema actress, is to play the part of Hedvig in the microphone version of "The Wild Duck," which the B.B.C. will broadcast to National listeners on May 31 and to Regional listeners on June 2. Leon Quartermaine will be Hjalmar.

Production will be in the hands of Val Gielgud.

Why Not B.B.C. "Serenades" ?

IT has always been a mystery to me why the B.B.C. should imagine that people are most anxious to dance at the end of a long day. That the B.B.C. think so is apparent from the fact that for the last ten years there has rarely been any alternative to the dance broadcasts after 10.30 p.m. Yet this is the hour when many people are best able to appreciate the soothing influence of quiet music.

The other evening I listened to one of those delightful "Serenade" hours from Munich, which begin at 10.45. The atmosphere is informal; just a few instrumentalists are collected together under the direction of an amiable compère who introduces each selection with a brief chat.

"Bravo, Mr. Smith!"

Sometimes two or more speakers have something to say on the characteristics of each piece, and the leader will go so far as to commend a player when the selection is finished.

Imagine a B.B.C. announcer exclaiming "Bravo, Mr. Smith!" in the manner of Herr Erich Kloss at Munich on Thursday last!

I believe an informal hour once or twice a week would be very acceptable to B.B.C. audiences.

"Daventry International"

THE Empire is asking for more. So Mr. Cecil Graves, Director of the Empire Broadcasting Department, is responding to the demand by arranging omni-directional broadcasts from the Daventry short-wave station every day from 11 a.m. to 1 p.m. (G.M.T.) and on Sundays from 11.30 a.m. to 1 p.m. These new transmissions, which commence on June 11th, will consist mainly of relays of the National programme, and they will be available to anyone who can pick them up.

It looks as if the "National" programmes will soon have to be labelled "International."

How the SUPERHET WORKS

A Simple Explanation of the Signal-frequency Stage

By W. T. COCKING



EVEN to those who are thoroughly familiar with the straight set and are unafraid to tackle the most ambitious design, the superheterodyne often remains something of a mystery, an assembly of apparatus to be regarded with proper reverence, but too complicated for general use. In actual fact, there is nothing mysterious about the superheterodyne, and it functions in a perfectly straightforward manner in accordance with known laws. So far from being complex, it offers the simplest means of obtaining the best combination of quality, selectivity, and sensitivity.

The theory of the superheterodyne, however, is certainly more advanced than that of the straight set, and in the following it is assumed that the reader has at least a broad knowledge of how the latter type of receiver operates. If he has not he is advised to read the series of articles entitled "The Signal Through the Re-

ceiver,"¹ for he will then be in a much better position to appreciate the essential differences of the superheterodyne, and much recapitulation will be saved.

In this series of articles dealing with the theory and practice of the modern superheterodyne receiver, Mr. W. T. Cocking, the well-known authority on this subject, explains in simple terms the function of each essential component. The present instalment covers the signal-frequency tuning system and stresses the importance of avoiding grid current.

The general outline of the superheterodyne will already be familiar, and it will

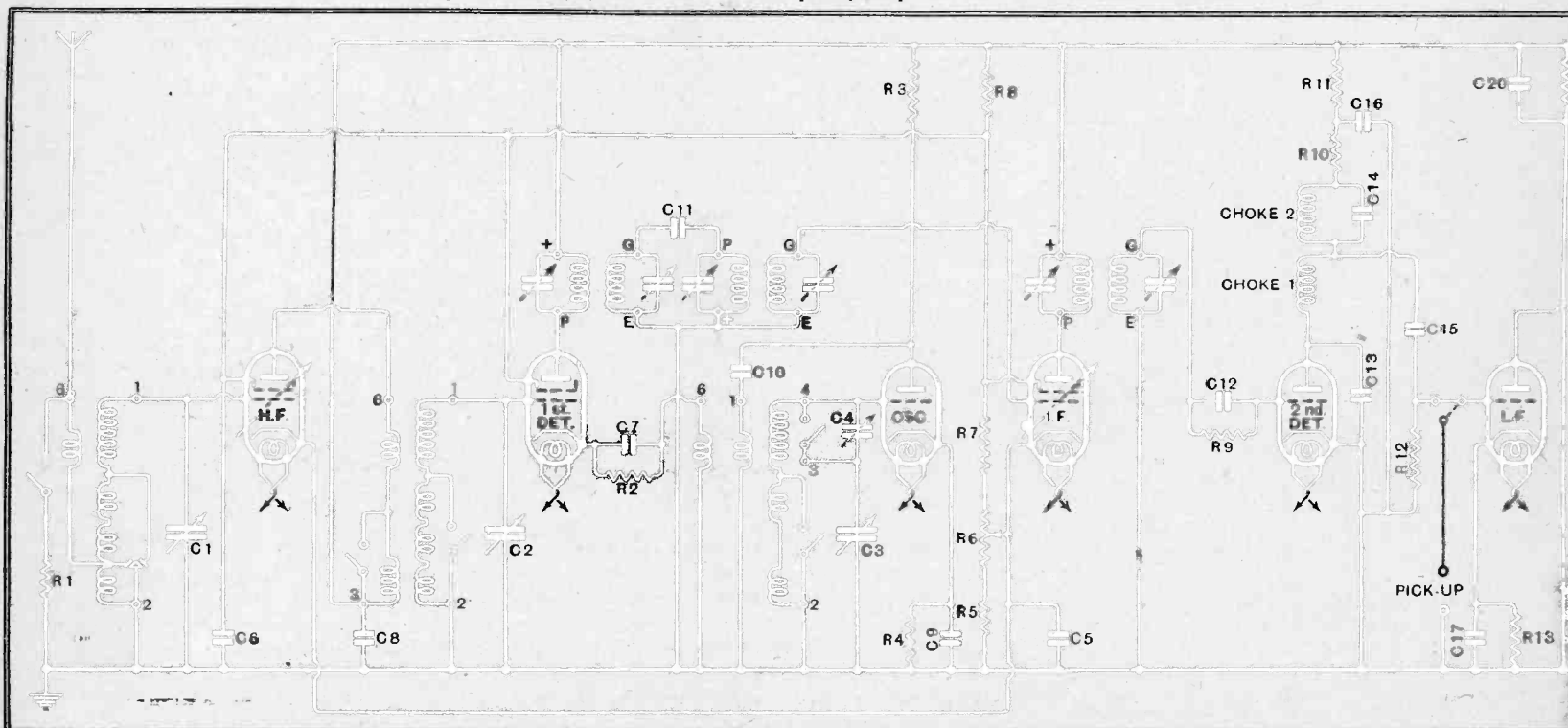
¹ The Wireless World, October 7th, 14th, 21st 28th, November 4th, 18th, 25th and December 16th, 1932.

be remembered that the initial circuits are usually identical with those of a straight set, often even to the inclusion of an H.F. stage. Instead of coupling the detector to the output of the H.F. stage, however, a piece of apparatus known as the frequency changer is incorporated. As its name implies, this changes the frequency, or wavelength, of the incoming signal to some other value. Another amplifier is then used, operating at this different frequency, and only after this is the detector proper included.

The operation will perhaps be best understood by tracing the course of a signal through a set, and in Fig. 1 is shown the circuit diagram of a modern A.C. superheterodyne of the most advanced type.

In this diagram all those details peculiar to the superheterodyne are included, but for simplicity's sake the apparatus required solely for providing the operating current from the mains has been omitted. It should be understood that this latter equipment differs in no

Fig. 1.—The complete circuit diagram of a modern high-sensitivity superheterodyne. This includes all apparatus peculiar to this type of receiver such as the frequency changer, the intermediate frequency amplifier and the fixed tone-corrector.



way from the practice employed in straight sets. This circuit is actually that of the Monodial A.C. Super². Throughout this series of articles constant reference will be made to this diagram, and when reading succeeding instalments it should be kept handy for reference, since it will not be repeated.

As a preliminary to a complete discussion of the superheterodyne principles, we shall trace the course of a signal step by step through the receiver, and return later to a more detailed consideration of certain very important points in the correct functioning of the apparatus. At first, consider the operation with all the coil switches closed, for the receiver is then set to work on the medium waveband. The signal from the broadcasting station which we wish to receive sets up a current in the aerial which is very similar, save in magnitude, to that in the transmitting aerial. The signals from all other broadcasting stations also set up currents in the aerial. The total aerial current, therefore, is of an exceedingly complex nature, since it is composed of a multitude of different currents set up by the different stations. The problem of reception thus resolves itself into three things: the selection of the particular current due to the desired station to the exclusion of all other currents; the amplification of this to the required degree; and the carrying out of these processes without adding to, or subtracting from, the original modulation of the desired carrier.

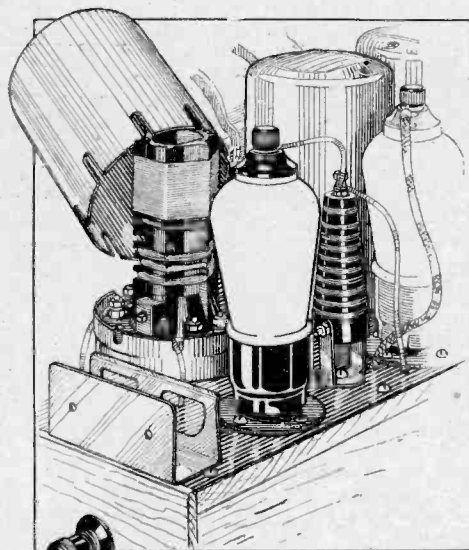
Station Selection

When the switch in series with R₁ of Fig. 1 is open, the currents in the aerial flow through the coil between the points 6 and 2 of the aerial coil assembly, and since this coil is in inductive relationship with the tuned secondary (points 1 and 2), there is also a current flow in this secondary circuit.

Now this secondary current is not identical with the original, for the tuned circuit responds more readily to currents of certain frequencies than to others. If the voltage set up in the aerial by a signal were held constant, and the signal frequency gradually varied while the voltage developed across the secondary tuning condenser C₁ were measured, it would be found that for one particular frequency the voltage would be a maximum. The results, in fact, could be plotted in the form of a curve such as that

shown in Fig. 2, in which it will be seen that the response at one frequency is greater than at any other.

This frequency of maximum response, or resonance, is dependent upon the values assigned to the coil inductance and



The principal components in the signal-frequency stage of a modern superheterodyne.

condenser capacity, and it is inversely proportional to the square root of their product. Since we obtain maximum signal strength when resonance in the tuned circuit coincides with the frequency of the desired station, we naturally choose this point in tuning, and in practice this is carried out almost universally by varying the capacity of the condenser. By tuning the circuit to resonance with the desired signal, however, not only do we obtain the greatest efficiency, but we increase the strength of that station relatively to the strengths of all other stations. If, in the absence of any such circuit, two broadcasting stations gave signals at the receiver of identical strength, their relative strengths at the grid of the first valve when such a circuit is employed can be read off from the resonance curve (Fig. 2) for their particular frequency separation. Thus, if they are separated by 10 kc/s, the unwanted station becomes only 25 per cent. as strong as the wanted signal, while if they are separated by 40 kc/s it is only 6.7 per cent. Away from resonance the response quickly falls off.

The tuned circuit, therefore, is selective, for it tends to select the desired signal to the exclusion of others. It is by no means completely selective, however, for it gives quite an appreciable response to frequencies different from resonance. In practice, the value of the coil inductance is fixed by the band of frequencies, usually 550-1,500 kc/s, which must be covered with a given variable condenser. When this is the case the absolute response of a tuned circuit of this nature at a frequency remote from resonance is substantially a constant factor, for it is not appreciably influenced by the efficiency of the circuit. The response at resonance, however, is determined by the efficiency.

Some losses must occur in every prac-

tical circuit, and these are usually considered as taking the form of a resistance connected in series with the tuning coil. The lower the value of this resistance the greater will be the response at resonance, and hence the better the signal strength which we shall obtain from the wanted station. Since the response at a frequency different from resonance is not greatly dependent upon the circuit resistance, however, the wanted signal will not only be increased in absolute strength, but also relatively to the strength of an unwanted station, so that the selectivity becomes greater.

Low coil resistance, high efficiency, and great selectivity thus become almost synonymous terms in a circuit of this nature, and it is obvious that efforts to reduce the resistance to a reasonably low figure will be well repaid. There is one other point, however: the wanted signal does not consist of a single frequency, but rather of a band of frequencies extending some 10,000 cycles on either side of the carrier frequency. For reasons which are too lengthy to go into here, it is usually considered that high quality reproduction is obtained if audible frequencies up to 5,000 cycles are fully reproduced, although there is no doubt that for the best quality higher frequencies must be included. In distant reception this is usually impossible on account of interference, and for the present we may say

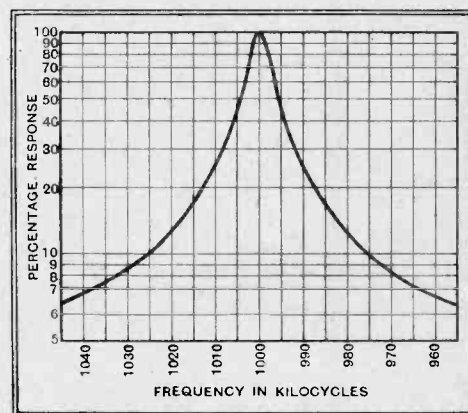
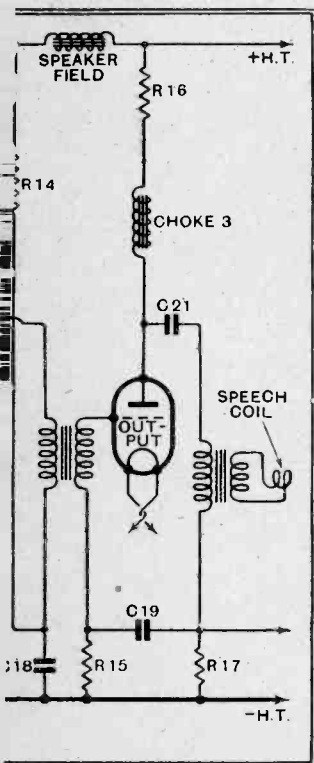


Fig. 2.—The resonance curve of a single-tuned circuit of good efficiency is shown for a wavelength of 300 metres, corresponding to a frequency of 1,000 kc/s.

that the wanted carrier has sidebands up to 5 kc/s only.

A modulated carrier, therefore, on 1,000 kc/s would really embrace the band of 1,005 kc/s to 995 kc/s, and a glance at Fig. 3 shows us that the selective action of the tuned circuit acts upon the wanted station. Frequencies remote from the carrier by 5 kc/s are reproduced in this case with a strength only 45 per cent. of that of the carrier, and the practical meaning of this is that an audible note of 5,000 cycles would be reduced to this value after the modulated carrier has passed through the tuned circuit. There is thus distortion, for it will be obvious that low audible frequencies are barely affected.

Fortunately, it is possible to correct for this effect in subsequent circuits of the receiver, but complete correction is hardly



² *The Wireless World*, April 13th, 20th and 27th, 1932.

How the Superhet Works—

possible, since the amount of sideband cutting which occurs is not constant at all wavelengths. Thus, if there is 45 per cent. at 300 metres (1,000 kc/s), the reduction at 200 metres may only be to 70 per cent., and at 500 metres it may be as much as to 20 per cent. It so happens, however, that the ear is very tolerant of this form of distortion, and the reduction of an audible frequency by as much as 50 per cent. is often barely detectable. In general, therefore, correction must be for the loss at about the middle of the tuning range; at higher wavelengths the correction will not be sufficient, and the higher audible frequencies will be somewhat reduced; at lower wavelengths the correction will be excessive, and the higher notes will be reproduced at abnormal strength. Provided that the variation of selectivity of the tuned circuit with wavelength is kept moderate, however, the ear cannot detect the imperfections. Since the ear is always the final arbiter, this is all that is necessary.

It will now be apparent that we obtain across C1 of Fig. 1 potential variations which are different from those in the aerial. The potentials due to the wanted station are enhanced relatively to those of the unwanted stations, and the modulation of the desired carrier is somewhat reduced at the higher audible frequencies. The condenser C1 is connected between the grid of the H.F. valve and the earth line, but for this valve to act as an amplifier the potentials must be applied between its grid and cathode. A large-capacity condenser C5, therefore, is connected between the valve cathode and the earth line to complete the connection, since such a condenser offers a very low impedance to high-frequency currents. The voltages developed across C1, therefore, are applied between the grid and cathode of the H.F. valve practically in their entirety.

Avoid Grid Current.

If the tuned circuit is to retain its normal efficiency when connected in circuit, it is obvious that the resistance of the valve grid-cathode path must be infinite, for any resistance in parallel with C1 has the effect of increasing the effective coil resistance. The internal grid-cathode path of the valve has a value approaching infinity only under certain conditions. If the grid is positive with respect to the cathode, the grid-cathode path of the valve is conductive, and the grid A.C. resistance has a value depending partly upon the valve structure and partly upon the potential applied. Under this condition, of course, there is a flow of grid current round the external grid-cathode circuit. This effect may be avoided by so arranging the circuit that the valve grid is always negative with respect to its cathode. In the case of an indirectly heated cathode valve, however, grid current may flow with a negative bias applied to the grid. The region of grid current with a negative bias is usually quite small, and normally it will suffice if the grid potential is always

more than one volt negative with respect to the cathode.

In a mains receiver it is usual for negative bias to be applied by biasing the cathode positively with respect to the grid, and in Fig. 1 it will be seen that the H.F. valve cathode is connected to the slider of a potentiometer R6, which is in the H.T.

circuit at a point positive with respect to the earth line, and, therefore, the grid. The bias can thus be adjusted at will, and over a large range to suit varying conditions. A fixed resistance R5 is included in order to prevent the bias from ever being too low to avoid grid current flow in the absence of a signal.

Correspondence

The Editor does not hold himself responsible for the opinions of his correspondents. Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Stamford Street, London, S.E.1, and must be accompanied by the writer's name and address.

Short-wave Reception

I AM sure you will be glad to know that the W.W. "Short-wave Two" is most successful here. The ratio of signal strength to background is without equal in my long experience of short-wave work. It excels in "Morse" reception, and is more powerful than a recent and quite good "four-valve set."

J. S. DUNN.

Capetown.

Automatic Volume Control

HAVING recently built *The Wireless World* A.C. Monodial with A.V.C., I am most surprised at Mr. Haynes' letter in criticism of A.V.C.

The loss of sensitivity is absolutely nil, as the A.V.C. cuts clean out when the signal falls below a strength which nearly overloads the second detector.

On the medium waveband there is no space between stations to get any "mush," while on the long waves the noise suppressor is very effective.

After using a milliammeter for a day or two tuning is quite easy without it, while range and wonderfully silent background accompany almost perfect quality.

I fail to see how A.V.C. can introduce noise, but if used on a noisy, insensitive set it can hardly be expected to remedy these troubles.

If A.V.C. operated on the modulation as Mr. Haynes appears to suggest, we should receive the whole of a musical programme at exactly the same volume, irrespective of the number of instruments performing, bringing up solo passages out of all proportion to the conductor's intentions! How horrible!

G. F. CHAMBERS.

Chesterfield.

I WAS very interested in the letter from F. H. Haynes on automatic volume control, which appeared in your issue of May 5th, and should like to put forward the following points against certain of his statements:

If the receiver is to compensate fully for fading it must be sufficiently sensitive to provide a power output of, say, 1 watt from the weakest parts of the carrier of any station of "entertainment value" at the time. It is admitted that all transmissions of greater field strength will be cut down to this level by the A.V.C., but this can by no means be called a "weak level." If a receiver of this sensitivity was not fitted with A.V.C., the detector and output stages at least would be very much overloaded on any signal of what might be called normal strength.

The statement that a weak signal is repre-

sented at the second detector of a superhet as a carrier of low modulation is not correct. The output from the oscillator of a superhet is not, as a general rule, modulated by the incoming signal, but is used to "beat" with it at the prearranged intermediate frequency. Obviously, if the incoming signal is weak, the I.F. beat will be weak (cf. oscillation in a straight receiver, producing an audio-frequency beat). If Mr. Haynes' statement was correct, then no incoming signal would be represented by an unmodulated carrier at the second detector. This is impossible, since, if there is no incoming signal, the intermediate beat frequency cannot be produced by the oscillator unless the H.F. stages are in a state of self-oscillation! Thus, A.V.C. arranged to work on the carrier amplitude at the second detector is quite in order. If, as Mr. Haynes seems to suggest, the A.V.C. valve was controlled by the depth of modulation of the carrier imposed on the second detector, all musical passages, not to mention speech, would be smoothed out to the same volume level, irrespective of relative loudnesses originally.

The statement that "some measure of A.V.C. is useful in limiting tuning-spread due to detector overloading" seems to be somewhat ambiguous. It is admitted that A.V.C. will obviate detector overloading, but it will increase, not limit, the tuning-spread; the selectivity of the receiver will not, however, be in any way affected. As the receiver is detuned from a station, the carrier amplitude on the detector and on the A.V.C. valve is reduced. The bias on the H.F. stages will, therefore, be automatically reduced, increasing the gain, and bringing the volume up to the previous level. This action continues as the station is further detuned, until the whole of the A.V.C. bias on the H.F. stages has been removed, after which the station rapidly disappears. This holds good only if there is no adjacent station working at the time. If a station is working adjacent to the one being received, at a separation of, say, 9 kc/s, then as the set is detuned from one to the other the total power output will remain fairly constant, but will dissolve from one station to the other. With a modern tuning circuit no interference will be experienced from the adjacent station.

On the other hand, a properly arranged Q.A.V.C. system will definitely limit tuning-spread, in some cases to a matter of 1 kc/s above and below the frequency of any station. Even in these cases the quality of reproduction is not impaired by high note cut-off.

The statement that the "set will no longer possess those essentials—range with silent background" implies that the addition of an A.V.C. system to a receiver restricts the

range and introduces background noise. The range of a receiver is exactly the same if fitted with A.V.C. or not, since when working all out the H.F. stages are not at all over-biased, but are at their maximum working mutual conductance. Background noise is brought up to its maximum level between stations on a receiver fitted with simple A.V.C., but is reduced immediately a carrier is received. When receiving a station background noise is no more if the set is fitted with A.V.C. than if it is not. If the noise is objected to, it can be overcome by Q.A.V.C.

Finally, a listener's receiver certainly does not require to be working at maximum sensitivity for all stations other than the "local" in this district, where the field strengths from many Continental stations average several times those of the National and Regional transmitters after dark. The greatest advantages of A.V.C. is that the sensitivity of the receiver is automatically varied inversely as the field strengths of the stations received, providing exactly the correct amount of gain is arranged to give an output of comfortable strength in all circumstances.

R. S. HODGSON.

Hull.

Prices

I HAVE read with much interest in *The Wireless World* your editorial comments regarding the prices of radio goods, and I must say that I am in total agreement with what you have said.

The present prices are far too high for the majority of components offered for sale today. Granted that the British radio goods are in the front ranks of the industry, but that does not give the manufacturers the

FOREIGN BROADCAST GUIDE

RADIO LUXEMBOURG

(Grand Duchy of Luxembourg).

Geographical position: 49° 36' N.; 6° 08' E.

Approximate air line from London: 310 miles.

Wavelength: 1,190.5 m. Frequency: 252 kcs.
Power: 150 kw.

Standard time: Greenwich Mean Time (adopts B.S.T.).

Standard Daily Transmissions.

18.00 G.M.T. (or B.S.T.) (week days), 19.00 (Sundays), gramophone records; 19.45, weather, concert; 20.30, English talk (Sun.); 20.40, records; 21.15, news (French), music; 22.00, news (German); 22.10, Variety or dance music.

Concerts destined for foreign listeners are broadcast according to following schedule: Great Britain (Sunday); Italy (Monday); Germany (Wednesday, Thursday); France and Belgium (Tuesday, Saturday); Holland (Friday).

Announcers: Man and woman (announcements are made in German, French and in the Alsatian dialect).

Call: *Hier Versuchsender Luxembourg; Ici poste expérimental Radio Luxembourg; Hai a der Luetzelburger versuchsender; occasionally, Radio Luxembourg calling.*

Opening signal: Siren.

Closes down with good night greetings in various languages followed by Anthem.

right to "stick on the price." While probably many months of experimenting on their part is entailed, it is also up to them to turn out the best possible, but why should the ultimate purchaser be charged up with the "dog work."

Naturally, one does not want the electrical efficiency to suffer if prices are cut, but

taking for example one of the numerous nice-looking transformers on the market, do the makers really consider that the pretty bakelite shrouding in any way enhances the efficiency of the component other than in appearance? The shrouding has to be made, and naturally paid for, but it is totally unnecessary. With the present-day cabinet the "innards" are very seldom put on show, so what does appearance matter? Why can't we have the crude article?

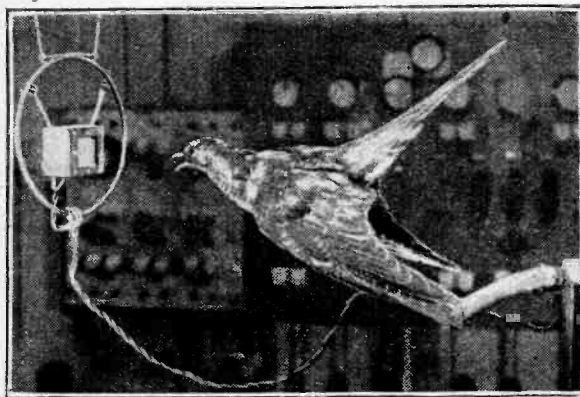
Again, the home constructor is at a decided disadvantage compared to the manufacturer in building a compact receiver; the stripped parts are unobtainable, so the home builder has to make his set very much larger than he really need do. It is also the present fashion to cellulose the various parts with a nice grey paint; beyond adding to the price, what's the use of it?

The Wireless World has done a lot for the home constructor. I hope your present "few words" will sink in where needed.

May I add another "grouse," which I am sure *The Wireless World* will agree with—that is, the terrible delays that occur after placing an order. A delivery by return is almost an unheard-of thing; two weeks or more is far more usual. This particularly applies to any new component which is ordered. There seems to be a mistaken policy in the trade that the demand creates the supply; surely it is the supply which creates the demand, with the usual "boosting," of course. It is most disappointing to be held up in the construction of a new set for some unobtainable part which has been advertised perhaps for weeks.

Wishing *The Wireless World* all the best—it certainly is the best.

Bournemouth. E. J. B. CURTIS.

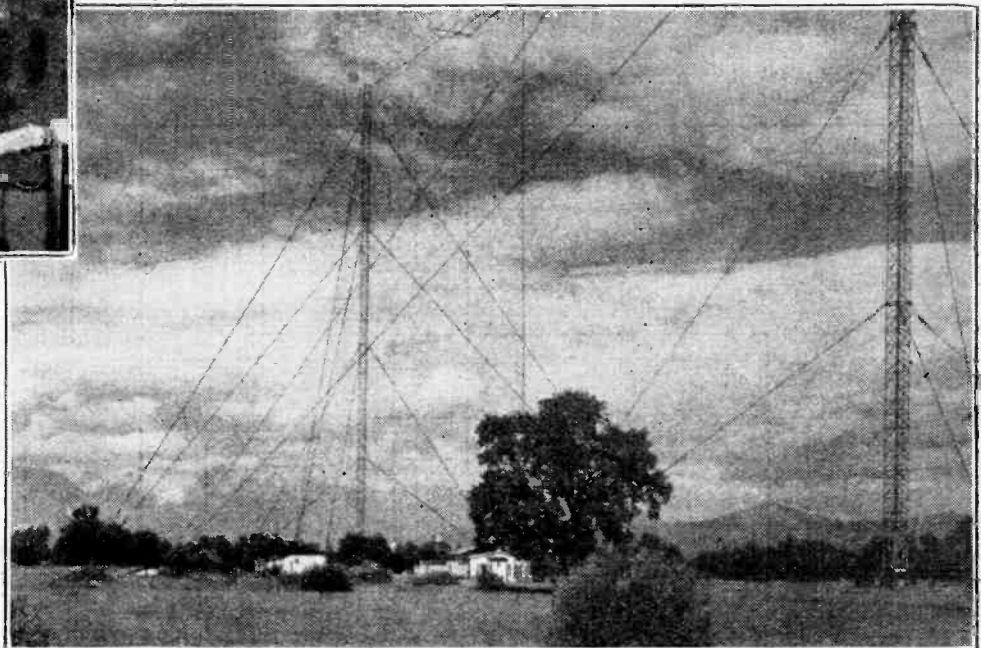


FOR THE BENEFIT OF VISITORS Ljubljana displays this stuffed cuckoo before a microphone in the control room. Actually the famous call is produced mechanically.

VIII—Ljubljana, 522 kc., 574.7 m.,
7 kw.

RADIO LJUBLJANA, famous for its cuckoo call, is situated some miles from the town of that name, at a village called Domzale, in the shadow of the Alps. It is operated by the Roman Catholic authorities, primarily for public education purposes, the Director, Abbé Zor, being a notable figure in religious circles. The Chief Engineer is Professor Ossana, of Ljubljana University, and to him goes the credit for the invention of the cuckoo call. Needless to say, the call is mechanically produced despite rumours that a specially trained bird resides on the premises!

When I visited the station in mid-winter the heating was by means of primitive iron



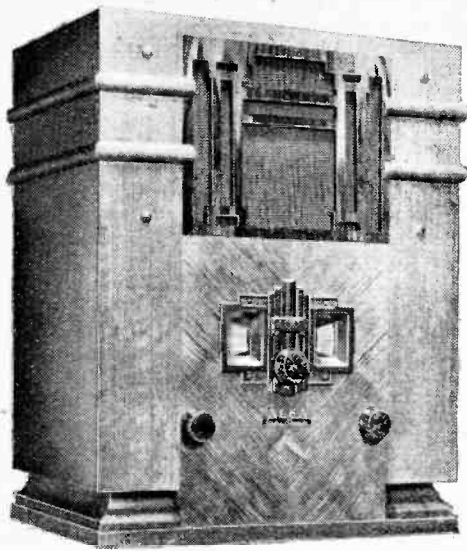
The station is beautifully situated near the Austrian Alps at Domzale, some miles from the University town of Ljubljana.

stoves; the whole station, in fact, wore an unpretentious appearance.

Despite its fame, Ljubljana cannot at the moment be serving more than some 10,000 paying listeners. Nevertheless, the cuckoo

call has won for the station enduring fame and the certainty of at least an occasional hearing from everybody in Europe who can manage to tune it in.

WANDERING WAVE.



ALBA Superheterodyne

MODEL 56

A Set Exemplifying the Advantages of a High Intermediate Frequency

with which stray H.F. currents can be filtered from the output of the second detector.

The adoption of 473 kilocycles for the I.F. stage is not without its disadvantages from the designer's point of view, but these are well worth the trouble of overcoming when the prize of success is a medium waveband free from second channel whistles. In the first place, the intrinsic selectivity of the I.F. coils is not so high as that of the more conventional 110 kc. amplifier, but any lack of selectivity from this cause is effectively countered in the Alba set by the use of reaction in the I.F. stage. The degree of reaction is under the control of the user, and a small knob is provided at the back of the set for this purpose.

The I.F. stage works on a wavelength of the order of 600 metres, and interference from ships' spark transmitters must be carefully guarded against. Direct pick-up on the coils is avoided by careful screening, and a wave-trap takes care of any residue of off-tune interference coming in through the aerial circuit. The series resonant trap across the long-wave section of the aerial coupling coil is included to suppress certain second channel whistles on long waves due to harmonics of the oscillator.

The oscillator coupling coils are included in the cathode return lead, and both sides

of the input I.F. transformer are tuned. With reaction on the output I.F. transformer only the secondary is tuned. A resistance-capacity filter is used to suppress H.F. in the output from the anode bend second detector, which is, in turn, resistance-coupled to the output pentode.

In the mains transformer a single layer of wire (open-circuited) serves the dual purpose of providing a mains aerial, and, when earthed, an efficient electrostatic screen for the primary winding.

The usual three controls of wave-range, tuning, and volume are arranged on the front panel, and a separate snap switch is provided at the back of the chassis to change over to gramophone reproduction. The circular tuning dial carries an up-to-date calibration in stations as well as wavelengths. Long-

and medium-wave stations are marked on opposite sides of the dial and viewed through two windows in the escutcheon plate. Contacts on the waverange switch automatically illuminate the appropriate scale.

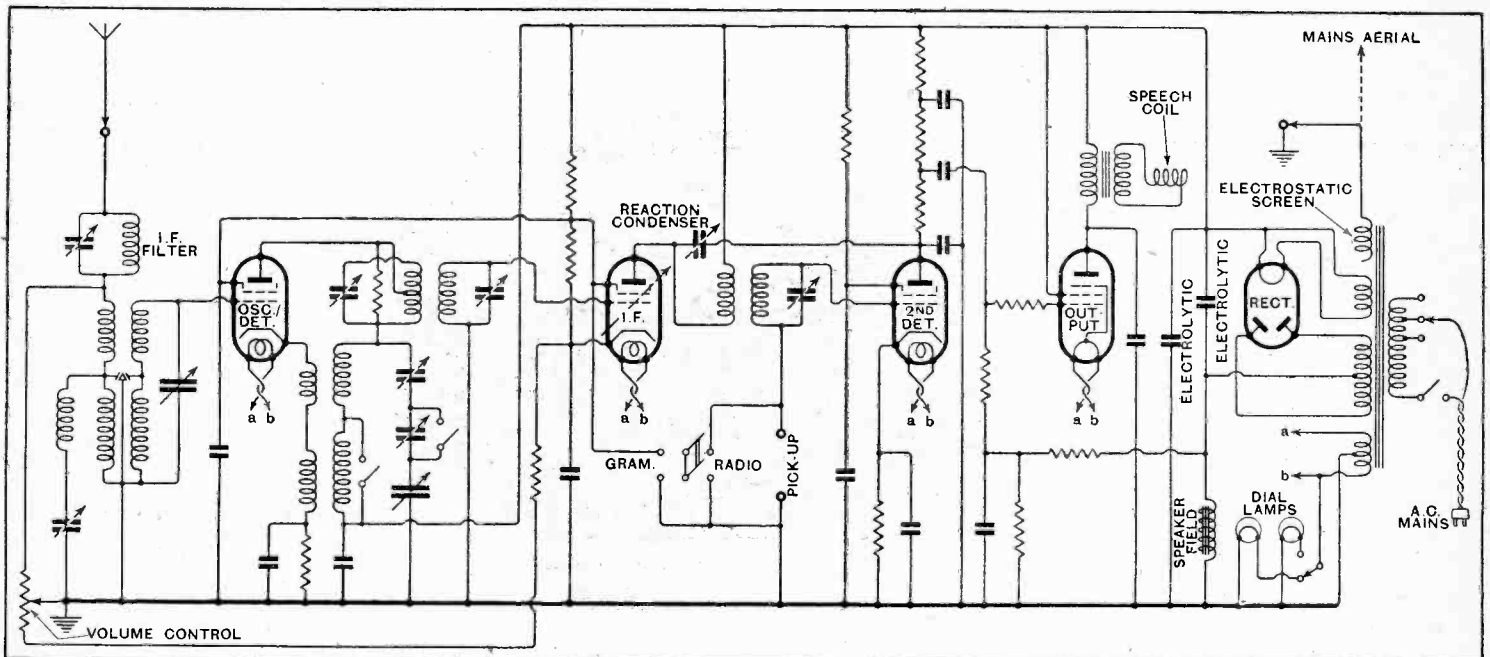
The performance as regards freedom from second channel whistles is fully in accordance with the theory of the design. A diligent search resulted in the discovery of only two whistles—one on medium waves between Söttnens and Midland Regional, and the other on long waves near Zeesen.

FEATURES

Type: Table model four-valve superheterodyne with moving-coil loud speaker. Provision for gramophone pick-up. **Circuit:** S.G. detector-oscillator, variable-mu I.F. with reaction, S.G. second detector, pentode output. **Controls:** (1) Tuning with dual dial calibrated in stations and wavelengths; (2) Volume; (3) Waverange. **Price:** 16 gns. **Makers:** A. J. Balcombe Ltd., 52-58, Tabernacle Street, London, E.C.2.

FROM the technical point of view the chassis embodied in this receiver is of more than usual interest. Superficially, the circuit, for a superheterodyne, is simple, and the manufacturing costs are correspondingly low, yet the performance, from the point of view of range and selectivity, challenges comparison with sets employing many more stages. Further, the set for its type is singularly free from heterodyne whistles and background noise.

The choice of an intermediate frequency of 473 kilocycles, as compared with the more usual figure of 110 kilocycles, is responsible for the simplification of the circuit in relation to performance. As the intermediate frequency is raised, those stations causing second channel interference on the medium waveband are farther removed from the resonant frequency of the aerial input circuit and the whistles to which they give rise are correspondingly reduced. It is unnecessary, therefore, to legislate for a signal frequency H.F. stage or even a band-pass filter, as a simple tuned circuit gives for all practical purposes complete immunity from second channel interference on the medium waveband. Another advantage of a high intermediate frequency is the ease



Circuit diagram of the Alba superheterodyne receiver. The radio volume control adjusts the bias of the I.F. stage and also shunts the aerial input.

Alba Superheterodyne—

Neither of these is sufficiently strong to cause the loss of a station, and in the normal course of tuning would probably be completely overlooked.

has a good minimum. It consists of a potentiometer, which simultaneously reduces the aerial input and increases the bias on the variable-mu I.F. valve. Any evidence of "double-hump" tuning indi-

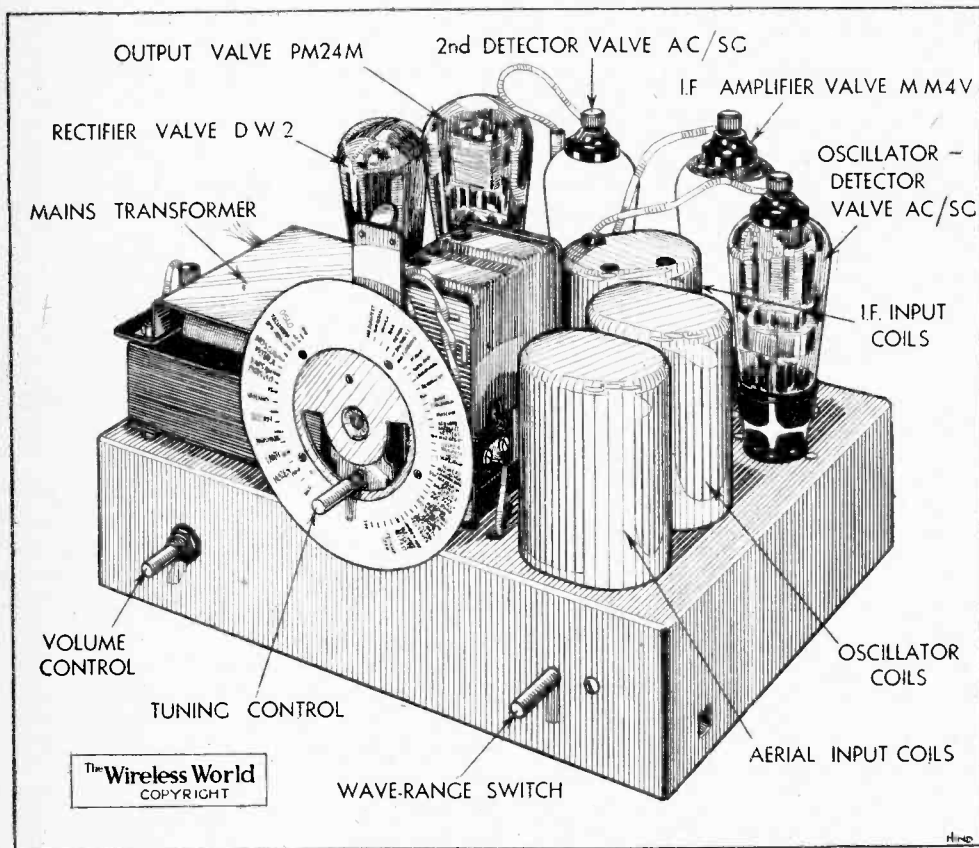
**NEW MAZDA
CLASS "B" VALVE**

A CLASS "B" battery valve of moderate filament and anode consumption has been added to the range of Mazda valves. It is styled the P.D.220 with a filament rated at 2 volts 0.2 amp. and a maximum H.T. voltage of 150, under which conditions, with a suitable driver valve, it is capable of delivering up to about 2½ watts speech. At all anode potentials the valve may be operated with zero bias, but a welcome reduction of quiescent anode current may be obtained by applying a grid potential of less than one volt from a single dry cell which must be discharged whilst the set is in operation.

Choosing the Driver

As the power output of all Class "B" valves is primarily dependent upon the power output of the driver, it is most important that this valve should be chosen with care and that its bias be correctly set.

Two valves are recommended as drivers, the L.2 and P.220. In the case of the first-mentioned valve with an anode voltage of



A compact chassis layout is obtained as the circuit only calls for a two-gang tuning condenser. The subsidiary control knob for I.F. reaction projects through a hole at the back of the metal base.

Selectivity is good having regard to the number of tuned circuits employed, and while four or five channels are lost on either side of the Brookmans Park transmitters in Central London, there is no difficulty in separating distant stations, such as Langenberg and North Regional on adjacent channels.

On long waves the selectivity is perhaps not quite so good as one would expect from performance on medium waves. Eiffel Tower comes in clear of Daventry, but a background from the latter station is heard on Zeesen, and extends as far as Radio Paris, but is then sufficiently weak to be negligible except during intervals in the French programme. This is in Central London, of course, and under more favourable conditions, say, on the South Coast, no interference from Daventry should be experienced on the Continental long-wave stations.

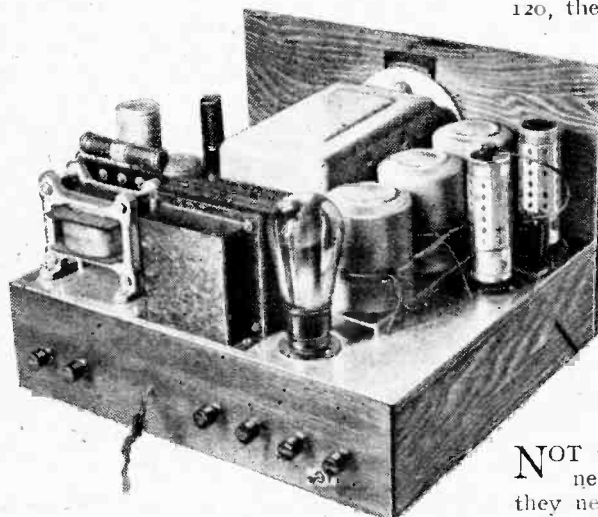
Reaction on I.F. Circuit

The I.F. reaction slightly improves selectivity, but has a greater effect on the sensitivity of the set. If pushed too far quality of reproduction suffers, and the lower notes predominate. However, all the range and sensitivity one could wish for are available with the reaction set at less than half its full range, and the quality is then bright and well balanced. At the same time, the quality is affected slightly by tuning, and a final adjustment of the tuning control may make all the difference between first-rate and merely satisfactory reproduction. The volume control is well graded, and

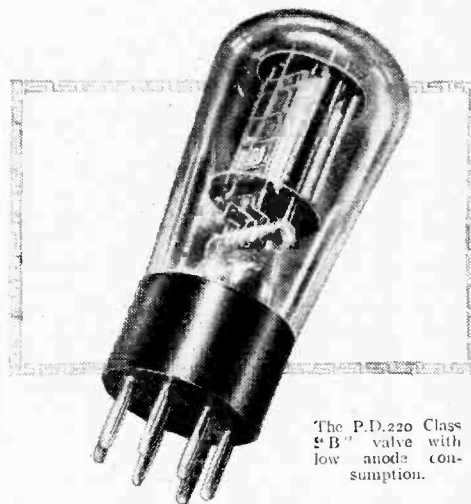
cates that the volume control is advanced too far, and is not due to maladjustment of the tuned circuits. Overloading the detector causes a diminution of volume.

For gramophone reproduction an additional volume control, preferably incorporated in the pick-up itself, will be required.

In appearance the Alba cabinet is neat and well finished, while the set as a whole is exceptionally light in weight. A D.C. model and a battery version with Class "B" output are also available.



A "Wireless World" Ferrocart III Receiver fitted with the new Catkin valves. The types shown are the VMS4, MH4 and MPT4.



The P.D.220 Class "B" valve with low anode consumption.

120 the total quiescent feed current of the output valve will be 2 milliamperes, the power output 1 watt, the driver transformer overall ratio 2 to 1, and the anode-to-anode load 17,000 ohms. Using the P.220 valve as a driver and assuming an H.T. voltage of 120, the total quiescent feed current of the output valve will be 2 milliamperes, the power output about 1½ watts, the driver transformer overall ratio 1.5 to 1, and the anode-to-anode load 11,500 ohms.

The P.D.220 valve is undoubtedly of highly efficient design, since to obtain a power output of 2½ watts only 65 milliwatts are required from the driver valve.

CATKIN-CUM-FERROCART

NOT the least important feature of the new all-metal valves is the fact that they necessitate no special circuit arrangements or modifications in existing sets. Catkins are available in the leading types and are interchangeable with ordinary valves in A.C. mains receivers.

READERS' PROBLEMS

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.

Free A.V.C. Voltage

WHEN one appears to be well on the way towards getting something for nothing in the radio art, there is generally a "snag" somewhere. We are afraid that a suggestion put forward by a reader with regard to the A.V.C. Unit is no exception to this axiom.

Briefly, it is proposed to construct the unit on the lines described in *The Wireless World* of March 31st, but to obtain H.T.

anode voltage which has to be balanced out. In addition, it must be remembered that the unit offers the advantage of "delayed A.V.C." By making the A.V.C. grid still more negative, the control does not come into operation until signal strength has risen to a value that may easily be determined by trial. This is another reason for using a bias battery with a fair margin of extra voltage.

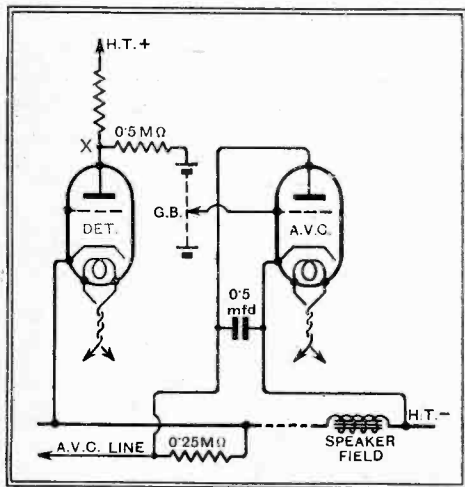


Fig. 1.—Obtaining H.T. voltage for the A.V.C. Unit by inserting the speaker field in the H.T. negative lead.

supply for the controlling valve from the drop in voltage across a high-resistance loud speaker field inserted in the negative H.T. lead of his A.C. receiver. What our querist intends to do is illustrated in a skeleton diagram reproduced in Fig. 1.

This scheme is basically sound, and could be made to work, but our querist has overlooked the fact that "free" H.T. voltage for the A.V.C. valve will be obtained only at the expense of an increased bias voltage for its grid. In fact, the "free" voltage developed across the speaker field will be added to the difference of potential between point X and the A.V.C. cathode, and, in order to obtain the right working conditions, exactly the same amount of extra grid bias voltage will be needed.

Accordingly, there will be no reduction in the total voltage of the batteries required for the unit; the only gain will be that no current whatever will be drawn from these batteries except that required for a potentiometer by which critical adjustment of grid voltage may be made.

The Balancing Battery

ONE or two constructors of the A.V.C. unit (March 31st) have not fully appreciated the point that the G.B. battery required for this device must have a sufficiently high voltage, not only to bias the A.V.C. valve to the point where anode current is entirely stopped, but also to balance out the "standing" H.T. voltage on the detector anode.

So far as grid bias is concerned a mere half a dozen volts or so will generally be sufficient, but to this voltage must almost always be added at least 50 volts—and often much more—which represents the detector

Combined G.B.-H.T. Battery

A SPECIAL high-tension battery, fitted with end-cells for grid bias, was specified for use with the Class "B" Ferrocart receiver. A querist now asks whether it would be permissible to use separate batteries for these purposes.

There is not the slightest objection to this course, and no difficulty should be experienced. Instead of running a single wire from the set to the common "H.T. - - G.B. +" socket of the battery, two leads must be taken; one will, of course, be connected to the negative socket of the H.T. battery and the other to the positive pole of the separate grid bias battery.

Matched Loud Speaker

SEVERAL querists have asked whether an existing moving-coil loud speaker of the permanent magnet type could be used satisfactorily with the Class "B" Ferrocart receiver.

So far as the loud speaker itself is concerned, requirements are not abnormal, but it must be remembered that the usual type of output transformer, built into the instrument, will not be suitable. A special type of transformer may be substituted, or the existing transformer may be fed through a tapped choke.

A.V.C. Valve Adjustment

A READER who has fitted A.V.C. to his Monodial receiver, in the manner described in recent issues, is not quite satisfied that he is obtaining the original sensitivity on weak signals, and asks whether this is normal. He also enquires as to how the operating conditions of the A.V.C. valve may be checked with the help of a milliammeter.

Normally, sensitivity should not be impaired in any way. To make a test, a

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.

milliammeter should be inserted in such a position that a reading may be made of the anode current flowing in one of the controlled valves—say, at point X—in the published circuit diagram of the modified receiver. The aerial should then be disconnected, and, in the absence of a signal, the reading of the meter should be noted. Then, on removing the A.V.C. valve from its socket, this current reading should remain unchanged. If, on the other hand, an increase in current is observed, we have an indication that the A.V.C. valve requires more bias. Extra bias may easily be applied by making a slight increase in the value of R13.

Volts on the Anode

IN a recently published reply it was recommended that measurement of the anode voltage of an output valve should be made directly between anode and cathode. If the meter be connected between anode and earth line (metal chassis), it is probable that the reading may be misleading, as the voltage developed across the bias resistor will be included.

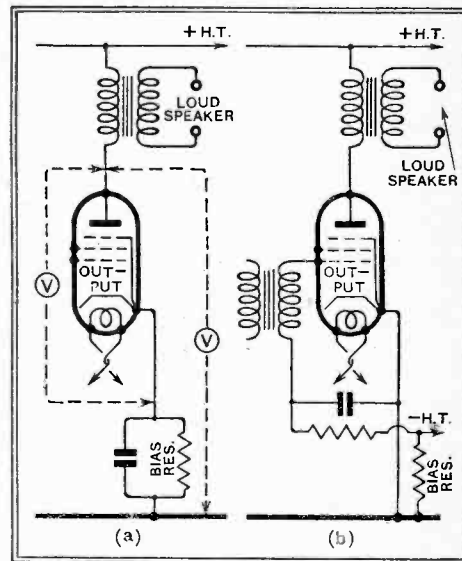


Fig. 2.—When bias voltage is developed across a resistor in the cathode lead, anode voltage must be measured directly from the cathode terminal, and not from the earth line.

A correspondent, who has read this reply, has applied the suggestions made to his own set, and finds that the voltage reading is precisely the same whether the negative terminal of the meter be connected to earth line or cathode. He wonders whether this is an indication that something is wrong with the bias system.

If the valve is self-biased by the flow of its own anode current through a resistor (as in Fig. 2 (a)), it would certainly appear that there is a fault; the bias resistor or its shunt condenser might be short-circuited. If, on the other hand, the valve is biased by the drop in voltage across a resistor in the common negative H.F. lead (Fig. 2 (b)), the effect is quite normal, and no difference in voltage reading is to be expected.