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Editor: HUGH S. POCOCK.

Assistant Editor: F. H. HAYNES.

Editorial Offices: 116-117, FLEET STREET, LONDON, E.C.4
Editorial Telephone: City 9472 (5 lines).

Advertising and Publishing Offices:
DORSET HOUSE, TUDOR STREET, LONDON, E.C.4.
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## WHAT OF THE FUTURE?

THE doors of Olympia have just closed upon what has undoubtedly been the biggest and most successful Radio Show ever held in this country, and the occasion suggests itself as one for reflection on the trend of progress and a consideration of the possibilities which lie ahead of us as broadcasting and its associated influences extend and develop.

### So Much More to be Done.

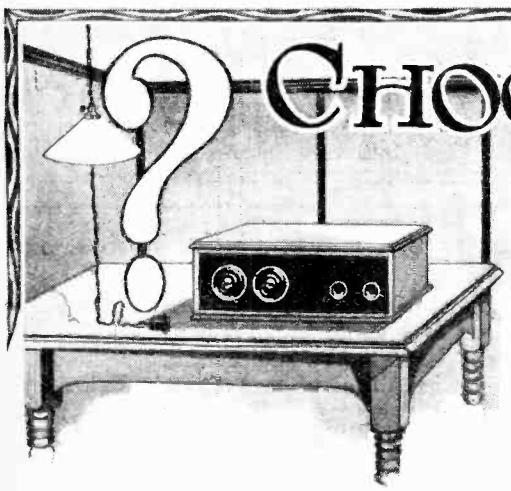
In a contribution to our issue of last week Captain Eckersley related reminiscences of the early days of broadcasting in humorous vein, but concluded (in all seriousness, we believe) with the remark, "There is so much more to be done, but sadly enough in some ways, never in the hit-and-miss improvisations of former times." Broadcasting as we understand it to-day has, we will agree, reached a standard where results can be forecasted and the hit-and-miss methods of bygone days are eliminated; but we are only able to express such confidence in regard to the future if we first assume that we shall continue to operate broadcasting on the present lines, and that there are no radical changes either technical or otherwise ahead of us. Captain Eckersley is undoubtedly right in emphasising that there is "so much more to be done," but may we not expect to find that the progress of the future will be just as full of the necessity for compromise expedients and hit-and-miss methods as the past. Short-wave broadcasting has not received any marked attention in this country during past months, but we may anticipate that the coming winter will revive its importance and that with improved improvisations (for we may still legitimately so term efforts made to obtain stable long-distance short-wave reception) the link-up between this country and the remoter continents by broadcasting may be looked for with some degree of confidence.

### New Avenues of Development.

Picture transmission is a new sphere of broadcasting activities of which we are promised a foretaste almost immediately, and although the sceptic may see nothing likely to maintain the interest of the public in the reproduction in the home of still-life pictures of some topical event, yet it would be rash to predict that no other applications will be forthcoming to provide variety and enhance the value of the service. Again, television, however incomplete we may regard its present state of development, may, almost at any time, perhaps through some system hitherto unheard of, be brought to a state of practical development justifying its application as an adjunct of broadcasting.

Again, with the development in this country of the national scheme for general electrification, is it not more than likely that some form of wired wireless will be applied as a means (perhaps alternative or auxiliary to the present system of broadcasting through the ether) of distributing information or entertainment throughout the country?

There are so many directions in which development may come that it is impossible to regard the present service provided by broadcasting as in any way final. Yet we have referred above only to technical considerations and have not touched upon the very wide possibilities which still remain open to development in the nature of the material to be broadcast. Is it to be supposed that the programmes of to-day and the purposes to which broadcasting is being put will remain stationary? Rather we would be prepared to believe that in the not far distant future on looking back on the present service which broadcasting provides we shall be astonished that we were so slow to realise its potentialities.



# Choosing An A.C. Eliminator

## How to Avoid Overload and Instability.

By A. L. M. SOWERBY, M.Sc.

THE writer does not pretend to know how many commercial receivers there are on the market, nor would he like to hazard a guess as to the number of different designs that have been published from which the home-constructor can build his own set. Inspection of the catalogue of a well-known wholesale house reveals the existence of some forty different eliminators, designed to supply anode current from alternating-current mains, and there are probably at least another forty models available. It will be seen, then, that the chance of acquiring a suitable eliminator for any particular set by going into a shop and blindly purchasing the first offered is tolerably remote. This fact is the justification for the present article, in which will be made some suggestions which, it is hoped, will be of assistance to those who are faced with the task of selecting from among the many eliminators offered the model which will most completely fulfil the requirements of their own particular receiver.

In choosing an eliminator, it must be remembered that the output stage of the receiver is that which most requires a high voltage, and that except in a few unusual cases the last valve draws about three-quarters of the total current required by the set. So far as the total output of the eliminator is concerned, it will therefore be sufficient to select a model which will maintain the voltage desired while passing a current some thirty to fifty per cent. greater than that required by the last valve.

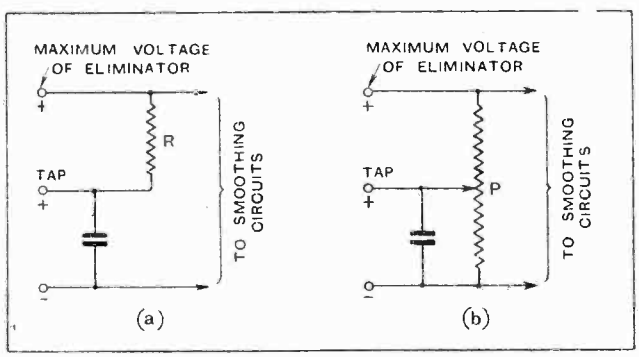



**Fig. 1.—In (a) the voltage-drop in the series resistance R is used to reduce the voltage for the "Tap" terminal; in (b) a potential divider P is employed. In the former case the presence of R with the condenser tends to check instability in the receiver by isolating the valve fed from the "Tap" terminal.**

For several different reasons, some of which depend upon the presence of the rectifying valves and smoothing circuits, the selection of an eliminator is not quite so straightforward a matter as the simplicity of the condition just laid down might suggest. It is a well-known fact, upon the reasons for which we need hardly dwell here, that the voltage at the output terminals of an eliminator varies with the current that is being taken from it, the voltage dropping fairly rapidly as the current is increased. One commercial model, for example, provides 14 milliamps. at a voltage of 200, but when 40 milliamps. are taken from it the voltage drops to 110 volts only—barely more than half the value given at the smaller load.

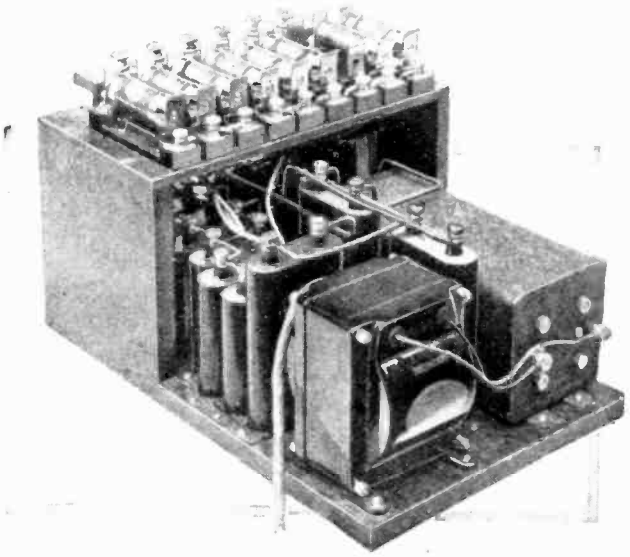
Apart from one or two instruments, which have fitted to them a device for keeping the output voltage practically constant whatever the load, this interdependence of current and voltage must always be expected. It will be less marked in an eliminator in which the smoothing chokes are large and robustly built than in one where the chokes are small; heavily built chokes are thus a recommendation. Even the heaviest chokes, however, cannot do away with that part of the voltage drop that is due to the internal impedance of the rectifying valves.

This variation of voltage with load throws on the manufacturer of the eliminator the duty of providing his prospective customer with the necessary information to enable him to know what voltage to expect with every different load; this information is most conveniently expressed in the form of a curve, though a short table of figures, which is more easily printed, may be equally useful. Not all makers provide this essential information; unless the purchaser is content to acquire an eliminator without a proper knowledge of its capabilities, his choice is, therefore, unnecessarily limited.

Quite apart from any possibility of undue voltage-drop, there are other reasons making it desirable, if there is no great objection to the extra outlay, to purchase an eliminator of such dimensions that the output

**Choosing an A.C. Eliminator —**

required for normal running is very comfortably within its powers. In a small eliminator, primarily designed for sets taking, perhaps, ten milliamps., the rectifying valves fitted will probably be capable of passing three or four times this current without being harmed, and this larger figure may quite fairly be given by the makers as the maximum output of the instrument. The chokes that form part of the smoothing equipment, however, will probably be but small, and though they may



A typical A.C. mains eliminator with four metal-oxide units forming a rectifying bridge. The series anode resistance scheme is employed.

provide very adequate smoothing when the current passing through them is low, they may approach the point of magnetic saturation when there is flowing through them the maximum output of the rectifying valves. If this takes place, their inductance is likely to drop to a value far below that which corresponds to normal running, with the result that the smoothing will become inadequate, and hum will be introduced into the receiver as a consequence.

### Where Economy may be Practised.

If the eliminator is being loaded up to its limit to provide the heavy current demanded by an ambitious output stage on a purely local-station receiver, this hum may not matter, because the low degree of amplification normally possessed by such a receiver will be insufficient to magnify the hum up to an audible sound. If, on the contrary, the eliminator is fully loaded by a multi-valve set with high overall amplification, the hum is likely to be decidedly objectionable.

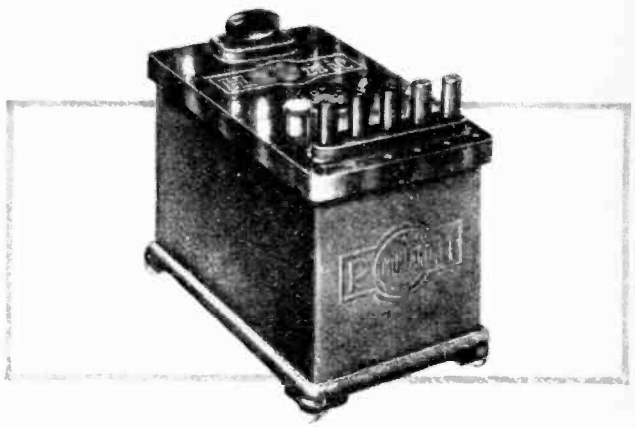
The remedy, of course, is to use an eliminator that is capable of supplying a considerably greater output than is likely to be required for normal use; it may then be assumed with perfect confidence that the smoothing chokes are fully adequate for the work that they have to do, and that hum will not arise. In addition, it is probable that the rectifying valves in the larger instrument will be passing decidedly less than their maximum current, which will ensure that their life will be long, and that there will, in consequence, be freedom from the expense of frequent replacements.

### How to Estimate Consumption.

As a rough guide for those who do not possess a milliammeter, the following figures for anode current may be used as a basis for reckoning the consumption of a receiver; although, in the nature of things, the figures can at best be only approximate, they will be near enough to be helpful in deciding the output that the eliminator should provide for any particular set. Since, for the purpose in question, it is important that too low an estimate of the receiver's consumption should not be made, the figures given are on the high side.

| Valve. | Probable Anode Current. Milliamps. |
|---|---|
| *Output Valve*: "Super-power" ... ... ... | 20 |
| "Power" ... ... ... | 6 |
| *L.F. Valve*: Followed by transformer or choke | 3 |
| Followed by resistance ... ... | 1 |
| *Detector*: Leaky-grid ... ... ... ... | 3 |
| Anode-bend ... ... ... ... | 1 |
| *H.F. Amplifier* ... ... ... ... ... | 3 |

As an example of the use of these figures, let us suppose that it is required to purchase an eliminator to feed a receiver consisting of one H.F. valve, an anode-bend detector coupled by a resistance to an L.F. amplifier, which is, in turn, coupled by a transformer to an



An A.C. eliminator with full-wave rectifying valve.

output stage consisting of two "super-power" valves in parallel. The total current required by the receiver will be 20 + 20 + 3 + 1 + 3 = 47 milliamps. The voltage required will be the highest that it is safe to apply to the last valves; say, some 150 to 160 volts. It will, therefore, be necessary to choose an eliminator which is known to maintain this voltage while delivering the very respectable current of 50 milliamps. Such an instrument will probably be capable of delivering, at a pinch, a maximum current of something like double this figure; or, alternatively, will maintain a voltage of some 200 volts while supplying currents of the order of 25 milliamps.

It is especially to be noticed that it will not be suffi-

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cient to purchase for this task an eliminator described in some such terms as "Output 150 volts; current up to 50 milliamps." This description, if examined closely, will be seen to give no guarantee whatever that the voltage will not drop far below that mentioned when any approach to the full current is drawn from it. Before completing the purchase of any instrument described in such a manner it is desirable, if disappointment is to be avoided, to obtain direct from the manufacturers a definite assurance that it will provide the output required.

### Commercial Eliminators Analysed.

On studying a catalogue containing fairly full particulars of eliminators made by a number of different manufacturers, it was found possible to classify them roughly according to their output, and the results of this classification are given here, together with the average cost of an instrument of each class. The column headed "percentage" in the table indicates the percentage of the total number of eliminators listed in the catalogue examined which fall into the class described in the first column.

| Output of Eliminator. Voltage Classification | Percentage. | Average Cost. |
|---|---|---|
| 120 volts and below | 46 | £6 16 6 |
| 120-150 volts | 29 | £8 2 0 |
| 150-200 volts | 21 | £9 5 6 |
| Over 200 volts | 4 | £13 15 0 |
| Classification by max. available current. | | |
| Below 20 milliamps. | 25 | £5 15 0 |
| 20-50 milliamps | 65 | £8 0 0 |
| Over 50 milliamps. | 10 | £12 16 0 |

It will be seen that most of the eliminators on the market are intended to provide a current of some 25 milliamps. at a pressure in the neighbourhood of 120 volts. This corresponds to the popularity of the output stage consisting of a single "super-power" valve run at about the highest voltage that the makers recommend; the total number of valves in the set makes very little difference to the output needed. It is chiefly where an output stage other than that just mentioned is in use that difficulties will arise in connection with the choice of a suitable eliminator.

The cost of an eliminator is only partly determined by the magnitude of its maximum output. The provision of tappings to supply voltages lower than the highest to the earlier valves of the set accounts for an appreciable proportion of the cost of many models, the extra charge for each additional voltage being generally between fifteen and twenty shillings. Whether an eliminator with taps for lower voltages shall be chosen, and, if so, how many such taps are desirable, depends very largely upon the type of receiver that is in use.

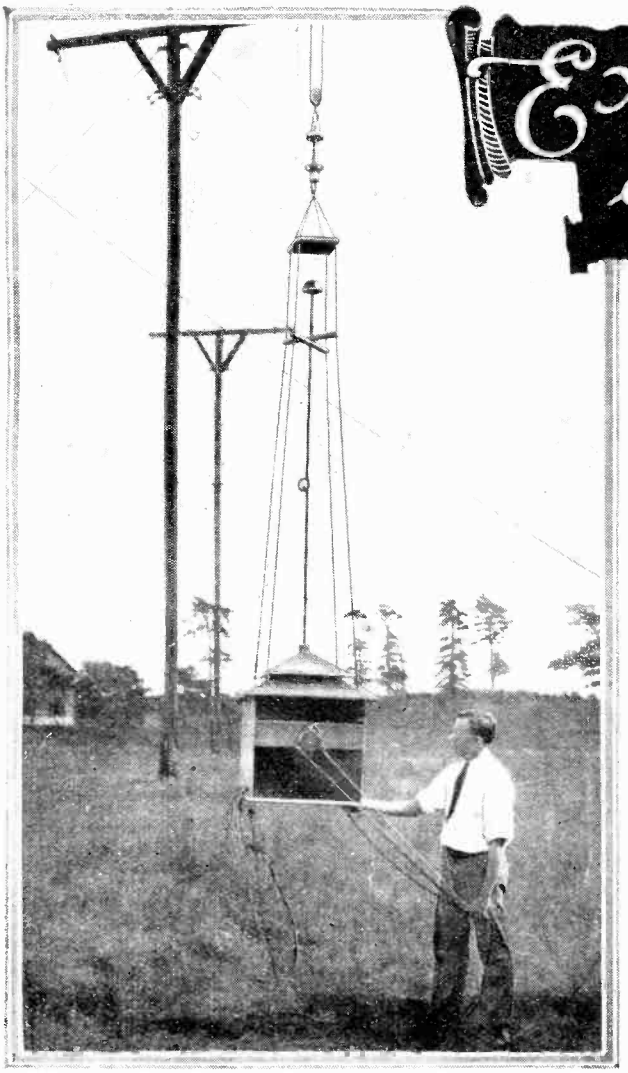
Much has been written recently about the prevention of instability by the use of resistance-capacity filters in the plate circuits of the various valves in a receiver, but it is still not generally realised that in most cases an eliminator furnishes its lower voltages through just such a filter. Either a potentiometer or a series resistance is used to drop the unwanted volts; in the first case, provided there is a condenser from each tapping point to H.T.−, as shown in the diagram, Fig. 1 (a), we have all the essentials of a resistance-capacity filter system.

If, therefore, an eliminator having several tappings is purchased, there is far less chance of the production of "motor-boating," low-frequency oscillation, or distortion, than if only one output terminal were available. With any well-designed modern receiver, which

**An eliminator for A.C. mains in which provision is made for H.T., L.T. and grid bias. The latter is obtained from a potential divider.**

permits of the application of independent grid-bias to all the valves, the need for any voltage lower than the maximum that the valves will stand does not exist where an anode rectifier is employed, and only arises where a grid detector is in use. Nevertheless, it is well worth while to choose an eliminator with a liberal number of tappings, in order to ensure that the chance of difficulties arising from instability of the receiver may be reduced to a minimum. This is subject to a proviso that the series resistance method of reducing voltage must be used, and not a potential divider.

No mention has been made of the relative merits of the different types of rectifiers used in eliminators which have to work from alternating current mains; the thermionic valve is used in the majority of cases. The gas rectifier, which has for some time past been very popular in America, does not seem to have caught the public fancy in this country, while the new metal rectifier is earning a good reputation. Any of the three may be taken to be satisfactory if the eliminator is properly designed, and is built by a reliable maker. After all, the buyer of such an instrument need do no more than satisfy himself that the performance of his purchase will fulfil his needs, and may quite well leave to the makers the choice of means by which this performance is attained.



# Experiments on 5 Metres

## Peculiar Shadow Effects Noticed with Ultra-short Waves.

THE steady reduction of wavelength during the past few years has demonstrated that short waves have certain habits of their own, which are not noticeably associated with the longer waves. For instance, there is the now well-known "skip-distance" effect, whereby a short-wave signal, after leaving the transmitter, will be audible over a comparatively short distance; then for a considerable distance the signal will be quite inaudible, after which it once more comes in strongly in a far-distant receiver.

Experience has shown that as the wavelength is reduced the greater this skip-distance becomes, until, somewhere below ten metres, the signal does not appear to be audible anywhere on this earth, except in the immediate vicinity of the transmitter. One theory is that the propagated wave at this frequency travels outwards from the earth at a tangent, and penetrates the Heaviside Layer instead of being reflected from it back to earth, as is the case with longer waves.

The 5-metre wave is being experimented with to a considerable extent to-day and the G.E.C. of America has been one of the foremost in the field. Their experiments have demonstrated that the 5-metre wave shows some of the characteristic of light propagation. The signal follows a straight and unobstructed line. Thus, a receiver on a distant hill will pick up a strong signal, but the same receiver, placed on the other side of the hill, so that it is not within the "line of vision" from the transmitter, will pick up a barely audible signal, whilst definite effects of a similar character are observable even with intercepting obstacles of comparatively small magnitude.

### "Shadow" Effect Accentuated.

The hill or other obstacle seems to cast a "shadow" through which the signal penetrates with difficulty. This effect is, of course, frequently met with when very much longer waves are being employed, but becomes less and less marked as the wavelength is raised. At about 5,000 metres or over, the effect is no longer noticeable, unless the receiver is situated immediately behind a very high mountain containing a high percentage of mineral ore.

In the tests made on five metres, natural static was entirely absent, but man-made static, such as that from the ignition systems of motor cars, was very noticeable. Thus far, the 5-metre transmitter has been tested at a range of only 30 miles, but engineers are now planning a test with receivers set up on Lebanon Mountain, near Pittsfield, Mass., which is about 40 miles from Schenectady, where the transmitter is situated.

The next test proposed will be made between Schenectady and New York City. In this case the transmitter will be elevated about 300 feet, and the receiver will be placed on top of the Woolworth Building in New York. A careful survey has indicated that there is a clear "line of vision" between the proposed transmitter location and the Woolworth Building, which is about 600 feet high.

### Apparatus Used.

Due to the peculiar nature of 5-metre wave propagation, the 1 kW. transmitter is constructed so that it can be slung, as shown in the title illustration to this article, from one of the 300-foot masts at the Schenectady transmitting laboratory. Two of the new type 4-electrode air-cooled valves (Fig. 1) are used in a special oscillator circuit.

The aerial, which is about eight feet long, consists of

**Experiments on 5 Metres.**—a half-wave radiator, voltage fed, connected directly to the oscillator. A meter in the middle of the aerial is used for measuring the aerial current, and this is read by means of a surveyor's transit on the ground. The tuning of the transmitter at a distance of 300 feet is made possible by means of a special rope drive connected with a vernier control. Wires for supplying power and control are run to the transmitter from the ground.

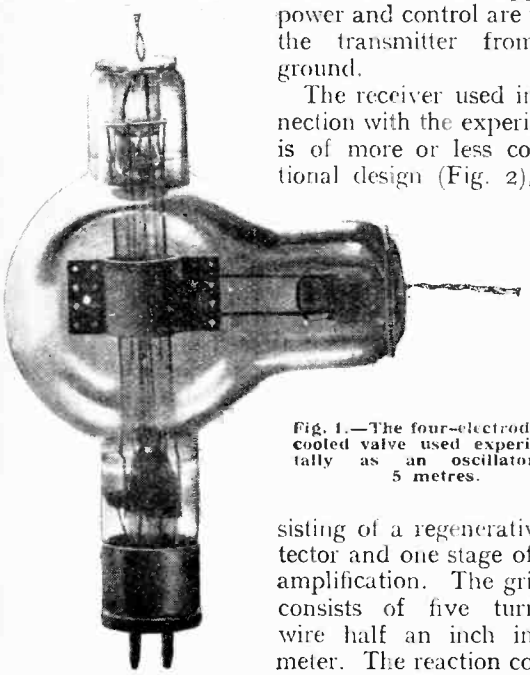


Fig. 1.—The four-electrode air-cooled valve used experimentally as an oscillator on 5 metres.

The receiver used in connection with the experiments is of more or less conventional design (Fig. 2), consisting of a regenerative detector and one stage of L.F. amplification. The grid coil consists of five turns of wire half an inch in diameter. The reaction coil is a quarter of an inch long and a quarter of an inch in diameter, and is placed inside the grid coil. Very small condensers placed close together are used for tuning and reaction control, and special low-capacity valves are used. Generally it has been found unnecessary to use an aerial, the head-phone cords picking up sufficient energy. An aerial may, however, be used if desired.

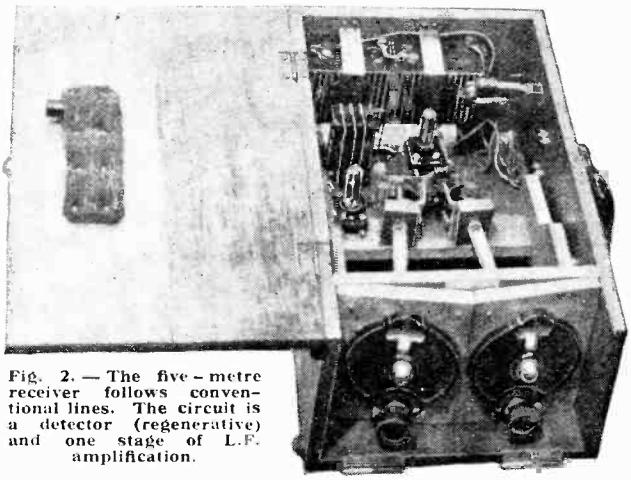


Fig. 2.—The five-metre receiver follows conventional lines. The circuit is a detector (regenerative) and one stage of L.F. amplification.

When dealing with such short waves, enormously high frequencies are involved. A 5-metre wave represents a frequency of approximately 60,000,000 cycles (60,000 Kc.) per second, and a 4-metre wave has a frequency of 75,000,000 cycles. In the interval between four and five metres, 15,000 kilo-cycles, every wireless station now in operation—amateur, Government, broadcasting, and commercial—might be accommodated without interference from overlapping signals.

Investigation of 5-metre wave propagation has only just begun, but it is possible that in time radio engineers will find some practical application for such ultra-short waves. It will be interesting, too, to see how far ultra-short wave propagation conforms to the principles of light propagation. A. D.

# WHEN DRY BATTERIES ARE BEST.

## Weaknesses of H.T. Accumulators and Eliminators.

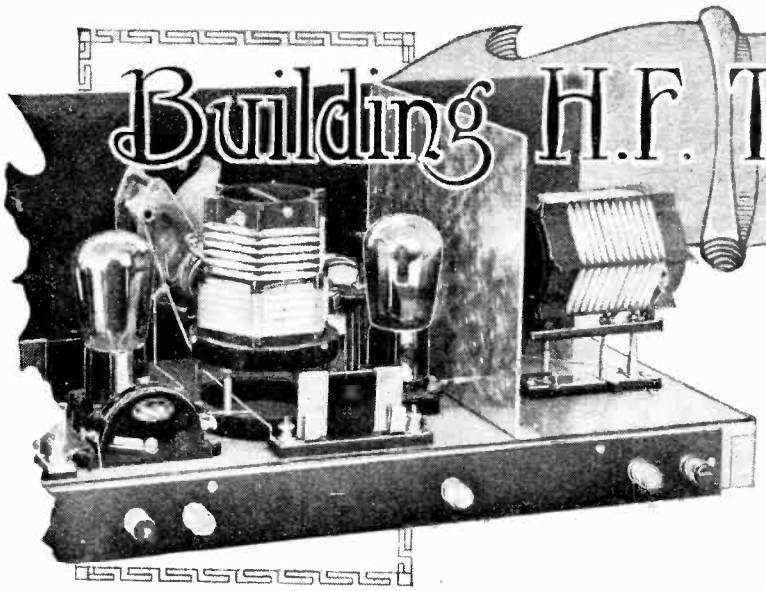
THE present tendency towards obtaining high-tension current from the mains when they are available, and from high-tension accumulators when they are not, is generally considered to effect in the long run a considerable saving as compared with dry batteries. While this saving is generally very real, in any case where the operation of a loud speaker makes it essential to supply the receiver with fairly heavy currents, it does not occur where the set is built to work telephones only.

Indeed, the very small plate current taken by such a set is quite insufficient to give high-tension accumulators the exercise they need, so that they speedily deteriorate, making depreciation cost so high that the use of this type of anode-current supply for such a set must be regarded as a costly luxury.

For headphone sets, unless steps are taken to insulate the telephones completely from the receiver, an eliminator worked from D.C. mains should be avoided as exposing the user to a distinct possibility of unpleasant shocks should he inadvertently touch an earthed object or a "live" lamp-holder while wearing the telephones. In addition, the smoothing afforded by these units, while quite adequate for loud speaker reception, is seldom perfect enough to make "hum" quite inaudible in telephones.

### Where the Dry Battery is Economical.

A dry battery, on the other hand, is not only convenient, but extremely economical as well in all cases where the current drawn amounts to a very few milliamperes only; a two-valve receiver using no valve of lower impedance than some 16,000 ohms will operate for nine months or more, even if used freely, from a 60-volt small-capacity dry battery of first-class make. On the score of economy one could hardly ask more than this.



# Building H.F. Transformers

## Efficient and Easily made Couplings for High-frequency Amplifiers.

By H. F. SMITH.

THE "goodness" of many recently introduced valves shows such a considerable improvement over the best hitherto achieved that some of our ideas with regard to H.F. amplification will need revision. For instance, readers who still favour the triode —as opposed to its screened-grid competitor—and who are about to construct a high-frequency amplifier (either as a separate unit or as part of a receiver) may well consider the possibilities of using solid wire for their transformers instead of the comparatively expensive Litz windings which have for some time been regarded as almost essential where superlative performance is required. It is now widely accepted that these latter transformers, in conjunction with the best and most suitable "pre-1928-29" valves, give as much magnification, in a single-stage amplifier, as is needed under moderately favourable conditions; it is the purpose of this article to describe the construction of cheaper couplings which, with the new valves, will give sensibly the same results, and which are compact and by no means difficult to wind.

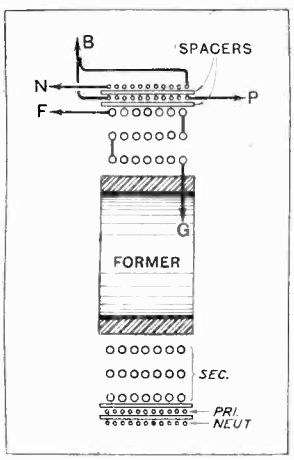
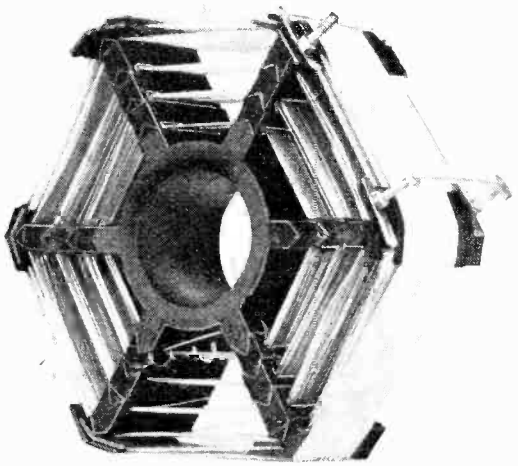



Fig. 1.—Sectional sketch showing disposition of windings and external connections.

It will be almost unnecessary to say that secondary coils of Litz have certain inherent advantages, and that transformers so wound will give an increased amplification commensurate with improved valve characteristics; in the quality of selectivity, also, they will confer some advantage. Accordingly, those in the wipe-out area surrounding a broadcasting station, or unfavourably situated in other ways, would be ill advised to effect economies in this direction, but for others the transformers to be described are put forward as likely to meet a real need.

### Ready-made Secondary Windings.

Some time ago the present writer described a long-wave H.F. amplifying unit[1] in which a commercial coil, with its plug and supporting band removed, was used as the secondary of the transformer, its primary and neutralising coils being over-wound in separate layers. This form of construction was found to be even more effective than had been anticipated, so it was decided recently to experiment with similar couplings on the normal broadcast waveband. For this purpose, inductances wound in several concentric layers are the most convenient; of course, the efficiency of the finished



A long-wave H.F. transformer consisting of a commercial coil with added primary and neutralising windings.

[1] *The Wireless World*, May 18th, 1927.

**Building H F. Transformers.—**

transformer will depend largely on the correctness of design of the coil. Fortunately, a number of suitable types are available; the majority of couplings of which amplification measurements have been made were built with Edison Bell coils, which lend themselves particularly well to this purpose.

This principle of construction will be made clear by considering Fig. 1 and the photograph of an unmounted transformer. It will be seen that the primary winding is immediately over the secondary, and is separated from it by spacing strips. Above this is the neutralising coil, similarly spaced.

Having removed the plug mounting, the first step is to prepare the spacing strips; when the coil is wound

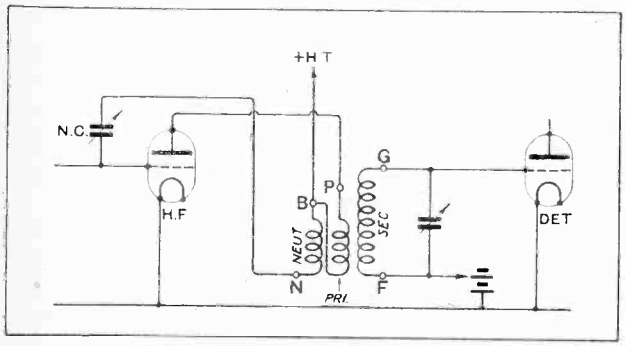



Fig. 2.—Circuit of H.F. amplifying stage. The lettering on the transformer terminals corresponds with Fig. 1.

on a six- or eight-ribbed former, these may conveniently consist of pieces of paxolin, pertinax, or similar insulating material, $\frac{1}{32}$in. in thickness, $\frac{3}{8}$in. in width, and of a length equal to the overall width of the coil—generally about an inch. These should be scored deeply with some sharp instrument and bent to have a cross section in the form of a widely opened "V," in order that they may fit neatly over the ridge formed by the winding where it passes over the ribs. Four small brass screws may be nutted to the ends of three of these strips to serve as terminals for the ends of the winding. The second set of spacers, for separating primary and neutralising coils, are similar, except that their ends should be either cut away or drilled to clear the terminal screws. A rubber band is used temporarily to secure the strips in position until they are held by the wire.

**The Art of Space Winding.**

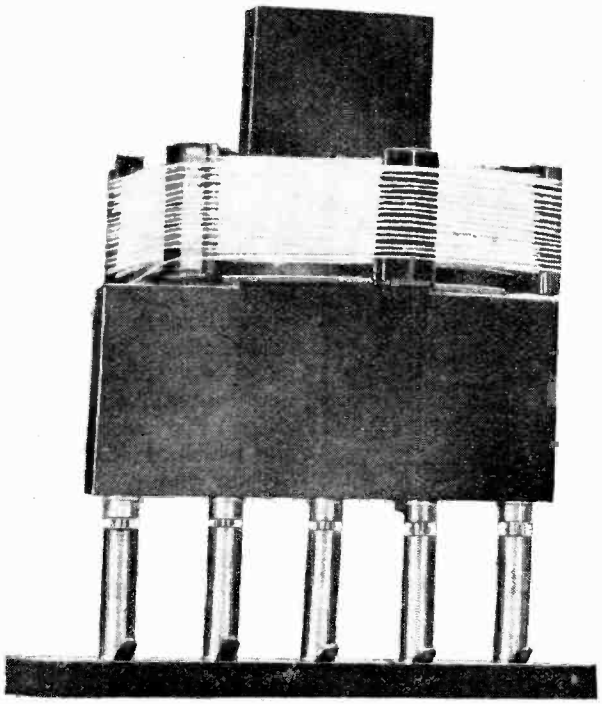
With regard to coils, the secondary inductance is chosen from the information as to wave-range published by the manufacturer. The addition of a primary will slightly modify the band of frequencies covered with a given tuning condenser, but to an almost negligible extent. As a rule, a "No. 75" will be suitable for the normal broadcast waveband when tuned with a maximum capacity of 0.0003 mfd. Assuming that this will be used in conjunction with a H.F. valve of from 20,000 to 30,000 ohms impedance, the primary winding may have 15 turns of No. 38 D.C.C., turns being spaced out to occupy the full winding length of the coil, which may vary from $\frac{3}{4}$in. to 1in. If only for the sake of appearance, it is desirable that the spaces between adjacent turns should be reasonably uniform; the operation is not difficult of execution if the coil is rotated by means of a wooden handle forced into the former. The neutralising winding, similar in all respects to the primary, is put on after fitting the second set of spacers; it is wound in the same direction.

For the 1,000-2,000-metre waveband, a No. 250 coil will, as a rule, have a correct inductance value. The appropriate primary and neutralising windings have each 45 turns of No. 38 D.C.C.; these will approximately fill the space available if adjacent turns are touching lightly, but not pressed together.

**Fixed and Interchangeable Transformers.**

As to the method of mounting, the constructor may suit his own requirements and facilities. When interchangeability is necessary, the fitting illustrated is suggested, as its construction calls for no elaborate workshop equipment. A piece of $\frac{1}{4}$in. ebonite sheet, $3\frac{1}{2}$in. square, is cut away as shown, so that the upper part fits tightly into the inside of the coil former; five valve pins are screwed into its lower edge, and are connected to the various ends of the windings in accordance with Fig. 1 and Fig. 2, in which the lettering corresponds. A base is made by mounting five similarly spaced valve legs on an ebonite strip. A short-circuit of the H.T. battery, due to an accidental reversal, may be avoided by joining "G" and "F" to the outer pins, and "B" to the centre contact.

In single-waveband or switch-over sets, the transformer may be mounted on a rectangular strip of wood fitted with small metal brackets by means of which it is secured to the baseboard.



A simple plug-in mounting for coils as shown in the preceding photograph.

**Building H.F. Transformers.—**

The circuit diagram in Fig. 2 is drawn on the assumption that the magnified output from the transformer will be passed on to an anode-bend detector, of which the connections are shown (ignoring the possible addition of a potentiometer for obtaining critical control of grid bias). Now a rectifier of this kind does not impose any appreciable damping on the circuit preceding it, and, for this reason, provision for reaction is not included. This is in accordance with conventional practice.

### Adding a Reaction Winding.

The use of leaky-grid condenser rectification, on the other hand, does impose a considerable load on the tuned circuit, and those who prefer this method would be well advised to take advantage of the great increase in sensitivity which results from counteracting the consequent damping by reaction. A circuit diagram showing the connections for this addition is given in Fig. 3, from which it will be seen that an extra coil, coupled to the secondary, must be added. The transformers are otherwise unchanged. The reaction coil, which may have about 25 turns for the normal broadcast waveband, and 75 turns for the long waves, may be wound on a small cylinder of a size suitable for inserting in the secondary coil former. Alternatively, the spacing strips which support the primary may be increased in length to provide an extension at one side of the coil on which the reaction coil may be wound. If this plan is followed, it is recommended that the winding should be "bunched" so that it may occupy a minimum of space; in either case, fine double-silk-covered wire of about No. 40 gauge should be used.

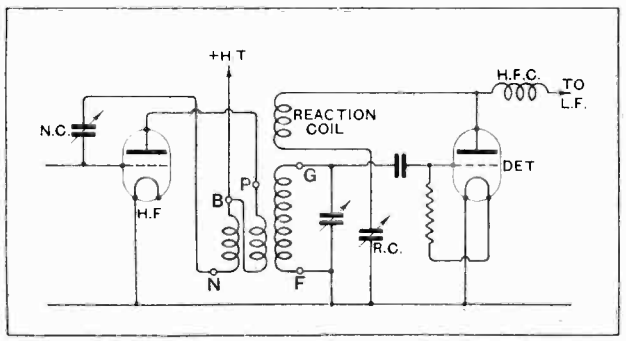
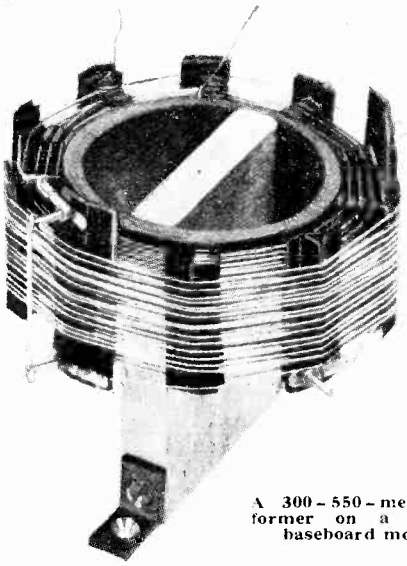



Fig. 3.—Capacity-controlled reaction may with advantage be added to sets using leaky grid condenser rectification.

It will be observed that the addition of reaction in the manner suggested will require that two extra contacts be fitted on the transformer mounting; this need not present any insuperable difficulty, but those who are using commercial fittings with six pins may solve the problem by connecting one end of the feed-back coil



A 300–550-metre transformer on a stand for baseboard mounting.

to the "F" end of the winding and transferring the control condenser (marked R.C. in the diagram) to the lead from the detector valve anode. This alteration will, unfortunately, mean that both sides of the condenser are at high oscillating potential with respect to earth, and consequently hand-capacity effects may cause inconvenience in operation; they may, however, be overcome by choosing a component fitted with an extension control rod.

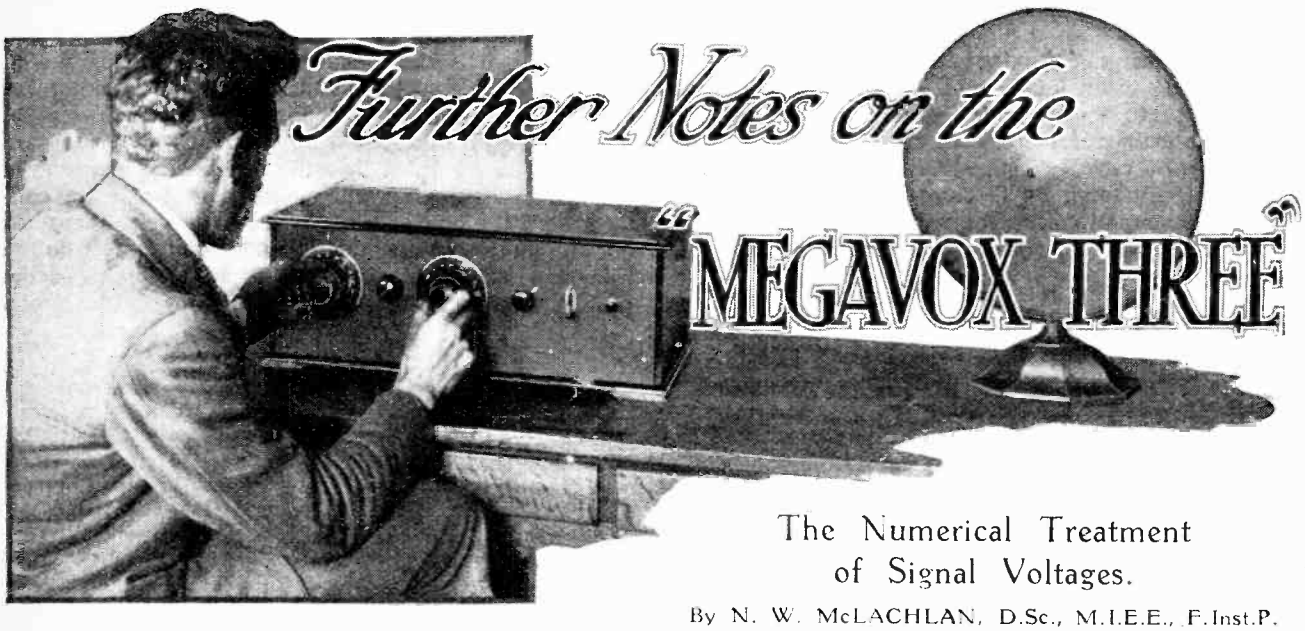
## A COIL-WINDING HINT.

THE winding of tuning coils is at the best of times rather a tedious task, especially if it is undertaken without making such preparation as is possible to facilitate matters. Particularly is it difficult to ensure that the wire will come easily off its reel without kinking or tangling, and it must be remembered that coil-winding engages both hands, so that if a kink appears the operator is left helpless to rectify it.

This difficulty is easily avoided by making a holder of some kind for the spool, so that the wire unwinds smoothly, and the spool, while free to rotate, cannot indulge in any other movement. Those who enjoy carpentry for its own sake will probably make a holder of polished wood, but a perfectly satisfactory, though unsightly, spindle can be rigged up in a few seconds by pushing a wooden knitting-needle through two opposite sides of a lidless cardboard box. That part of the knitting-needle which lies inside the box is used as the axle for the spool of wire.

It will be found advisable, if thick wire is being used, to weight the box to prevent movement, though this precaution is hardly necessary with wire finer than about 26 s.w.g., or with Litzendraht.

In winding such components as H.F. chokes, where a number of turns of fine wire have to be run rapidly into a slot, the coil-former may be held in a hand drill and rotated rapidly. To prevent the spool from overrunning and releasing a length of unwanted wire, and to keep the wire taut while winding, a hand may be laid on the spool; if both hands are engaged, even a stockinged foot has been found to make a very effective and easily controlled brake! A. L. M. S.



# Further Notes on the "MEGAVOX THREE"

## The Numerical Treatment of Signal Voltages.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

(*Concluded from page 387 of last week's issue.*)

WHILST operating the *Megavox Three*, it was found that the detector and loud speaker occasionally co-operated in a little sing-song on one note. This acoustic reaction, which will be a familiar experience to most readers, occurred with anode bend, but not with leaky grid detection. And anti-pong rubber suspension valve holder or any of the usual artifices adopted in such cases will cure this disease. Orienting the loud speaker is often effective since room reflection is also an accomplice.

In the course of the experiments I noticed that the pentode became warm. The reason is clear when the various sources of watt loss are investigated. Using a P.M.24 with feed currents of approximately 20 mA. and 4 mA. to the anode and screen, respectively, and an anode voltage of 150, the loss figures are 3.0 and 0.6 watt. The filament dissipation is $0.15 \times 4 = 0.6$ watt. The total wattage is, therefore, $3.0 + 0.6 + 0.6 = 4.2$ which makes the glass warm.

### Numerical Design Data for Output Voltage.

In designing a receiver to work on a certain transmitting station it is essential to know the signal strength of the station at the aerial of the receiver. During the past year or so, a number of measurements have been made on the signal strength of various stations in different localities. The diagrams showing signal strength are usually given in the form of contour maps. In this journal on January 4th, 1928, Mr. R. H. Barfield told us all about measuring field strength at different distances from a radio transmitter. His contour map for 2LO is given in Fig. 3. Suppose we desire to calculate the performance of the *Megavox Three* at Cambridge on 2LO's wavelength. Referring to Fig. 3 we find the field strength of 2LO is 0.7 millivolt per metre of *effective aerial height*. Now very few people know the effective heights of their aerials, so that we must make some assumption. Taking a moderate aerial and assuming its *effective* height to be 5 metres (about 16 feet), the voltage induced in the aerial due to the carrier wave will be $5 \times 0.7 = 3.5$ millivolts. This voltage is amplified by the aerial transformer, the degree of amplification depending upon the aerial resistance, the transformer ratio, the secondary resistance and the volume control resistance. Some of these factors are unknown, so we must adopt other means of elucidating the matter. In *The Wireless World*, May 2nd, 1928, I calculated the amplification of an average aerial circuit as 25. The valve and tuned anode can also be assumed to yield 25. Thus the input to the grid of the detector is $3.5 \times 25 \times 25 = 2{,}100$ millivolts $= 2.1$ volts root mean square. This corresponds to a peak voltage of $2.1 \times 1.4 = 2.9$. Such a voltage will overload a grid leak detector, and if used on anode bend will overload the pentode. Moreover, even when the voltage is reduced to a lower value, the grid leak detector will be amply loaded. The magnification over the major part of the audio range[1]—with a full loaded detector—is the "*m*" value of the detector × transformer ratio. This is $12 \times 3.5 \div 40$. But the modulation of the carrier wave is only $20\% = 1/5$, so that the actual voltage amplification at the detector is $40/5 = 8$. Hence the peak voltage applied to the pentode, without the use of reaction, is $8 \times 2.9 = 23$. This would, of course, cause distortion since the grid bias of the pentode lies between $-7.5$ and $-10.5$. Moreover, there would be ample output on 2LO at Cambridge, and the input potentiometer would have to be set to reduce this from 23 to something below the bias voltage of the pentode.

I have had no opportunity of testing the *Megavox Three* at Cambridge, but with a full-size open aerial in the heart of the metropolis *without reaction* 5GB

[1] Where the transformer characteristic is flat.

**Further Notes on the "Megavox Three."**—

causes a peak signal strength at the grid of the pentode exceeding 25 volts. In both cases the use of reaction would enhance the signal strength enormously. With the same aerial, 2LO is worked with both H.F. circuits in tune and the input potentiometer all out except the last few degrees. Using a frame aerial 2 feet 6 inches square[2] (of moderate resistance) and a L.S. coil of 2,500 turns, 5GB was obtained in the heart of the metropolis Hall was good. The frame aerial gave the same signal strength as a few feet of aerial wire.

### Intensity Control Design.

Although the intensity control on the grid of the high frequency valve works smoothly and nicely, it ought to follow a definite law to give satisfaction from the aural viewpoint. If we start with a certain loudness and use, say, a stud control, then for the increase to be readily

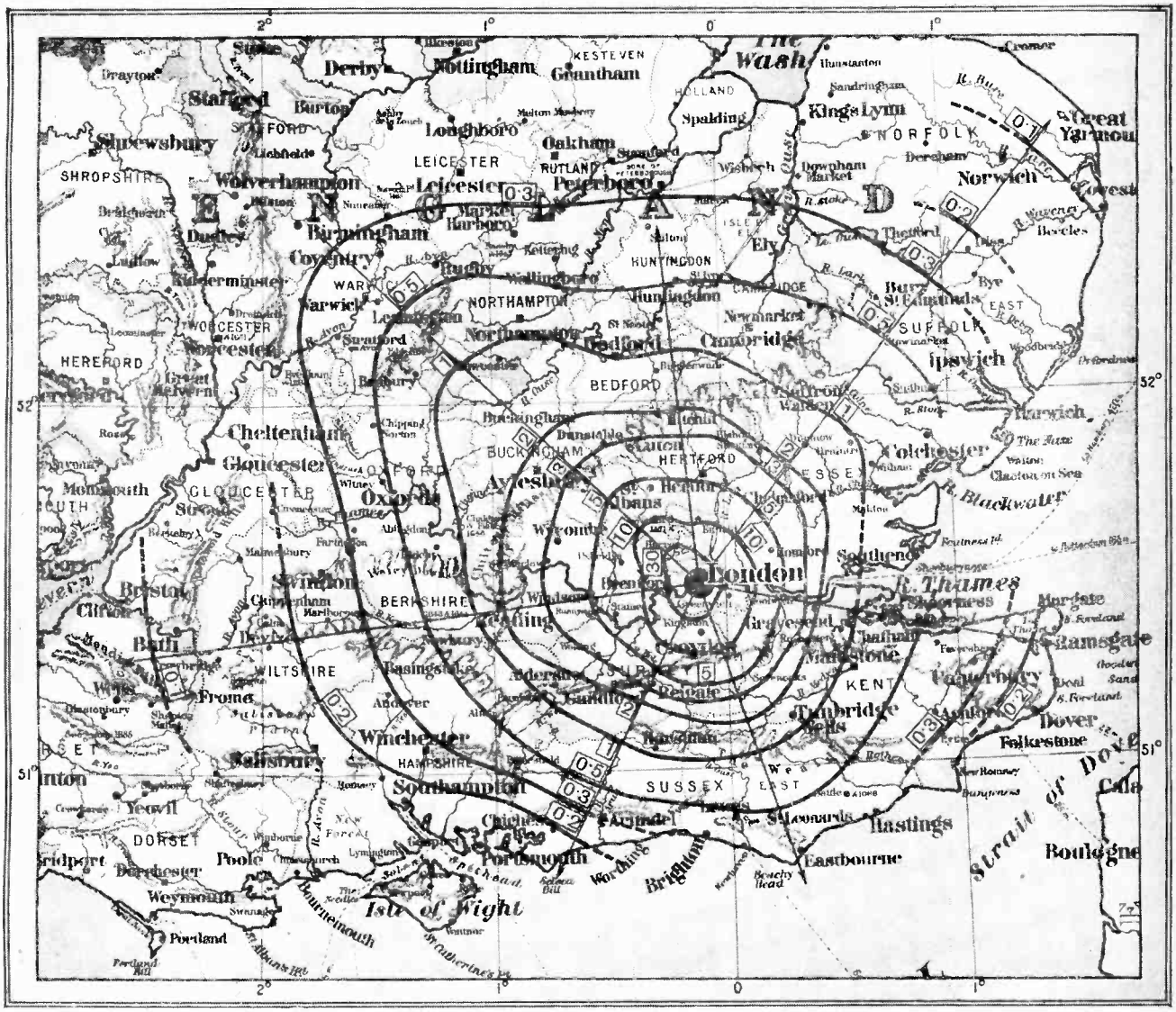



Fig. 3.—Contour map of the field strength from 2LO. The numbers against the radii represent the field strength in root mean square millivolts per metre.

sufficiently loud to prevent conversation in a room of average size. The grid leak detector was used to get an adequate upper register and the reaction required was small. Moreover, the quality as tested on transmission from the Promenade Concert at the Queen's

perceptible, the next stud must raise the *volume* about four times. Taking the second stud as a fresh datum, the third stud must increase the volume fourfold and so on. Thus we have the loudness gradations 1, 4, $4 \times 4 = 16$, $16 \times 4 = 64$, $64 \times 4 = 256$, etc. If the volume ratio were three, the series would be 1, 3, 9, 27, 81, etc. When either of these series is plotted the result is a curve of the form illustrated in Fig. 4. This is known in

[2] The stranded wire aerial coil was removed and the frame connected across condenser $C_1$ of the original diagram.

**Further Notes on the "Megavox Three."**

mathematics as a *logarithmic* curve, and is similar in shape to that used in the construction of loud speaker horns of the exponential variety.

In this discussion the general effect of the multitude of frequencies, which act simultaneously in speech or in music, is considered. For simplicity the variation in the *incremental* sensitivity of the ear at different frequencies and loudness has not been considered.

The design of the control on the H.F. input must be such that the volume from the loud speaker follows a law of the nature portrayed by curve 1 of Fig. 5.

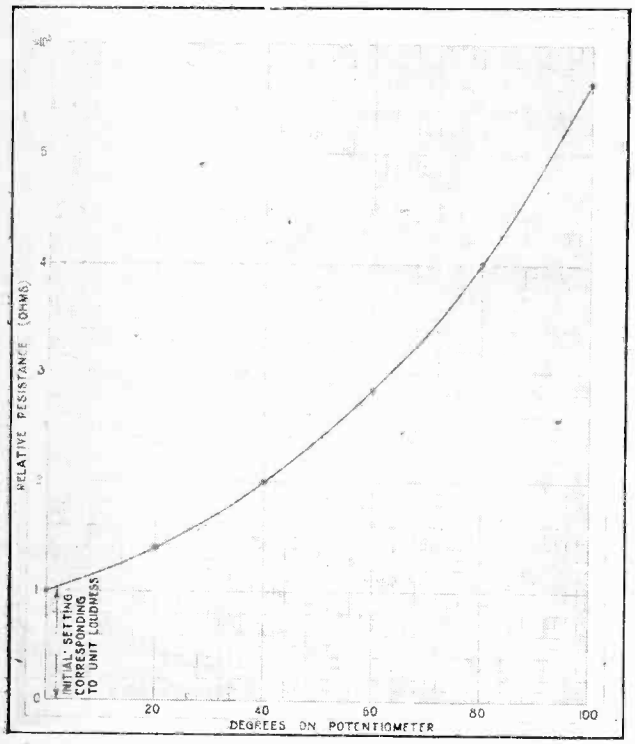



**Fig. 4.—This curve illustrates the relationship between control resistance and degrees movement to obtain smooth volume control. The curve is logarithmic and the values are arbitrary.**

To ascertain the curve for the potentiometer we must work backwards from the power valve. The output intensity is proportional to the square of the voltage applied to the grid of the power valve. Thus, to reproduce curve 1 of Fig. 5, the voltage applied to the grid must vary as the *square root* of the ordinates of said curve. This is illustrated by curve 2 of the same figure. Working back still further in the receiver we come to the

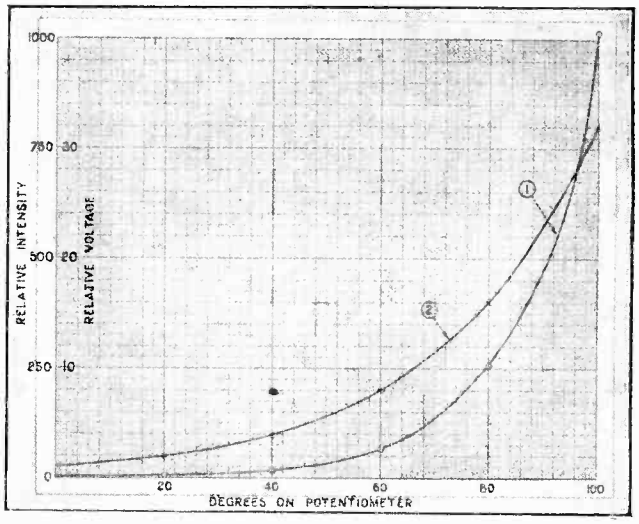



**Fig. 5.—Curve 1 shows the relation between output intensity and degrees on the potentiometer. Curve 2 shows the relation between the signal voltage on the detector valve and degrees on the potentiometer.**

detector. It is well known that with weak signals, doubling the input voltage produces much more than double the output. This means that the detector output is not proportional to the input. It is usual to assume the detector to follow a square law, although this is not always the case. However, for simplicity we shall assume this to hold now. This means that double the grid input produces four times the anode output. Moreover, to obtain curve 2 of Fig. 5 by operating on the detector grid, it is again essential to take the square root, which results in a logarithmic curve similar in shape to those in Figs. 4, 5. Thus the relationship between resistance and the degrees turned by the control knob must be of the form obtained by taking the fourth root of the logarithmic curve of Fig. 4. It has been assumed throughout that the feed-back of the H.F. valve is negligible so that the insertion of resistance in series with the valve grid does not affect its amplification.

# OLYMPIA SHOW COMPETITION.

*THE WIRELESS WORLD* Olympia Show Competition entries must be forwarded not later than October 8th, so we ask all our readers to get busy at once in completing the entry form which is published in the advertisement pages of this issue, and which appeared also in our Show numbers of the last two weeks.

We hope that every reader will complete a form and post it to us in order that the voting as to the best apparatus at the Olympia Show may be as representative as possible of the views of our readers. As we have previously explained in earlier announcements, our object in conducting the Competition is to accumulate the individual views of all our readers, and to analyse them so as to arrive at a result which will place the outstanding exhibits of the Show in order of merit. To stimulate interest in the voting *The Wireless World* is presenting prizes to the winning competitors, as decided by the totals in accordance with the rules which are printed with the entry form. The prizes offered are, a first prize of £50 in cash, and second, third, fourth, and fifth, prizes to the total value of a further £50 in the form of vouchers for the purchase of wireless apparatus.

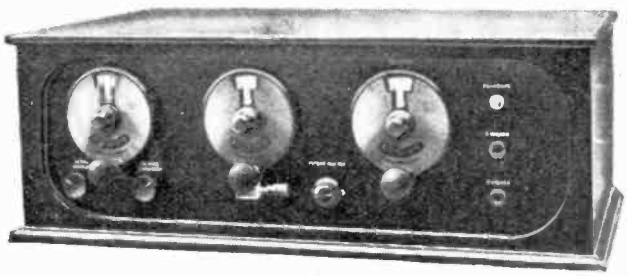
The Competition is confined to apparatus actually exhibited at the Olympia Show, and readers are asked to consider in making their choice the value of apparatus at the price asked for it, so that expensive as well as cheaper apparatus may be taken into consideration.

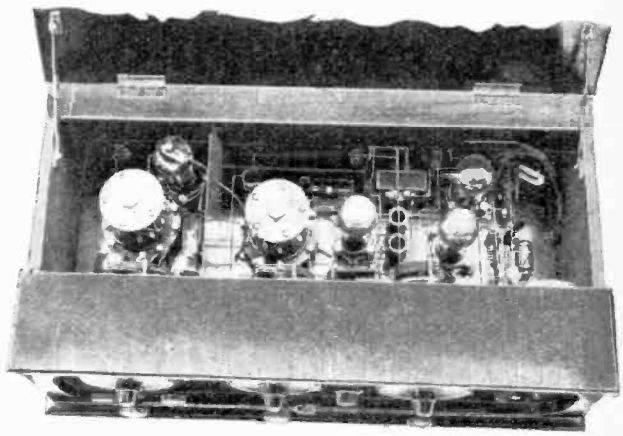

## Olympia's New Features—Representative Types Described.

IN attempting to present a true picture of modern tendencies in receiver design as exemplified at the Olympia Exhibition, we cannot do better than begin with the H.F. amplifier. Here it is abundantly clear that the neutralised three-electrode valve is moribund, surviving only in its most efficient form. We of *The Wireless World* may be forgiven if we pause here for a moment figuratively to brush away a tear at the passing of an old friend; the subject of the balanced high-frequency amplifier has always received particular attention from contributors to these pages, and it is submitted that their researches have done something to bring it to its present state of high efficiency. However, when we come to face facts squarely, our regret is tempered by the knowledge that it has never been really popular except among the wireless *intelligentzia*, and it is probably all to the good that it should give way to its screened grid competitor, which has gained pre-eminence not because it gives, in practice, any vast increase in magnification, but because less elaborate couplings and circuit arrangements are required for sensibly equal results. Real H.F. amplification, formerly the privilege of the few, is now open to everyone.

As far as multi-stage H.F. amplifiers are concerned, the new valve may be said to have swept the board, as there are but one or two sets of this class with ordinary triodes. Among the more interesting "2-H.F." sets are the Marconiphone Type 44, in which "single ended" H.F. valves were used, followed by a detector and one L.F. amplifier, and the G.E.C. "World-Wide Four," which embodies a similar circuit with "double ended" valves. Mention must also be made of the B.T.H. "Five Stage" receiver, which is of particularly clean design.

Regarding the control of the H.F. amplifier, it becomes evident that complete ganging is, with a few exceptions, confined mainly to transportable sets, which are intended to appeal to the totally unskilled, and in

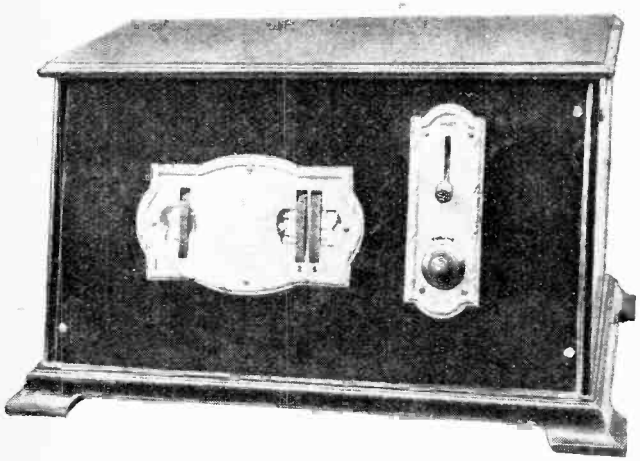




Two views of the Igranic H.F. set, which covers all the ultra-short wave bands.

**The Trend of Progress.—**

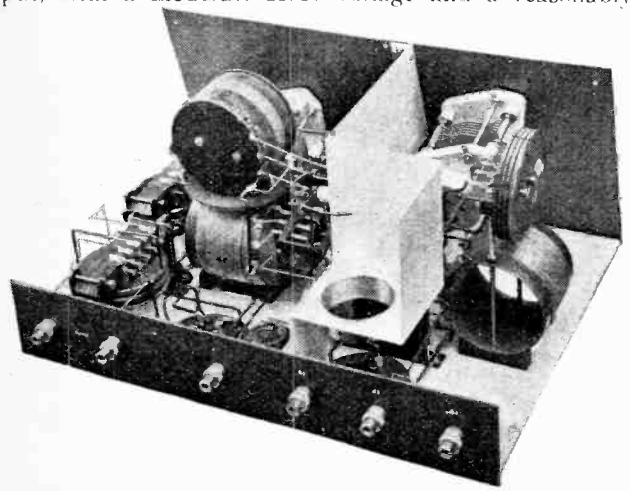
which the problems involved are slightly less difficult of satisfactory solution, due to the absence of an open aerial of indeterminable capacity. A far more popular method, exemplified in more sets than can be enumerated, is a form of partial ganging obtainable in a very simple way by mounting the edgewise control



Typical of the more ambitious modern receiver, the Marconiphone Type 44 has two tuned H.F. stages.

drums of the condensers in pairs. One of the most noticeable completely ganged sets is the B.R.C. five-valve receiver, in which particular care seems to have been taken to get well-balanced tuning over the full band.

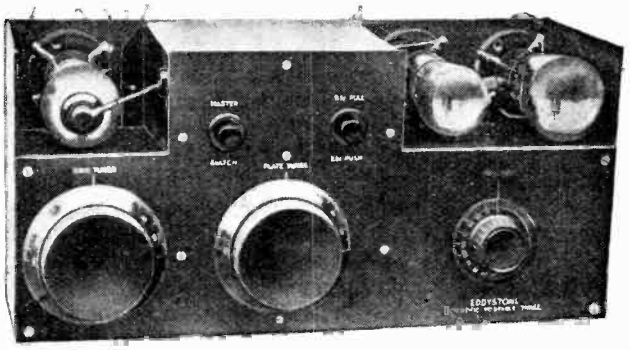
Coming to the detector, we find that there has been very little change since last year; the balance between anode and grid methods still remains about the same, but the former might have gained ground had it not been for the advent of the pentode. When we come to consider the L.F. amplifier, it is at once apparent that the introduction of this new valve has almost revolutionised this side of receiver design, and that manufacturers have been quick to grasp the importance of its ability to provide high magnification and large output, with a moderate H.T. voltage and a reasonably low consumption of anode current. Although its use does not automatically render a receiver immune from motor-boating and L.F. reaction troubles, their prevention is much simpler and easier than in a multi-stage triode amplifier giving sensibly the same performance. Where pentode valves are not used on the L.F. side, it is evident that the combination of a resistance stage followed by a transformer is becoming almost standard practice.



A good example of up-to-date set construction; chassis of the Pye Type 360 set.

**Wave Changing by Switching.**

Another real innovation is wave range switching. In the great majority of receivers interchangeable plug-in coils have been abolished. This is a logical development which was to be anticipated; a properly designed switching system causes an almost imperceptible loss in a receiver comprising the most efficient low-loss circuits; this loss will be even less apparent with coils designed to comply with the exigencies of commercial production. In almost every case H.F. coupling is by the tuned anode method, which in itself facilitates switch change-over. There is, however, at least one example (in the Bowyer-Lowe "Vox Populi" set) of transformer coupling between the screened grid H.F. amplifier and detector; the opinion is held in some quarters that we shall see more transformers next year, as their use does not inhibit a switch-over change, which is, indeed, used in the Bowyer-Lowe set.



The Eddystone chassis ready for mounting in the cabinet of a self-contained receiver.

Where waveband switching is not included, manufacturers have endeavoured to simplify the operation of changing coils, as witness the "Magnum" three-valve set (S.G. H.F.-triode-pentode), in which the grid and anode coils are linked together mechanically on an ebonite crossbar carrying contact pins.

There can be no question that the most popular 1928-29 set is a combination of one screened grid H.F. amplifier, an ordinary triode detector (almost invariably operating on the grid circuit rectification principle) and a pentode output valve. It would be impossible to enumerate all the examples of this excellent circuit, but mention may be made of the McMichael Screened Dimic Three, which is probably a pioneer of its class; readers will be familiar with its features, as it has already been reviewed in the pages of *The Wireless World*. The Burndept Screened Ethophone is another good example of a moderately-priced set of this type;

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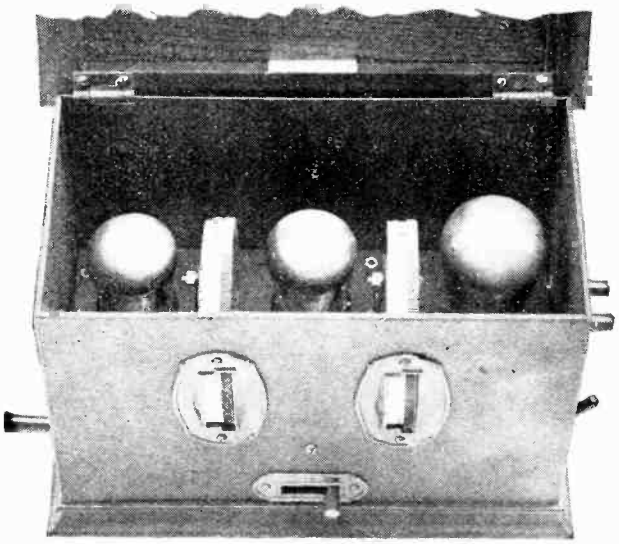
as is the Marconiphone Type 35 receiver, which costs only £12. The Bowyer-Lowe set, as already stated, has a novel feature of transformer-H.F. coupling, and



Of unconventional construction, the G.E.C. "Victor Three" is mounted in a metal cabinet.

in addition its screening box is ingeniously contrived to permit of easy access to the interior of the receiver. The Pye Type 350 set is noteworthy on account of its general design.

In spite of its obvious advantages for local station work, the simple two-valve set with an ordinary detector followed by a pentode seems to have received but little attention; an example, however, is the Peto-Scott "Triple Two."

As for volume control devices, by far the most popular method is H.F. filament dimming, although a few manufacturers fit a potentiometer for controlling the input to the L.F. amplifier.

In the matter of constructional details, it becomes obvious that metal is replacing other materials in this branch of industry, as in many others. While one does not find many all-metal cabinets, a number of sets are built on metal chassis, insulating material being used only where it is essential. This, again, is a logical development brought about by the necessity for screening in circuits using the new valves.

Mains-fed receivers are steadily gaining ground, and it is noticed that considerably more attention is given to producing models for A.C. supplies than for D.C. current. Apart from the fact that this latter is going out of use, it does not lend itself so easily to the production of an economical set that can be guaranteed to work satisfactorily under all conditions.

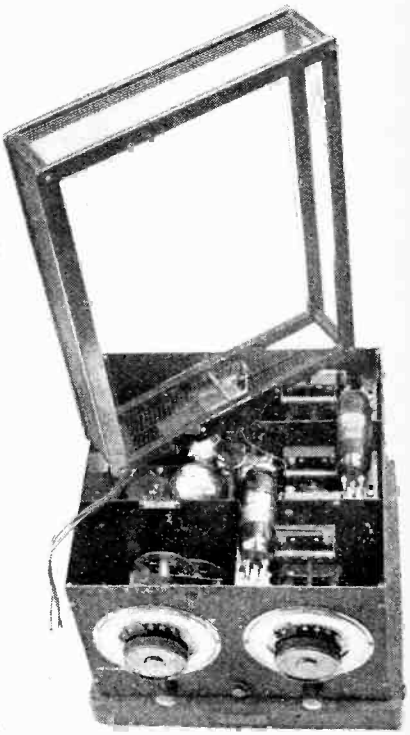
### Filament Heating from Mains.

Broadly speaking, the problem of mains filament heating is tackled in three ways. First we have the indirectly heated valves as applied to the Metro-Vick sets; Cosmos valves are also used in the Pye Type 350 A.C. set, which, by the way, employs one of the new indirectly heated screened valves as an H.F. amplifier. We shall have more to say about this very exceptional valve later. A second plan is to use a floating battery, generally of small ampere-hour capacity, in conjunction with a trickle charger, which is a practice followed in some of the Burndept apparatus. Thirdly, we can use the new directly heated A.C. valves; it seems to be usual, however, to retain an indirectly heated triode as a rectifier. An example of this latter practice is seen in the G.E.C. "All Electric Three," in which a P.625A is used in the output position. This valve has a comparatively heavy filament, and can be fed from raw A.C., providing certain precautions are taken. Although the question of H.T. supply will be dealt with later, it should be noted in passing that metal rectifiers are included in some receivers. There is a growing and commendable tendency to regard set and eliminator as a complete unit.

As for portable sets, we find that the popular combination of two aperiodic H.F. stages followed by a detector and two L.F. amplifiers still holds its own against the more modern receivers using screened grid valves in tuned circuits. This is probably because the former type of set exerts a wide appeal on account of its easy operation. We find interesting attempts to combine high amplification with ease of control in the McMichael and Igranic portable sets. Both these comprise two screened grid H.F. stages (one tuned and one aperiodic) followed by a detector and an L.F. amplifier, which in the case of the latter set comprises the conventional two stages. Here the resemblance ends, as the various problems have been tackled on quite different lines. Both have many points of interest; and in both the frame and H.F. tuning condensers are ganged, thus giving a single control. The Burndept portable, with a single H.F. stage and two tuning controls, has a direct wavelength calibration on both dials.

Another type of portable which is representative of modern practice is the screened grid-triode-pentode combination; in this class may be instanced the Eureka and Lotus models.

In the short-wave field enormous advances have been made. The Igranic Company, whose H.F. set for very high frequencies was the first of its kind, have now



A highly sensitive set with two screened grid H.F. stages; the G.E.C. "World Wide Four" with cover removed and frame aerial in position.

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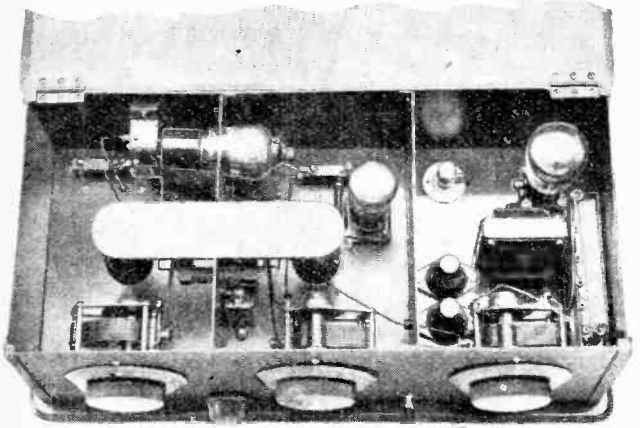
produced a new model which arrived at Olympia too late to be included in our Show Report. It makes use of a screened grid H.F. amplifying valve with a tuned anode coupling, followed by the conventional detector and L.F. amplifier. The residual capacity in a screened valve, although low, is by no means negligible on very short wavelengths, and it is interesting to note that in this set it has been found necessary to neutralise it. One can well believe that by doing this the magnification is much greater than would be otherwise obtainable. The Eddystone set is an example of an S.G.-det-pentode combination which tunes to wavelengths up to 100 metres, while there are several all-wave receivers, or

A Gambrell A.C. mains set with screened grid H.F. amplifer and a single finger tuning control.

sets primarily designed for the broadcast waveband, which put up a good performance on the very short waves. Among these are the McMichael Dimic Three and the Magnum Receiver. In the detector-L.F. class we have the Marconi Type 34, which covers all wavelengths by means of interchangeable coils and adaptors, and the Bowyer-Lowe set, with its ingenious arrangement of series-parallel tuning condensers. The Burndept "Empire" screened grid set, which covers ultra-short and normal broadcast wavebands, is in a class of its own.

The Exhibition was happily free from "stunt" circuits, probably for the first time since its inception.



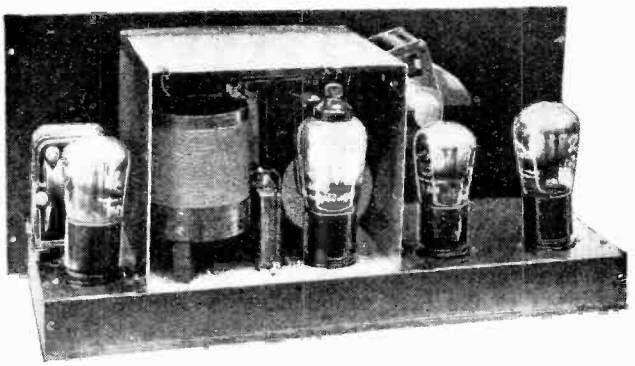
The "Magnum" Universal receiver, showing the mechanically-coupled tuning coils.

Careful consideration of the foregoing will show that, after all, progress is largely bound up with valve design. The manufacture of ordinary types has already reached a high state of excellence, and we now look to the makers for an abundant supply of screened grid and pentode valves of an equally high standard as regards consistency of characteristics; unless this is forthcoming, public confidence will be lost, and the new developments, real as are their advantages, will fall into disrepute.

**Progress in Valve Design.**

And now for some specific details as to progress in valve design. Last year our eyes were focussed on the screened grid valve which helped to quell our H.F. oscillation troubles and to simplify the H.F. coupling. This year there is a marked improvement in mutual conductance in all classes of valves, a reduction in working filament temperature, a new type of screened grid valve, and a power output screened grid valve known as the pentode. Furthermore, there has been introduced a comprehensive range of directly heated A.C. valves (triodes, tetrodes and pentodes) with short stout low-voltage filaments, also a series of special detectors.

In the embryonic stage there is an indirectly heated screened grid valve of great potentialities, but we must wait with patience until it is ready to grace our receivers. By virtue of their greatly increased efficiency the new



The Peerless 4-valve chassis, with cover of screening case removed.

valves, if suitably chosen with regard to their characteristics and coupling components, will give a much enhanced performance, or alternatively the same performance with fewer stages of amplification.

**Remarkable Improvement in Mutual Conductance.**

The general improvement in constants can be traced in the main to research in filament emission. New coatings have been evolved which per given square millimetre of surface are capable of emitting relatively more electrons with the added advantage of a lower working temperature. Attention has been paid to the protection of the pinch from the effects of the gettering. If the closely spaced electrode leads are left exposed the gettering often causes weak insulation resistance and in extreme cases flash-over.

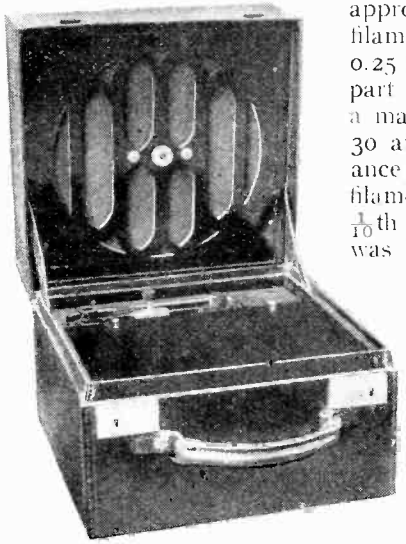
Acoustic reaction or the microphonic howl (usually from the detector) often experienced with high valve

**The Trend of Progress.—**

sensitivity is due to the sudden alteration in anode current resulting from differential movement between a low-temperature filament and the grid; this annoyance has been overcome by at least one manufacturer by bracing the grid and filament supports together by fusing them into a glass bead. Greater consistency of characteristic is promised by manufacturers; this would be especially welcome with screened grid valves which, it must be admitted, have varied within rather wide limits.

A valve is a voltage operated device, and whatever grid voltage swing is applied to it we want the greatest possible change in anode current, so that when the latter is passed through the impedance which must exist in the intervalve coupling the greatest possible voltage will be built up and be impressed on the succeeding grid. The change in anode current in mA for a volt applied to the grid is called mutual conductance (or slope), and depends upon the relation of impedance to magnification factor.

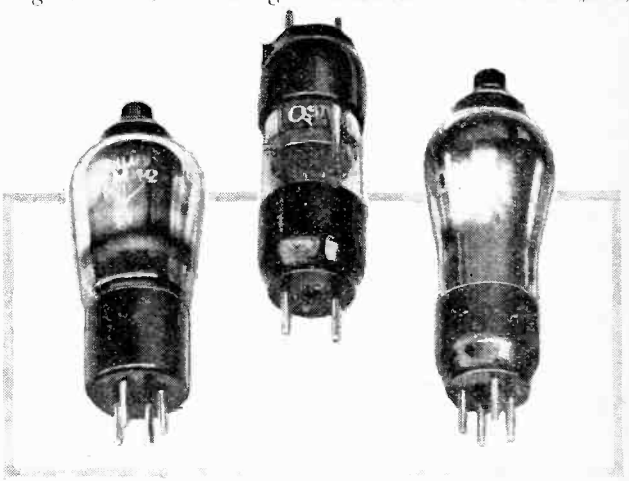
Mutual conductance, especially in low-frequency valves, can be considered as a figure of merit or performance factor, and in this connection readers attention should be drawn to a general improvement of the order of 50 per cent. As an example the well-known D.E.5B valve with a magnification factor of 20 and a mutual conductance of approximately 0.7 with a filament consumption of 0.25 amps. has a counterpart in the H.L.610 with a magnification factor of 30 and mutual conductance of one, while the filament only consumes $\frac{1}{10}$th amp. The D.E.5A was a valve which had come to be regarded as a highly efficient output valve and had a mutual conductance of 0.88; now with the same filament consumption we have a choice between the P.625 and the P.625A, which have respectively mutual conductances of 2.5 and 2.2, which means that for a given signal input loud speaker intensity will be considerably more than doubled.



One of the smallest five-valve portable sets; the "Rolls-Caydon" which measures 12in. × 12in. × 12in. when closed.

A perusal of the valve data publish by *The Wireless World* on August 29th will reveal many other examples of greatly increased mutual conductance and hence efficiency.

In view of the rapid conversion of lighting mains from D.C. to A.C. serious attention is now being paid by manufacturers to the design of valves with filaments which can be heated from raw A.C. dispensing with the necessity for rectification and smoothing or the alternative expedient of indirect heating. If suitably transformed raw A.C. is applied to an ordinary triode filament there is a liability to hum due chiefly to the rapid changes of emission from end to end of the filament in sympathy with the alternations. There is also the question of thermal response to the variation in current. This effect is the more pronounced the longer and thinner the filament. High voltage filaments are usually long while low voltage filaments are short, and, generally speaking, the greater the current consumption the stouter the filament. Raw A.C. valves have been designed for every purpose, and are known as the "Point-eight" class, having a filament consumption of 0.8 amp. at 0.8 volt; the potential difference across the ends of such a filament is so small that the changing emission phenomenon already mentioned is reduced to negligible limits. The 0.8 amp. consumption necessitates so thick a filament that there is sufficient thermal lag between alternations to prevent sympathetic cooling, and hence changes in emission; in other words, hum is entirely avoided.



(1) (2) (3)

Types of screened grid valves; (1) is a Mullard 2-volt valve; (2) is the double-ended Osram valve while (3) is a directly-heated A.C. screened grid valve with "Point-eight" filament.

These directly heated A.C. filaments have been incorporated in the various classes of triodes, in screened grid valves and in pentodes, so that in the near future we may look forward with interest to a great simplification in apparatus for working our receivers from A.C. mains. While no special precautions have to be taken with high- and low-frequency amplification, the grid potential is extremely critical when using one of these valves for anode-bend rectification, and a potentiometer across the grid bias battery is desirable. With leaky grid rectification it is advisable to use an indirectly heated cathode valve. The screened valve for the coming season has been redesigned, and embodies a four-pin base and an anode terminal at the top of the glass bulb. The working capacity between the anode and grid is approximately 0.014 micromicrofarad, whereas contrary to popular belief that of the double-ended or older type is 0.022 micromicrofarad, but the greater efficiency

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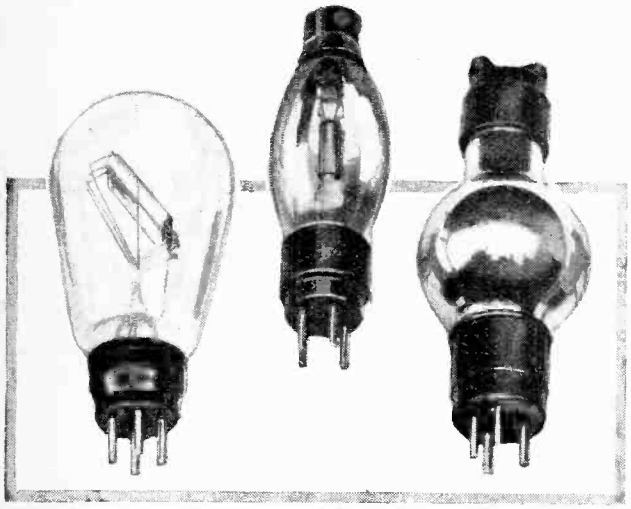
(mutual conductance) of the first mentioned leads to greater amplification, so that more precautions must be taken to prevent instability. It is now well known that the potential gradient down and the field around a heated filament restrict the number of electrons which can be attracted by the anode. By including a separate heater so that no current passes through the cathode these limitations are overcome, and much improved mutual conductance can be obtained.

The indirectly heated screened grid valve already alluded to would appear to mark an important advance



(4) (5) (6)

**The new Marconi power output triode—the P. 625—with the remarkable mutual conductance of 2.5 (No. 4). No. (5) is the Ediswan indirectly-heated valve known as the "M" type. The Cossor indirectly-heated cathode valve is shown on the right (No. 6).**

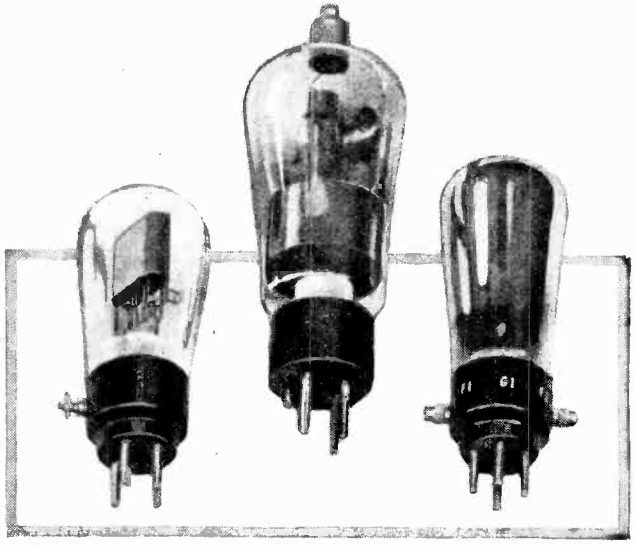
in valve design. The valve belongs to the Cosmos series, and is known as the AC/S, with a magnification factor of no less than 1,200 and an impedance of 600,000 ohms; thus the mutual conductance is 2. Assuming a tuned anode circuit, the dynamic resistance of which might be 150,000 ohms at resonance, and allowing an ample margin of safety, it would seem safe to predict that a H.F. stage gain of 100 could be obtained which is remarkable, but the valve will not be generally available for some time yet.

There has been evolved a series of valves especially suitable for detection with pronounced lower bends and steep straight portions in the characteristic. These are well exemplified by the P.M.D. class; the P.M.4DX, for instance, has a mutual conductance of 2 and an amplification factor of 15. Using such a valve as an anode bend detector it is possible to follow it with a transformer having a high primary inductance.

The pentode valve is undoubtedly having a profound effect on the design of low-frequency amplifiers, as it successfully replaces the two stages of triodes usually necessary for adequate loud speaker reproduction. So much has lately been written about this valve that the reader is referred to recent issues of *The Wireless World*. There are, however two points that should be brought forward, first the importance of omitting any other stage of L.F. amplification between the detector and the pentode, for its inclusion would mean the serious overloading of the pentode or underloading of the detector; second, the fact that it is not necessarily safe to employ all the straight of the anode characteristic as we are wont to do with triodes. The anode voltage swing may make an excursion beyond the linear part of the anode voltage-anode current curve, and so flatten the tops of the waves and cause harmonics. When biasing a pentode it is necessary to study carefully the anode voltage-anode current curve as well as the better known grid volt-anode current characteristic. Pentodes are becoming available for 2, 4 and 6-volt accumulators and for running on raw A.C. The indirectly heated pentode will probably come, but will any loud speaker be capable of accepting its output? Before leaving the subject of progress in valve design mention should be made of the Mazda two-stage valve with two anodes, two grids, and a single filament capable of fulfilling the functions of two ordinary valves, whilst for those who do *not* live in attached or semi-detached houses there is the new L.S.6A giving three times the modulated output of the L.S.5A.

**Picture Broadcasting and Television.**

Under the heading of progress must be included the newly devised apparatus associated with picture broadcasting and also television. The former apparatus has been fully described in our previous issue, and it was a little regrettable to note that the picture broadcast receiving equipment shown on the Burndept stands was not of the highly developed types seen at recent demonstrations of the "Fultograph."



(7) (8) (9)

**The new Ediswan 2-volt pentode with vertical anode (No. 7). No. (8) is the Cosmos indirectly-heated screened grid valve having a magnification factor of no less than 1,200 On the right (No. 9) is the new B.T.H. double purpose valve with two anodes, two grids and a single filament; it is capable of fulfilling the duties of two valves.**

In accordance with promises widely announced in the Press of a short while ago, "Televisors" intended for the reception of broadcast moving images attracted much attention at the stand of the Baird Television

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Development Co., Ltd. Three models were shown, model "A," stated to be specially designed for television reception by being connected to the output terminals of any wireless set capable of operating a loud speaker. A description of the instrument takes the form of operating instructions stating that a 6-volt accumulator is connected to terminals supplying current to a small motor which drives the mechanism. The television signals are tuned in by the ordinary process, *"but instead of hearing sounds on the loud speaker, the listener becomes a 'looker-in' and sees on the screen of the instrument a swirling mass of reddish light."* Continuing the wording used in the pamphlet, *"a synchronising control must now be turned slowly, increasing the speed of the little motor. As this is done the swirling light slowly resolves itself into a series of images moving rapidly downwards across the screen. As the motor approaches the correct speed, the images become stationary, and finally come to rest. At this point the synchronising mechanism comes into operation and holds the image in place."*

The list price of this model "A" instrument, which is beautifully finished externally, is £20. Two other models are quoted at £40 and £150, the former being fitted with a moving-coil loud speaker in addition to the television gear, while the latter comprises the complete radio receiver and amplifier.

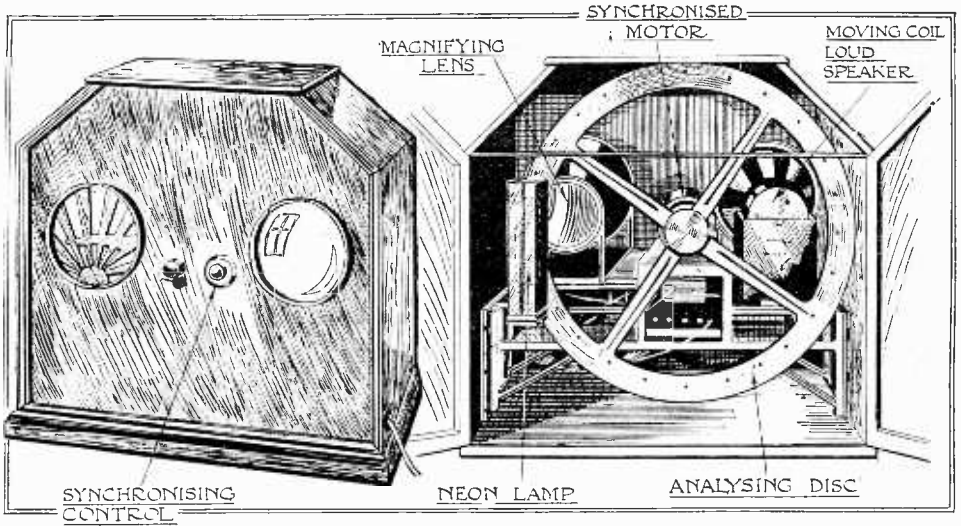
In premises adjoining the Exhibition the television apparatus is demonstrated. Several receiving sets are in operation simultaneously from a single transmitter. One cannot but be impressed by the demonstration and the quality and definition of the image. Synchronising adjustments precede each demonstration with the stationary face of a dummy in front of the transmitting gear. Flashes of light are first seen through the magnifying lens, and by careful adjustment of the synchronising knobs referred to earlier, these quickly resolve themselves into small pictures fleeting rapidly across the lens. These images are slowly brought to rest and centred. A programme of transmission includes an address on the subject of television and broadcasting together with a musical item in which all the facial movements of the singer associated with the rendering of the song are followed with ease. The image does not flicker, neither is it visibly cross-marked by the scanning disc. The illumination is good and synchronising holds steady without further adjustment when once set. Viewed from a distance of some three feet from the lens, the image appears to be about 3½in. in height by 2½in. across. Actually it is very much smaller, and from a subsequent examination of the width of the revolving disc in the apparatus it is probably about 1in. × 1½in. In spite of the fact that a motor and revolving disc are accommodated within the cabinet the apparatus runs silently and smoothly, and from a mechanical standpoint is well constructed. From an appreciation of all the difficulties attendant upon the development of a system of television with its almost unsurmountable problems of synchronising and amplifying, the Baird demonstration was a noteworthy achievement and appeared to greatly interest the public as they witnessed the formation of the picture.

In making these observations it must not be overlooked that this demonstration is from a local studio within a very short distance of the receiver, the connection being by wire and not through a radio link, as demanded for broadcasting; this obviates the three primary difficulties of television. They are:—

(1) The high frequency created by a fine analysis of even a small picture;

(2) The use of this frequency to modulate a radio frequency wave of many times its frequency; and

(3) The exceedingly close synchronising that is required.




Baird "Television" Model B.

Considered numerically in the case of the small image analysed into points thirty to the inch, and transmitted ten times a second, then the modulating frequency becomes at least 13,500/2, or nearly 7 kilocycles. The simultaneous picking up of a controlling signal to hold the receiver in step with the transmitter within very close limits, together with the reception of the speech signals of broadcasting, are problems of which we have long awaited a solution. In order that the confidence of the public may be gained as to the performance of the apparatus which the Baird Television Development Co., Ltd., have for sale, it is to be hoped that some explanation will be offered on the points just mentioned and concerning which wireless enthusiasts have been seeking technical information since the first suggestion of radio television. (*To be concluded.*)

# PROGRAMMES FROM ABROAD

## SATURDAY, OCTOBER 6th.

**All Times are reduced to British Summer Time and are p.m. except where otherwise stated.**

**BARCELONA** (Radio Barcelona), Call EAJ1 (**344.8 metres**); 1.5 kW.—**6.0,** Market Prices and Exchange Quotations. **6.10,** Sextet Selections. **8.30,** Advanced French Lesson by Prof. Francés Martin. **9.0,** Exchange Quotations and News. **9.5,** Orchestral Selections: March, El Capitan (Sousa); Waltz from The Dollar Princess (Fall); Selection from Bohemios (Vives); Tango, Ay pobre mio (Dotras Vila); Czardas, Margarita (Michiels); Overture to Pique Dame (Suppé). **10.0,** Chimes and Weather Report. **10.5,** Programme relayed from **Madrid,** EAJ7.

**BERGEN** (**370.4 metres**); 1.5 kW.—**7.0,** Programme for Children. **7.30,** Talk for Girls. **8.0,** Orchestral Concert; in the Interval, Topical Talk. **9.0,** Talk by Edw. Welle-Strand. **9.30.** Violin and Pianoforte Recital from the Works of Sjögren, Sonata in G Minor, Op. 19, (a) Allegro vivace, (b) Andante, (c) Finale and Presto; Erotikon Nos. 1 and 2 for Pianoforte. **10.0,** Weather Report, News and Time Signal. **10.15,** Dance Music. **12.0 Midnight** (approx.), Close Down.

**BERLIN** (Königswusterhausen), (**1,250 metres**); 40 kW.—**4.0,** Educational Talk. **4.30,** Dr. Hanold, Talk: The Economic Value of Bureaucracy. **5.0.** Programme from **Hamburg.** **6.0,** Paul Lange, Talk: The History of Materialism. **6.30,** Elementary Spanish Lesson. **6.55,** Fritz Ohrmann, Talk: Bruckner. **7.20,** Talk by Dr. Eberhard Preussner. **8.0,** Programme from **Voxhaus.**

**BERLIN** (Voxhaus) (**484 metres**); 4 kW.—**10.10 a.m.,** Market Prices. **10.15 a.m.,** Weather Report, News and Time Signal. **11.0 a.m.,** Programme of Gramophone Records. **11.30 a.m.,** Exchange Quotations. **12.55,** Time Signal. **1.30,** Weather Report and News. **3.10,** Agricultural Prices and Time Signal. **3.30,** Programme of Gramophone Records. **4.0,** Chess Talk by E. Nebermann. **4.30,** Concert: Overture to May Night (Rimsky-Korsakoff); Adagio from the String Quartet in D Minor (Lorenz); Selection from Der Landstreicher (Ziehrer); Selection from Manon Lescaut (Puccini); Violin Solo from The Violin Maker of Cremona (Hubay); Potpourri of Offenbach's Melodies (Fetras); Extase (Ganne); Waltz from Das süsse Mädel (Reinhardt); Overture to La Belle Hélène (Offenbach); Blue River (Meyer); Ramona (Wayne); followed by Announcements. **6.30,** Leopold Lehmann, Talk: Where Germany's State Treaties are Kept. **7.0,** Erich Offermann, Talk: Aviation and the Ila. **7.30,** Wolfgang Schwarz, Talk: Is Peace Really Possible? **8.0,** "Liebe," Drama (Wildgans), followed by Weather Report, News, Time Signal and Sports Notes, and Dance Music from the Restaurant Burgund in the Central Hotel.

**BERN** (**411 metres**); 1.5 kW.—**7.29,** Time Signal and Weather Report. **7.31,** Talk: The Office Girl as Housewife. **8.0,** "Der Wittlig," Dialect Comedy (Zimmermann). **9.45,** News and Weather Report. **10.0,** Relay from the Bern and Jura District Agricultural and Industrial Exhibition in Pruntrut; Orchestral and Vocal Concert. **10.40,** Dance Music. **12.0 Midnight** (approx.), Close Down.

**BRESLAU** (**322.6 metres**); 4 kW.—**4.0,** Review of Books. **4.30,** Concert of Popular Music. **6.0,** Peer Lhot, Talk: The Baroco Period and the Present Day. **6.20,** Talk in Esperanto by Elsa Koschate. **6.30,** Johannes Winkler, Talk: The Rocket as a Motive Power. **7.25,** Herr Grosser, Talk: The History of the Sea Cable. **7.50,** Georg Lichey, Talk: Mohammed. **8.15,** Talk: "Red Cross Day, 1928." **8.20,** "Dorine und der Zufall," Play with Music (Jean Gilbert). **10.0,** News. **10.30.** Dance Music, relayed from the Golden Crown Café, **Breslau.** **12.0 Midnight** (approx.), Close Down.

**BRÜNN** (**441.2 metres**); 3 kW.—**4.30,** Programme for Children. **6.0,** Time Signal. **6.2** (approx.), German Transmission. **6.25,** Talk. **7.0,** Programme from **Prague.** **10.0,** Programme from **Prague.**

**BRUSSELS** (**508.5 metres**); 1.5 kW.—**5.0,** Orchestral Concert from the Café Metropole. **6.0,** Elementary English Lesson. **6.25,** Advanced English Lesson. **6.45,** Orchestral Concert (continued). **7.0,** Organ Recital from the Church RR. PP. Carmes. **7.30,** "Radio-Chronique." **8.15,** Concert from the Works of Armand Marsick; in the Interval, Topical Talk. **10.15,** News. **10.30** (approx.), Close Down.

**BUDAPEST** (**555.6 metres**); 35 kW.—**6.0,** October 6th Memorial Festival Programme: The National Hymn, Poetry Recital and Talk. **7.30,** Programme from the Royal Hungarian Opera House; in the Interval, Time Signal and News. **10.40,** Weather Report and Close Down.

**COLOGNE** (**283 metres**); 4 kW.—**12.10,** Programme from **Langenberg.** **1.5,** Concert: March, Die Komödianten (Fuhrmann); Waltz, Liebestraum (Heuberger); Overture to Das blaue Bild (Lincke); Selections from Halka (Moniuszko); Selections (Berbutö), (a) Wiegenlied, (b) Boston; Solos; Potpourri of The Czardas Princess (Kálmán); Der Pfeifer u. sein Hund (Pryor); Intermezzo, The Troubadours (Powell); Waltz, Nachtschwärmer (Ziehrer). **3.40,** C. Bennewitz, Talk: Electro-Acoustics. **4.0,** Richard Wenz, Talk: Rhenish Workdays and Holidays in Literature. **4.30,** Programme from **Königswusterhausen.** **5.10,** Talk for Women by Aenne Gausebeck. **5.45,** Concert: Choral Selections, (a) Der abend kommt leise hernieder (Türk), (b) Verlassen (Koschat), (c) Gib mir dein Herze, Folk Song, (d) Der Schatz im Jägerhause (Rödger); Quintet with Horn (Mozart); Choral Selections, (a) Wanderer's Night Song (Kuhlau), (b) Woran ich meine Freude hab' (Wolfrum), (c) Herzensweh (Volbach), (d) Drei Lilien (Othegraven). **6.30,** Dr. Helm Jaretzki, Talk: A Visit to the Workshop. **7.15,** Programme from **Dortmund** (see **Langenberg**). **7.35,** W. Leimbach, Talk for Workers: The German State Railways. **8.0,** Variety Programme. **10.30** (approx.), News, Sports Notes, Announcements, Orchestral Selections and Dance Music. **1.0 a.m.** (approx.) (Sunday), Close Down.

**CRACOW** (**566 metres**); 1.5 kW.—**7.30,** English Lesson. **7.55,** Market Report and News. **8.30,** Programme from **Warsaw.** **11.30** (approx.), Close Down.

**DUBLIN,** Call 2RN (**319.1 metres**); 1.5 kW.—**1.30,** Weather Report and Gramophone Selections. **7.20,** News. **7.30,** Poem Recital by Dorothy Day. **7.45,** Irish Lesson by Seamus O. Duirinne. **8.0,** Concert: Orchestral Selections—Round the World on Music Wing, (a) The Arctic Zone, (b) The South Pacific, (c) The Chinese Bazaar, (d) The Prairie; Songs from the Hemisphere by Alfred Deale (Baritone); Orchestral Selections: Europe (a) Spain, Toreador March, (b) France, Waltz, (c) Sweden, Melody, (d) Italy, Tarantella; America, (a) Mighty America, (b) The Song of the Bells, (c) Arrival of the Coontown Cadets. **9.20,** Sketch by Jack Dwan and Company. **9.50,** The Station Celeste Orchestra. **10.0,** Gaelic and Anglo-Irish Songs by May Mortell (Mezzo Soprano). **10.15,** Selections by the St. Laurence O'Toole Pipe Band. **10.30,** News, Weather Report and Close Down.

**FRANKFURT** (**428.6 metres**); 4 kW.—**1.0,** Gramophone Selections. **2.35,** Programme for Children. **3.55,** Hints for the Housewife by Fini Pfannes. **4.35,** Concert of Operetta Selections: March from Gasparone (Millöcker); Overture to Morning, Noon, and Night (Suppé); Song; Potpourri of Giroflé-Girofla (Lecocq); Overture to Orpheus in the Underworld (Offenbach); Selections from Pariser Leben (Offenbach); Song; Selections from Die Prinzessin von Trapezunt (Offenbach). In the Interval, Announcements. **6.10,** Readings from On Two Planets (Lasswitz) by O. W. Studtmann. **6.30,** The Letter Box. **7.0,** Lesson in Shorthand by Georg Kalis. **7.30,** Dr. Hans Geisow, Talk: Sport as a Means of Education. **8.15,** Programme from **Stuttgart.** **9.0,** Relay of an Operetta, followed by Dance Music from **Voxhaus.** **12.30 a.m.** (approx.) (Sunday), Close Down.

**HAMBURG,** Call HA (in Morse) (**394.7 metres**); 4 kW.—**10.15 a.m.,** News. **11.0 a.m.,** Programme of Gramophone Records. **12.10,** Weather Report. **12.15,** Exchange Quotations. **12.30,** Concert relayed from **Hanover** (297 metres); In the Interval at **12.45,** Shipping Forecast. **12.55,** Time Signal. **1.10,** News. **2.40,** Exchange Quotations. **3.30,** Review of Books. **4.0,** Labour Exchange Report. **4.15,** Concert relayed from **Kiel** (254.2 metres): Serenade Op. 6 (Suk); Symphony Op. 27 (Graener). **5.0,** "The Crown of Creation" under the musical direction of Adolf Secker. **6.0,** Request Programme. **7.0,** Leopold Lehmann, Talk: A Visit to the German Experimental Centre for Aviation, in connection with the "Ila," Berlin. **7.25,** Questions of Modern Dietetics by Emil Grotzinger. **7.55,** Weather Report. **8.0,** "Nanon," Operetta (Richard Genée), followed by News. **10.30** (approx.), Concert from the Café Wallhof.

**HILVERSUM** (**1,071 metres**); 5 kW.—**11.40 a.m.,** Police Announcements. **12.10,** Concert of Trio Music. **1.40,** Concert relayed from the Tuschinski Theatre, **Amsterdam.** **3.40,** Elementary Italian Lesson. **4.10,** Advanced Italian Lesson. **5.10,** Talk and Time Signal. **5.40,** Orchestral Concert: Overture to The Italian in Algiers (Rossini); Ballet Suite (Lacôme); Violin Solo, Sonata in G. Minor (Locatelli); Serenade (Godard); Selection from La Traviata (Verdi); Violin Solos, (a) La précieuse (Couperin-Kreisler), (b) Arietta (Bosmans), (c) La Capricieuse (Elgar), (d) Hungarian Dance (Brahms), Melody (Rubinstein); Potpourri, Notenregen (Urbach); Finale. **7.25,** Police Announcements. **7.40,** Programme arranged by the Workers' Radio Society: Concert and Talk. **10.15,** Concert relayed from the Royal Picture House, **Amsterdam.** **11.15** (approx.) Close Down.

**HUIZEN** (**340.9 metres**); 4 kW.—Transmits on 1,870 metres from 5.40 p.m. **12.10,** Concert of Trio Music. **5.10,** Gramophone Selections. **7.10,** Lesson in Dressmaking. 7.40, Talk for Agriculturists. **8.0,** "La Châlet": Opera-comique (Adam).

**JUAN-LES-PINS** (Radio L.L.) (**244 metres**); 1.5 kW.—**1.0,** Concert. **9.0,** News, Weather Report, Talk for Women and Concert. **10.0,** Dance Music. **10.30** (approx.) Close Down.

**KALUNDBORG** (**1,153 metres**); 7 kW.—Programme also for **Copenhagen** (337 metres).—**7.30 a.m.,** Morning Gymnastic. **11.0 a.m.,** Weather Report. **12.0 Noon,** Chimes. **12.5** Orchestral Concert from Wivel's Restaurant. **3.0,** Programme for Children. **3.30,** Instrumental Concert: Recitations in the Interval. **6.20,** Talk by L. Rasmussen. **6.50,** Weather Report. **7.0,** News, Exchange Quotations, and Time Signal. **7.30,** I. V. Christensen, Talk: Ringsted Church. **8.0,** Chimes from the Town Hall. **8.2,** "In Olden Times" Concert: Overture to Heiberg's Vaudeville Et Eventyr i Rosenborg Have (Weyse); Ballet Music from Heiber's Play Elverhöj (Kuhlau); Fantasia on Danish Student Songs (arr. Raeson); Recitations; Waltz, The Blue Danube (Joh. Strauss); Serenade for Strings (Haydn); Polonaise and Waltz from Et Folkesagn (Gade); Columbine Mazurka (Lumbye); En Tur paa Dyrehavsbakken (Lumbye), followed by News. **9.15,** "Gotfred writes a Play": Play in One Act (Hans Hansen). **9.45,** Concert of Light Music: Overture to Isabella (Suppé); Heinzelmännchens Hochzeit (Köpping); Waltz, Fleurs de Granada (Zois); Serenata di baci (Micheli); Fantasia on Danish Songs; Waltz, Dinka (Jespersen); Intermezzo, Niniche (Ohlsen); Soldier's March from The Chocolate Soldier (Oscar Straus). **10.45,** Dance Music from Wivel's Restaurant. **12.0 Midnight,** Chimes from the Town Hall. **12.15 a.m.** (approx.) (Sunday), Close Down.

**KATTOWITZ** (**422 metres**); 10 kW.—**7.0,** News and Announcements. **7.30,** Talk. **7.55,** Agricultural Report. **8.5,** Talk: Contemporary England. **8.30,** Programme from **Warsaw.** **10.0,** Time Signal, Weather Report and News. **10.30,** Dance Music.

## Programmes from Abroad.

**KAUNAS (2,000 metres)** ; 7 kW.—**4.30,** Concert of Lithuanian Music : Marches, Violin Solos, and Potpourri of Lithuanian Folk Songs ; News in the Interval. **7.0,** Weather Report. **7.15,** Programme Announcements. **7.30,** Concert by Balalaika Orchestra : Russian Potpourri ; Hungarian Dance ; Czardas (Monti) ; Waltz, Romance, Die Fesseln der Liebe. **8.0,** Talk : Self Education. **8.30,** Concert : Potpourri of Die Meistersinger von Berlin (Lincke) Waltz from Eva (Gilbert) ; Extase (Ganne) ; Selection (Komzak) ; Violin Solo ; Lithuanian Songs ; Slumber Song (Ersfeld) ; Intermezzo, Galop (Suton).

**LAHTI (1,522.8 metres)** ; 35 kW.—**5.0,** Orchestral Selections : Marche Militaire (Kaunis Karjala) ; Overture to Jean de Paris (Boieldieu) ; Waltz, Parlemoi (Marcier) ; Selection from Faschingsfee (Kalman) ; Valse Chevaleresque (Sibelius). **5.57,** Time Signal, Weather Report and News. **6.15,** Programme of Talks. **7.0,** Choral Concert from the Church of St. John. **8.0,** Orchestral Concert Crucifixus (Fami) ; L'Enfant prodigue (Debussy) ; Lentu du Concerto (Lalo) ; Ave Maria (Schubert) ; Overture to Egmont (Beethoven). **8.45,** News in Finnish and Swedish. **9.15,** Sacred Recital. **10.0,** (approx.). Close Down.

**LANGENBERG (468.8 metres)** ; 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**12.10,** Gramophone Selections. **1.5 to 4.25,** Programme from **Cologne.** **4.30,** Programme from **Königswusterhausen.** **5.10 to 6.55,** Programme from **Cologne.** **7.15,** Reading from **Dortmund.** **7.35 to 1.0 a.m.** (Sunday), Programme from **Cologne.**

**LEIPZIG (365.8 metres)** ; 4 kW.—**3.0,** Gramophone Selections. **4.30,** Concert by the Leipzig Symphony Orchestra. **5.45,** Labour Exchange Report. **6.0,** Wireless Talk. **6.20,** Weather Report, Time Signal and News. **6.30,** Programme from **Königswusterhausen.** **7.0,** Prof. A. Mendt, Talk : Art and Technique. **7.30,** Josef Eberle, Talk : Charlie Chaplin. **8.30,** Cabaret Concert. **10.0,** News and Sports Notes. **10.15,** Dance Music from **Voxhaus.**

**LILLE,** Call PTT **(264 metres)** ; 0.5 kW.—**12.30,** Orchestral Concert. **1.35,** News, Agricultural Report and Harbour Notes. **3.0,** Dramatic Programme. **7.0,** Market Prices and Exchange Quotations. **7.10,** Concert, arranged by " Le Journal l'Echo du Nord." **8.15.** Talk, arranged by the Lille Radio Club. **8.45,** Concert, organised by the Wireless Association of Northern France, followed by News.

**MADRID** (Union Radio), Call EAJ7 **(375 metres)** ; 3 kW.—**7.0,** Sextet Selections : Selection from La Muñeca del amor (Penella) ; Suite, En las regiones del mediodia (Fresco) ; Interlude by Luis Medina. **8.0,** Dance Music. **9.45,** Market Prices. **10.0,** Chimes and Exchange Quotations, followed by " La Generala " a Musical Play (Vives), and News. **12.30 a.m.** (approx.) (Sunday), Close Down.

**MILAN,** Call 1MI **(549 metres)** ; 7 kW.—**8.35,** Time Signal and News. **8.50,** Concert : Quintet Selections, (a) Au Couvent (Borodine), (b) Abruzzian Song (De Nardis) ; Soprano Solos, (a) Ave Maria from Othello (Verdi), (b) Loreley (Catalani) ; Solo Selection from L'Africaine (Meyerbeer), The Moon (Mendelssohn) ; Talk ; Soprano Song from L'Amico Fritz (Mascagni) ; Baritone Solo from William Tell, with 'Cello obligato (Rossini) ; Orchestral Selections, (a) Umbrian Rhapsody (Parelli), (b) Symphony from William Tell (Rossini) ; News. **11.0,** Orchestral Music from the Hotel Majestic Diana. **11.45** (approx.), Close Down.

**MOTALA (1,380 metres)** ; 30 kW.—Programme also for **Stockholm** (454.5 metres), **Böden (1,190 metres), Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres), **Sundsvall** (545.6 metres).—**5.0,** Concert of Light Music. **6.0,** Programme for Children. **6.30,** Concert of Old Time Dance Music. **7.30,** Humorous Recital, relayed from **Göteborg.** **7.45,** Pianoforte Recital : Melodies (Grieg), (a) Alla marcia, (b) Serenade, Scherzo Op. 33 (Sinding). **8.0,** Cabaret Programme. **9.15,** News and Weather Report. **9.45,** Topical Talk. **10.0,** Dance Music. **12.0 Midnight** (approx.), Close Down.

**NAPLES,** Call 1NA **(333.3 metres)** ; 1.5 kW.—**8.20,** Wireless Notes. **8.40,** Time Signal and News, followed by Harbour Notes. **8.50,** " Histoire d'un Pierrot," Play (Costa) ; " Diritti Dell' Anima," Comedy (Giacosa) ; and " Il Gatto Nero," Play in One Act (Varaldo) ; in the Interval, Foreign Report. **10.50,** News. **10.55,** Calendar and Programme Announcements. **11.0** (approx.), Close Down.

**OSLO (461.5 metres)** ; 1.5 kW.—Programme relayed by **Fredrikstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres) and

# Saturday, October 6th.

**All Times are reduced to British Summer Time and are p.m. except where otherwise stated.**

**Rjukan** (448 metres).—**6.0,** Programme for Children. **7.15,** Weather Report, News and Agricultural Report. **7.30,** Talk : Child Tuberculosis. **8.0,** Time Signal. **8.2,** Orchestral Concert : Overture to Poet and Peasant (Suppé) ; Selection from Fra Diavolo (Auber) ; Minuet (Bjerke) ; Pensée élégiaque (Ancel) ; Marquisette (Lindsay-Theimer) ; Selection from Polenblut (Nedbal) ; Marche Marine (Egge). **0.0,** Programme from **Bergen.** **9.30,** Weather Report, News, Sports Notes and Topical Talk. **10.0,** Dance Music from the Grand Hotel, Oslo. **11.30** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT **(458 metres)** ; 0.5 kW.—**6.30,** " Radio Journal de France." **8.0,** Sports Notes and Talk. **8.30,** Concert, arranged by the Association Générale des Auditeurs de T.S.F., News, Time Signal and Weather Report, followed by Dance Music from the Coliseum de Paris.

**PARIS** (Eiffel Tower), Call FL **(2,650 metres)** ; 5 kW.—**6.45,** " Le Journal Parlé." **8.10,** Weather Report. **8.30,** Concert : Bucoliques (Dulaurens) ; Trio for Violin, 'Cello and Pianoforte (Mendelssohn) ; Songs ; Les Danses de Chez Nous (Jacquet) ; Vieux Manoir (Devranches) ; Songs, (a) Berceuse (Kreisler), (b) The Cuckoo (Lehmann), (c) The Answer (Huntington Terry) ; Cœur méconnu (Royan) ; Gavotte (Gossec).

**PARIS** (Petit Parisien) **(340.9 metres)** ; 0.5 kW.—**8.45,** Gramophone Selections, Talk, News and Announcements. **9.0,** Concert : Overture to Les Hirondelles (Hirschmann) ; Selection from Messidor (Bruneau) ; Symphony Orchestra, (a) Finale of the Heroic Symphony in E Flat (Beethoven), (b) Symphonic Poem, Viviane (Chausson) ; Spanish Suite (Vidal) ; Pas d'armes from Le Roi Jean (Saint-Saëns) ; Scherzo from Scenes norvégiennes (Matt) ; News in the Intervals.

**PARIS** (Radio-Paris), Call CFR **(1,750 metres)** ; 6 kW.—**12.30,** Columbia Gramophone Concert : L'Apprenti Sorcier (Dukas), by the Conservatoire Orchestra ; Danse Macabre by the Orchestra of the Queen's Hall, directed by Sir Henry Wood ; Les Clochettes from Lakmé (Delibes) ; Le Bestiare (Poulenc) ; The First Trio (Schumann) ; Preludes for Pianoforte (Chopin) ; Tango Vidalita (Sentio) ; Fox-Trot, Mine, All Mine ; Waltz, Together ; Vocal Tango, Mano a Mano ; The New St. Louis Blues ; Fox-Trot, Miss Annabelle Lee ; News in the Intervals. **1.50,** Religious Notes and News. **3.45,** Dance Music, followed by News. **8.0,** Agricultural Report. **8.15,** Talk, arranged by the Union des Grandes Associations Françaises, followed by News. **8.30,** Symphony Concert ; News in the Intervals.

**PITTSBURGH,** Call KDKA **(63 and 27 metres)** ; 25 kW.—**12.30 a.m.** (Sunday), Concert from the William Penn Hotel. **12.55 a.m.,** Baseball Announcements. **1.0 a.m.,** Time Signal and Concert (continued). **1.20 a.m.,** Week-end Tours (A.A.A.) with Probable Weather Conditions. **1.30 a.m.,** Home Radio Club. **1.45 a.m. to 3.0 a.m.,** Programme from WJZ, **New York.** **1.45 a.m.,** Lew White Organ Recital. **2.15 a.m.,** Dr. Julius Klein, Talk : A Week of the World's Business. **2.30 a.m.,** Selections by Godfrey Ludlow. **3.0 a.m.** B.S.T. (2.0 a.m. Greenwich Mean Time), Republican Speaker. **2.30 a.m.** G.M.T., " Philco Hour," from WJZ, **New York.** **3.0 a.m.** G.M.T., Time Signal and Baseball Scores. **4.0 a.m.** G.M.T., Time Signal and Weather Report. **4.5 a.m.** (approx.) G.M.T., Close Down.

**POSEN (344.8 metres)** ; 1.5 kW.—**7.0,** Mr. K. Kapitanczyk, Talk : Mission Fields. **7.35,** Mr. Henri Grudzinski, Talk : Craftmanship in the Middle Ages. **8.0,** Finance Report. **8.30,** Programme from **Warsaw.** **10.0,** Time Signal, News, Weather Report and Announcements. **10.40,** Dance Music from the Carlton Restaurant. **12.0 Midnight** (approx.), Concert, arranged by the Maison Philips. **2.0 a.m.** (approx.) (Sunday), Close Down.

**PRAGUE (348.9 metres)** ; 5 kW.—**4.10,** Talk for Women. **5.40,** Agricultural Report. **6.0,** German Transmission. **7.0,** " Der Bauer ein Schelm," Opera (Dvorák), relayed from the National Theatre. **9.30,** Selections of Popular Music. **10.0,** Time Signal and News, followed by Dance Music.

**RIGA (526.3 metres)** ; 4 kW.—**6.30,** French Lesson. **7.0,** Variety Concert. **9.0,** Weather Report and News. **9.30,** Concert from the Café de l'Opera.

**ROME,** Call 1RO **(447.8 metres)** ; 3 kW.—**8.30,** Sports Notes, News, Exchange Quotations and Weather Report. **8.47,** Topical Talk and Time Signal. **9.0,** " Lucia di Lammermoor "—Opera (Donizetti) ; In the Intervals, Review of Art and Literature, and Topical Events Review. **11.20,** News and Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF **(21.96 and 31.4 metres)** ; 30 kW.—**12.55 a.m.** (Sunday), Baseball Scores. **1.0 a.m.,** Statler's Pennsylvanians, directed by Johnny Johnson, from **New York.** **1.30 a.m.,** Concert from the Hotel Sagamore, **Rochester.** **2.0 a.m.,** Variety Programme from **New York.** **3.0 a.m.,** B.S.T. (2.0 a.m. Greenwich Mean Time)—" The Open Mike " from **New York.** **3.0 a.m.** G.M.T., Organ Recital by Robert Berentsen, from **Rochester.** **4.0 a.m.** G.M.T., Dance Music from **Buffalo.** **5.0 a.m.** (approx.) G.M.T., Close Down.

**STAMBOUL (1,200 metres)** ; 5 kW.—**6.15,** Concert of Turkish Music. **8.30,** Weather Report and Time Signal. **8.40** (approx.), Concert : Overture to Le Roi d'Ys (Lalo) ; Fantasia on a Hungarian Melody (Padouk) ; Songs ; Italian Serenade (Schebek) ; Military Marches Nos. 1, 2 and 3 (Schubert). **10.0,** News and Announcements. **10.10** (approx.), Close Down.

**STUTTGART (379.7 metres)** ; 4 kW.—**3.0,** Concert : Orchestral Selections, (a) Festival Overture (Lassen), (b) Paraphrase on Am Brunnen vor dem Tore (Diederich) ; Recitation ; Untreue (Silcher), Die drei Röselein (Silcher) ; Mädele, guck raus (Vollmer) ; Orchestral Selections, (a) Paraphrase on Grüsse an die Heimat (Kromer), (b) Paraphrase on Verlassen bin i (Esterl) ; Recitations ; Selections (Silcher), (a) Mei Maidle, (b) Die Auserwählte ; Orchestral Selections, (a) Waltz, Am schönen Rhein (Kéler-Béla), (b) Wandervogelmarsch (Fétras). **4.35,** Programme from Frankfurt. **6.5,** Time Signal and Weather Report. **6.15,** Talk by Prof. Hassinger, relayed from Freiburg (577 metres). **6.45,** Dr. Wolff, Talk : Book-keeping. **7.15,** Reading by Oscar Schmitz. **8.15,** Concert of Old House and Chamber Music on historical instruments : Chanson (Dufay) ; Chanson (Binchios) ; Lute Solo ; Maria, zart (Schlick) ; Suite (d'Andrien) ; Song with Lute and Viola (Dowland) ; Prelude (Bach) ; Minute (Telemann) ; Aria (Telemann) ; Song (Bellman). **9.0,** Programme from **Frankfurt,** followed by Dance Music from the Pavillon Excelsior.

**TALLINN (408 metres)** ; 2.2 kW.—**5.30,** Programme for Children. **6.0,** Weekly Report. **6.30,** News. **7.0,** Gramophone Selections. **8.15,** Dance Music.

**TOULOUSE** (Radiophonie du Midi) **(391 metres)** ; 3 kW.—**12.45,** Instrumental Concert. **8.0,** Exchange Quotations and News. **8.30,** Programme of Recitations. **8.40,** Orchestral Selections : 1812 Overture (Tchaikovsky) ; Berceuse from L'oiseau de feu (Stravinsky) ; Les journaux du matin (Strauss) ; Polonaise (Chopin). **8.55,** Two Orchestral Marches. **9.5,** Dance Music. **11.0,** North African News and Close Down.

**VIENNA (577 and 517.2 metres)** ; 1.5 and 15 kW.—**6.15,** Programme in Commemoration of Karl Busse (Died December 4th, 1918) and Bruno Wille (Died September 3rd, 1928). **7.15,** Chamber Music : Harp Quartet in E Flat Major Op. 74 and Op 135 in F. Major (Beethoven). **8.15,** " Der Clown wider Willen " Wireless Comedy (Konrad Maril), followed by Orchestral Music : March, Pan Europa (Chemel) ; Waltz, Wiener Bonbons (Strauss) ; Overture to Der Bettelstudent (Millöcker) ; Grossmütterchen (Langer) ; Harp Trio, Die Spieluhr (Blauw) ; Potpourri, From the Rhine to the Danube (Rhode) ; Song and Dance Suite from Der Traum der Radio-Zenzi (Silving), Mondaine Song and Dance Series (Geissler) ; March (Ischpold).

**VILNA (435 metres)** ; 1.5 kW.—**5.10,** Talk from **Warsaw.** **5.35,** Talk for Women by Mme. Ela Buncler. **6.0,** Relay of the Service from the Ostra Brama Chapel. **6.50,** Talk by Mr. Valerien Charkiewicz. **7.15,** News. **7.30,** Talk from **Warsaw.** **7.55,** Art Talk by Prof. Jules Klos. **8.20,** News. **8.30,** Programme from **Warsaw.** **11.30** (approx.), Close Down.

**WARSAW (1,111 metres)** ; 10 kW.—**7.0,** Announcements. **7.30,** " Radio-Chronique." **7.55,** Market Report and News. **8.30,** Concert, News in French during the Interval. **10.0,** Time Signal, Weather Report, News, Announcements and Sports Notes. **10.30,** Dance Music. **11.30** (approx.), Close Down.

**ZURICH (588 metres)** ; 1 kW.—**7.17,** Selections by The Loreti Quintet. **8.0,** Walter Möller in his own Works, assisted by Ilse Möller-Sieverling and the Station Orchestra. **9.0,** Orchestral Concert. **10.0,** Weather Report and News. **10.10,** Concert.

## Programmes from Abroad.

**BARCELONA** (Radio Barcelona), Call EAJ1 (**344.8 metres**); 1.5 kW.—**12.0 noon,** Chimes from Barcelona Cathedral, followed by Weather Report for Europe and Weather Forecast for North-East Spain. **1.30,** Concert by the Iberia Trio: Gramophone Selections in the Intervals. **2.45 to 6.0,** No Transmission. **5.0,** Stock Exchange Quotations. **6.15,** Concert by the Station Orchestra, with Vocal and Instrumental Solos. **8.40,** Sports Notes. **9.0** (approx.), Close Down.

**BASLE** (**1,010 metres**); 1.5 kW.—Programme, relayed from **Bern.** **7.0,** Concert of Chamber Music by the Weiss Quartet from **Vienna.** **8.45,** Weather Report and News Bulletin. **9.0** (approx.), Close Down.

**BERGEN** (**370.4 metres**); 1.5 kW.—**9.30 a.m.,** Relay of Divine Service. **11.30 a.m.,** Weather Forecast and General News Bulletin. **7.0,** Concert by the Station Orchestra. **7.20,** Talk on Current Topics. **8.30,** Music Recital. Mrs. Nora Duesberg-Baranowski. Adagio (Second Movement of the Violin Sonata in E Minor) by Toivo Kuula. **9.0,** Weather Report, Late News Bulletin and Time Signal. **9.15,** Orchestral Selections. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen), (**1,250 metres**); 40 kW.—**7.55 a.m.,** Chimes, relayed from the **Potsdam** Garrison Church. **8.0 a.m.,** Concert, relayed from **Voxhaus,** followed by the Berlin Cathedral Chimes. **10.15 a.m.** (approx.), Orchestral Concert, relayed from **Voxhaus.** **2.30 to 3.45,** Agricultural Talks from **Voxhaus.** **4.0,** Concert, relayed from **Voxhaus.** **5.30,** Talk. **6.0,** Talk, followed by relay of another German programme. **9.15,** Press News. **9.30,** Dance Music. **11.30** (approx.), Close Down.

**BERLIN** (Voxhaus), (**484 metres**); 4 kW.—**7.55 a.m.,** Garrison Church Chimes. **8.0 a.m.,** Vocal and Instrumental Concert, followed by Cathedral Chimes. **10.15 a.m.,** Orchestral Concert. **2.30,** Talks for Farmers. **4.0,** Concert of Orchestral Music, followed by Talks. **7.15** (approx.), Concert. **9.10** (approx.), Weather Report, Time Signal, Sports Notes and General News Bulletin. **9.30,** Dance Music. **11.30** (approx.), Close Down.

**BERN** (**411 metres**); 1.5 kW.—**9.30 a.m.,** Religious Address. **12.0 Noon,** Time Signal and Weather Report. **12.5,** Orchestral Concert. **2.30,** Concert of Light Music. **6.29,** Time Signal and Weather Report. **6.30,** Doctor Bruschweiter, Talk: Baptismal Customs in Switzerland; Preparations for the Christening. **8.45,** Sports Notes, General News Bulletin and Weather Forecast. **9.0,** Orchestral Selections. **9.35** (approx.), Close Down.

**BRESLAU** (**322.6 metres**); 4 kW.—Programme, relayed by **Gleiwitz** (329.7 metres).—**7.45 a.m.,** Relay of Chimes from Christ Church. **10.0 a.m.,** Catholic Morning Festival, with Address and Vocal and Choral Renderings. **11.0 a.m.,** Instrumental Concert, followed by Two Talks. **1.35,** Chess Hints. **2.0,** Children's Corner, followed by Talks and Musical Programme. **7.30,** Concert or Play. **9.0,** General News Bulletin. **9.30,** Musical Programme. **11.0** (approx.), Close Down.

**BRUNN** (**441.2 metres**); 3 kW.—**9.30 a.m.,** Talk for Farmers. **10.0 a.m.,** Musical Recital. **5.0,** German Transmission. **6.15** (approx.), Concert of Light Music. **9.0,** General News Bulletin, relayed from **Prague,** followed by Concert.

**BRUSSELS** (**508.5 metres**); 1.5 kW.—**5.0,** Dance Music, relayed from the St. Sauveur Palais de Danse. **6.0,** Programme for Children. **6.30,** Concert of Trio Selections. **7.30,** "Le Journal Parlé de Radio-Belgique." **8.15,** Concert by the Radio-Belgique Orchestra, under the direction of M. René Tellier. Artistes: Mademoiselle Marguerite Thys, of the Conservatoire Royal, Brussels (vocalist), and M. Alexandre Arsenieff (pianist). **10.15,** Press News. **10.30** (approx.), Close Down.

**BUDAPEST** (**555.6 metres**); 35 kW.—**8.0 a.m.,** News from the Press. **8.15 a.m.,** Beauty Hints. **9.0 a.m.,** Relay of Church Service. **11.30 a.m.** (approx.). Orchestral Concert. **2.30,** Agricultural Talk. **3.0,** Children's Programme. **4.0,** Programme of Music. **7.15** (approx.), Concert or Play. **9.20,** Orchestral Selections. **10.30** (approx.), Close Down.

**COLOGNE** (**283 metres**); 4 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Langenberg** (468.8 metres) and **Münster** (250 metres).—**7.15 a.m.,** Musical Selections. **7.35 a.m.,** Esperanto Lesson. **8.5 a.m.,** Catholic Morning Festival, with Choral and Instrumental Items. **10.0 a.m.,** Talk on "The German Language." **10.30 a.m.,** Agricultural Talk and Talk on Music. **12.0 Noon,** Concert of Orchestral Selections, followed by Talks on Literature and Chess. **3.30,** Orchestral Concert and Talks. **8.0,** The First Act of "Die Walküre" (Wagner), followed by Late News Bulletin Sports Notes and Dance Music. **11.0** (approx.) Close Down.

# SUNDAY, OCTOBER 7th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**CORK,** Call 6CK (**400 metres**); 1.5 kW.—**8.30,** Organ Recital, relayed from St. Fin Barre's Cathedral, Cork; Organist: T. J. Horne, Mus.Bac., A.R.C.O. **9.0,** Vocal and Instrumental Concert. **11.0.** Weather Forecast and National Anthem. **11.15** (approx.), Close Down.

**CRACOW** (**566 metres**); 1.5 kW.—**9.15 a.m. to 10.45 a.m.,** Cathedral Morning Service. **11.0 a.m. to 11.10 a.m.,** Fanfare, relayed from Notre Dame, Cracow, followed by Time Signal and Weather Forecast. **12.30 to 1.30,** Programme relayed from the Pavillon Restaurant. **3.0,** Two Agricultural Talks. **3.40,** Dr. St. Wasniewski, "La Chronique Agricole." **5.30,** Miscellaneous Items. **5.50 to 6.15,** Talk. **7.0,** Fanfare, relayed from the Church of Notre Dame. **7.15,** Sports Notes. **7.30,** Concert of Instrumental and Vocal Music: The Symphony Orchestra of the "Hejnal" Musical Society, under the direction of Vinceslas Karas: Hungarian Dances, Nos. 5 and 6, by Brahms. **9.0,** Programme relayed from **Warsaw.** **9.30,** Concert by a Restaurant Orchestra. **10.30** (approx.), Close Down.

**DUBLIN.** Call 2RN (**319.1 metres**); 1.5 kW.—**8.30 to 11.15** (approx.), Programme relayed from **Cork:** Vocal and Instrumental Concert: Signor Grossi and Madame Grossi, Sonata for Violin and Pianoforte. **11.0,** Weather Forecast and National Anthem. **11.15** (approx.), Close Down.

**FRANKFURT** (**428.6 metres**); 4 kW.—Programme relayed by **Cassel** (252.1 metres).—**7.0 a.m. to 8.0 a.m.,** Morning Concert. **10.30 a.m.,** Transmission for Parents under the direction of Dr. Flesch and Director K. Wehrhan. **11.0 a.m.,** Orchestral Concert. **12.0 Noon,** Report of the Wiesbaden Agricultural Institute. **4.0** (approx.), Concert. **7.30,** Musical Programme. **9.30** (approx.), Relay of Dance Music from **Berlin.** **11.30** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse) (**394.7 metres**); 4 kW.—Programme relayed by **Bremen** (272.7 metres), **Hanover** (297 metres) and **Kiel** (254.2 metres).—**7.15 a.m.,** Time Signal. **7.30 a.m.,** Weather Forecast and General News Bulletin. **8.0 a.m.,** Legal Notes. **8.15 a.m.,** Concert. **9.55 a.m.** (for **Kiel** only), Morning Service from the University Church of Kiel. **10.0 a.m.,** Technical Talk. **11.55 a.m.,** Time Signal, relayed from **Nauen.** **12.0 Noon** (for **Hamburg** and **Kiel**), Concert. **12.0 Noon** (for **Bremen**), Orchestral Programme. **12.0 Noon** (for **Hanover**), Gramophone Records. **1.0,** Children's Corner, by Funkheinzelmann. **2.0,** Concert. **4.0** (approx.), Popular Concert, followed by Talk. **6.30,** Talk, arranged by the Physical Training School in **Hamburg.** **6.40,** Sports Notes. **6.55,** Weather Report. **7.0** (approx.), Concert or Play. **8.30** (approx.), General News Bulletin and Weather Report for the North Sea and the Baltic, followed by Orchestral Concert, relayed from the Café Wallhof (for **Hamburg** and **Kiel**) and relay from the Café Continental (for **Hanover** and **Bremen**). **10.0** (approx.), Close Down.

**HILVERSUM** (**1,071 metres**); 5 kW.—**12.40 to 2.10,** Concert by the Hilversum Radio Trio. **2.30** (approx.). Concert. **7.40,** General News Bulletin and Weather Report. **7.55,** Relay of Orchestral Concert. **9.45** (approx.), Musical Programme. **10.50** (approx.), Close Down.

**HUIZEN** (**340.9 metres**); 4 kW.—Transmits on 1,870 metres from 5.40.—**8.10 a.m. to 9.10 a.m.,** Morning Service and Address. **9.30 a.m.** (approx.), Relay of Church Service. **12.10,** Concert by the Winkels Trio. **5.45** (approx.), Relay of Divine Service, from the Evangelical Church at s'Gravenhage; Address by the Minister, Dr. H. C. Zwahler; Mr. J. R. Gravelotte at the Organ. **7.25,** Talk. **7.55,** Orchestral Concert. **10.20** (approx.), Epilogue by the Choir. **10.40** (approx.), Close Down.

**JUAN-LES-PINS** (Radio LL) (**244 metres**); 1.5 kW.—**1.0 to 2.0,** Children's Concert and Talk by "Radiolo" (Marcel Laporte). **9.0,** General News Bulletin and Weather Report. **9.15,** Concert; Monsieur Stan, Talk Pre-War Songs, with Illustrations by Madame Verlaque, MM. Debert, Vermez and Laporte. **10.0,** Selections by the Dance Orchestra of the Municipal Casino. **10.30** (approx.), Close Down.

**KALUNDBORG** (**1,153 metres**); 7 kW.—Programme also for **Copenhagen** (337 metres).—**9.0 a.m.,** Church Service from **Copenhagen.** **10.30 a.m.** (**Kalundborg** only), The Meteorological Institute Weather Report. **4.0,** Relay of Divine Service from **Copenhagen.** **5.30** (approx.), Twenty Minutes for Children. **5.50** (**Kalundborg** only), The Meteorological Institute Weather Report. **6.0,** News from the Press. **6.15,** Time Signal. **6.30,** Talk. **7.0,** Relay of Chimes from the Town Hall, **Copenhagen.** **7.5,** Concert of Orchestral Selections, followed by General News Bulletin. **8.45,** Concert by the Copenhagen Station Orchestra: "My Old Kentucky Home" arranged for Strings by Carl Busch. **9.45,** Programme of Dance Music; in the interval at **11.0,** Chimes from the Town Hall. **11.30** (approx.), Close Down.

**KATTOWITZ** (**422 metres**); 10 kW.—**5.50,** Talk. **6.45,** Talk. **7.30,** Concert, relayed from **Warsaw.** **9.0,** Time Signal, Weather Forecast, Press and Sports News. **9.30,** Dance Music. **10.30** (approx.), Close Down.

**KAUNAS** (**2,000 metres**); 7 kW.—**11.0 a.m.,** Weather Forecast and Press News. **11.30 a.m.,** Concert. **12.0 Noon,** Children's Corner, followed by Physical Culture. **2.30,** Young People's Programme. **3.0,** Literary Talk. **3.30,** Health Talk. **4.0,** Talk on Economics and Life. **4.25,** Musical Selections. **4.35,** Notes for Farmers. **5.15,** 'Cello Recital by Robert Mofmekler: Andante from the Concerto in A Minor (Goltermann). **6.10,** Weather Report. **6.20,** Political Talk. **6.30,** Orchestral Concert, followed by Miscellaneous Items. **9.30** (approx.), Close Down.

**KÖNIGSBERG** (**303 metres**); 4 kW.—Programme, relayed by **Danzig** (272.7 metres).—**8.0 a.m.,** Morning Concert. **10.0 a.m.** (**Königsberg** only), Weather Forecast. **10.15 a.m.,** Concert of Orchestral Selections, **11.55 a.m.,** Time Signal, relayed from **Nauen,** followed by Weather Report. **1.50,** Chess Talk by P. S. Leonhardt. **2.20,** Spanish Lesson for Beginners by Kurt Metze, Spanish Lecturer at the Technical Institute. **3.0** (approx.), Concert by the Station Orchestra, under the direction of Volkmar Shalak, followed by Talks. **6.30,** "Egmont," Tragedy by Goethe, Music by Beethoven; The Station Orchestra conducted by Erich Seidler. **9.15,** General News Bulletin and Sports Notes. **9.30** (approx.), Dance Music. **11.30** (approx.), Close Down.

**LAHTI** (**1,522.8 metres**); 35 kW.—Programme also for **Helsingfors** (375 metres).—**8.0 a.m.** (approx.), Relay of Divine Service. **9.50 a.m.,** News from the Press. **10.5 a.m.,** Musical Programme. **10.50 a.m.,** Time Signal and Weather Report. **11.0 a.m.,** Church Service in Swedish. **3.0,** Musical Items. **4.0,** Talk. **4.57,** Time Signal and Weather Report. **5.10,** History Talk. **6.0,** Concert. **7.45,** Late News Bulletin in Finnish and Swedish. **9.0** (approx.), Close Down.

**LANGENBERG** (**468.8 metres**); 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**7.15 a.m.,** Musical Programme, relayed from **Cologne.** **7.35 a.m.,** Esperanto Lesson, relayed from **Cologne.** **8.5 a.m.** (approx.), Catholic Recital. **10.0 a.m.,** Three Talks on the German Language, Agriculture and Music. **12 Noon,** Orchestral Concert, followed by Talks on Literature and Chess. **3.30,** Orchestral Selections. **6.45,** Concert by the Westdeutscher Rundfunk Orchestra. **8.0,** Programme from **Cologne,** followed by News Bulletin, Sports Notes and Light Musical Selections. **11.0** (approx.), Close Down.

**LEIPZIG** (**365.8 metres**); 4 kW.—Programme relayed by **Dresden** (275.2 mteres).—**7.30 a.m.,** Relay of Organ Recital. **8.0 a.m.,** Morning Concert. **10.0 a.m.,** Concert of Orchestral Music. **12.0 Noon,** Veterinary Talk. **12.30,** Talk for Farmers: Modern Agricultural Methods. **1.0,** Talk by the German Speaking Union, and Notes on Foreign Politics. **1.30,** Musical Selections. **6.30,** Programme relayed from **Jena:** "Samson," Oratorio by Händel. **9.0,** Sports News. **9.30,** Relay of Dance Music from **Berlin.** **11.0** (approx.), Close Down.

**LILLE,** Call PTT (**264 metres**); 0.5 kW.—**12.30,** Orchestral Concert. **1.35,** Prices of Motor Oils. **8.30,** Concert of Vocal and Orchestral Music, followed by Late News Bulletin.

**LYONS** (Radio Lyon) (**291 metres**); 1.5 kW.—**11.0 a.m.,** Programme of Sacred Music, arranged by "La Maison Rabut." **12.0 Noon to 7.30,** No Transmission. **7.30,** The Radio-Lyon "Journal Parlé." **8.0,** Sports Notes. **8.10,** Orchestral Concert, Pianoforte Solo by Madame Ducharne, Piccolino (Guiraud). **9.15,** Selections by the Dance Orchestra. **10.0** (approx.), Close Down.

**MADRID** (Union Radio), Call EAJ7 (**375 metres**); 3 kW.—Programme relayed by **Salamanca,** EAJ22

## Programmes from Abroad.

(405 metres).—**2.0,** The Station Orchestra in a programme of Light Music; Interlude by Luis Medina. **3.30 to 7.0,** No Transmission. **7.0,** Children's Hour, Kiki and his friends, and Fairy Stories, Selections by the Station Sextet. **8.0,** Dance Music by the Station Sextet. **8.30 to 10.0,** No Transmission. **10.0,** Relay of Chimes and Time Signal. **10.5,** Military Concert: The Band of the Saboya Regiment, conducted by Don Tomas Romo, Songs by Terele Silva. **12.0 Midnight,** Dance Music by the "Palermo en Rosales" Orchestra. **12.30 a.m.** (approx.) (Monday), Close Down.

**MILAN,** IMI (**549 metres**); 7 kW.—**9.30 a.m. to 10.0 a.m.**—Vocal and Instrumental Morning Concert. **11.30 a.m.,** Time Signal and Selections by the Station Quartette. **12.30 to 3.0,** No Transmission. **3.0,** Opening Signal and Variety Programme with selections by the Station Quintet; Soprano Solos by Signora Maria Avezza. **4.25,** Agricultural Notes. **4.30,** Concert by the Orchestra at the Majestic Hotel Diana. **5.0 to 7.25,** No Transmission. **7.25,** Opening Signal and General News Bulletin. **7.35,** Time Signal. **7.45,** Sports News. **7.50,** Relay of an Opera with talk in the Interval by Ulderico Tegani. At the end of Act 2, Late News Bulletin and Sports Notes. **10.45** (approx.), Close Down.

**MOTALA** (**1,380 metres**); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres) and **Sundsvall** (545.6 metres).—**9.0 a.m.,** Relay of Divine Service. **11.35 a.m.,** Weather Report. **11.45 a.m.,** Exchange Quotations. **11.55 a.m.,** Time Signal. **1.0,** Concert of Symphony Music from the Concert Hall in **Stockholm. 4.55,** Relay of Chimes from the Town Hall, **Stockholm. 5.0,** Church Service. **7.0** (approx.), Concert. **8.15,** General News Bulletin. **8.30,** Weather Report. **8.40,** Concert. **10.0** (approx.), Close Down.

**MUNICH** (**535.7 metres**); 4 kW.—Programme relayed by **Augsberg** (566 metres), **Kaiserslautern** (277.8 metres) and **Nuremburg** (241.9 metres).—**10.0 a.m.,** Relay of Town Hall Chimes. **10.15 a.m.,** Wireless Weather Chart for Bavaria. **11.0 a.m.,** Orchestral Selections. **12.5,** Time Signal, Weather Report and Programme Announcements. **2.15,** Concert by the Station Orchestra. **5.10,** Musical Selections. **6.0,** "Die Meistersinger von Nürnberg" (Wagner) relayed from the National Theatre in Munich. **9.5,** General News Bulletin. **9.30,** Concert relay. **10.45** (approx.), Close Down.

**NAPLES,** Call INA (**333.3 metres**); 1.5 kW.—**9.0 a.m.,** Concert of Sacred Music. **3.45,** Programme for Children. **4.0,** Concert of Light Music, Signora Carla Spinelli (Vocalist). **4.50,** Time Signal. **7.20,** Topical Talk. **7.40,** Time Signal. **7.48,** Report of the Harbour Authorities at Naples. **7.50,** Concert of Orchestral Music: "Silvo a quest'ora," duet from "I Pagliacci" (Leoncavallo) by J. Rizzuto (Soprano) and R. Aulicino (Baritone), accompanied by the Orchestra. **9.0,** Sports Notes. **9.55,** Calendar and Notes on Forthcoming Programmes. **10.0** (approx.), Close Down.

**OSLO** (**461.5 metres**); 1.5 kW.—Programme relayed by **Fredrikkstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—**9.50 a.m.** (approx.), Carillon. **10.0 a.m.,** Relay of Divine Service from the Garrison Church. **6.15,** Weather Report and Press News. **7.0,** Time Signal. **7.5,** Concert by the Station Orchestra: Conductor, Hugo Kramm. **8.30,** Weather Report and Press News. **8.45,** Topics of the Day. **9.0,** Relay of Orchestral programme from the Hotel Bristol, Oslo. **10.45** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT (**458 metres**); 0.5 kW.—Programme relayed at intervals by the following stations: **Bordeaux PTT** (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille PTT** (264 metres), **Limoges** (285 metres), **Lyons PTT** (476 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse PTT** (260 metres).—**8.0 a.m.,** News Bulletin and Time Signal. **10.25 a.m.,** International Time Signal and Weather Forecast. **12.0 Noon.** Concert: **1.0,** Industrial Notes. **1.30,** Orchestral Programme: Ballet from "Romeo and Juliet" by Gounod. **2.30,** Concert of Symphony Music arranged by "Le Journal." **6.30,** Le Radio Journal de France. **8.0,** Talk. **8.30,** Orchestral Concert organised by the General Association of French Wireless Listeners followed by Late News Bulletin, Time Signal and Weather Report. **10.30** (approx.), Dance Music relayed from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL (**2,650 metres**); 5 kW.—**7.56 a.m.,** Time Signal on 32.5 metres. **9.26 a.m.,** Time Signal on 2,650 metres. **5.45,** "Le Journal Parlé," par T.S.F. Dr. Pierre Vachet, Talk: Portez-vous bien, M. René Casalis, Talk on Sport with Gleanings from the paper "Paris Sport": Detective Ashelbé, Police Anecdotes. **7.10 to 7.20,** Weather Report. **7.30,** Mario Cazes and his Orchestra. **7.56,** Time Signal on 32.5 metres. **10.26,** Time Signal on 2,650 metres. **11.30** (approx.), Close Down.

# Sunday, October 7th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**PARIS** (Radio L.L.) (**370 and 60 metres**); 1 kW.—**12.30,** General News Bulletin and Programme organised by "Radio-Liberté," followed by Topical Talk. **3.0,** Dance Music Selections arranged by "Les Etablissements Radio L.L."

**PARIS** (Petit Parisien) (**340.9 metres**); 0.5 kW.—**8.45,** Gramophone Selections. **8.50,** Talk. **8.55,** News from the Press. **9.0,** Orchestral Concert. **9.25,** General News Bulletin. **9.30 to 10.0,** The Symphony Half-Hour. **10.0,** Late News Bulletin. **10.15,** Concert of Instrumental Music: Bacchante from Samson and Delilah (Saint-Saëns). **11.0** (approx.), Close Down.

**PARIS** (Radio-Paris), Call CFR (**1,750 metres**); 6 kW.—**8.0 a.m.,** General News Bulletin and News from the Press. **12.0 Noon,** Morning Recital, arranged by "La Vie Catholique," with Choral Renderings; Address by Father Lhande on "Le Christ dans la banlieue: la marée montante." **12.30,** News from the Press. **12.45,** Light Music by the Albert Locatelli Orchestra. **4.30,** Dance Music by the Grand Vatel Orchestra; in the Interval: News from the Press. **8.0,** Agricultural Notes and Press News. **8.45,** Variety Concert; in the Intervals: Press Notes and General News Bulletin.

**PITTSBURGH,** Call KDKA (**63 and 27 metres**); 25 kW.—**3.45,** Telechron Time. **4.0,** Divine Service. **7.0,** Roxy's Stroll Programme from WJZ, **New York. 11.0,** Time Signal and Baseball Scores. **11.30,** Relay of Concert. **12.0 Midnight,** Time Signal and Baseball Scores, followed by Relay of Concert from the William Penn Hotel, Pittsburgh. **1.0 a.m,** (Monday), Programme relayed from WJZ, **New York. 2.15 a.m.** Concert relayed from WJZ, **New York. 3.0 a.m.,** Time Signal. **3.15 a.m.,** Baseball Scores and Telechron Time. **3.30 a.m,** (approx.), Close Down.

**POSEN** (**344.8 metres**); 1.5 kW.—**9.15 a.m. to 10.45 a.m.,** Divine Service from the Posen Cathedral; Renderings by the Choir, under the Direction of the Abbé Dr. Gieburowski; Sermon by the Abbé Thadée Zamyslowski. **11.0 a.m.,** Time Signal. **11.5 a.m.,** Agricultural Talk. **11.30 a.m.,** Agricultural Talk. **6.20,** Talk, relayed from **Warsaw. 6.45,** Talk, relayed from **Warsaw. 7.15,** Orchestral Concert. **9.0,** Time Signal, Weather Report and Sports Notes. **9.20,** Variety Programme. **9.40,** Relay of Dance Music from the Restaurant of the "Palais Royal." **11.0** (approx.), Close Down.

**PRAGUE** (**348.9 metres**); 5 kW.—**9.0 a.m.** (approx.), Talk for Farmers. **10.0 a.m.,** Morning Recital. **12.5,** Commerce Notes. **12.20,** Topical Talk. **5.0,** German Programme. **6.15** (approx.), Light Music. **9.0,** Time Signal and General News Bulletin, followed by Musical Programme.

**RIGA** (**526.3 metres**); 4 kW.—**9.15 a.m.,** Relay of Morning Service. **12.0 Noon.** Children's Corner and Musical Selections. **3.0,** Concert by the Station Orchestra. **4.0 to 6.0,** Programme of Talks. **6.0,** Orchestral Concert. **8.0,** Weather Report and General News Bulletin. **8.30,** Concert, relayed from the Café de l'Opera. **10.0** (approx.), Close Down.

**ROME,** Call 1RO (**447.8 metres**); 3 kW.—**9.15 a.m to 10.0 a.m.,** Opening Signal and Vocal and Instrumental Music. **10.0 a.m. to 12.0 Noon,** No Transmission. **12.0 Noon to 1.0,** Trio Selections. **1.0 to 4.0,** No Transmission. **4.0,** Opening Signal. **4.5,** Concert of Light Music. **5.0 to 7.0,** No Transmission. **7.0,** Opening Signal and News Bulletin. **7.20,** Talk for Farmers. **7.30,** Sports News and General News Bulletin. **7.59,** Time Signal. **8.0,** Concert by the Grand Symphony Orchestra: Namouna, Suite by Lalo, (a) Prelude, (b) Serenata, (c) Theme with Variations, (d) Alla fiera, (e) Festa Popolare: Talk in the Interval. **10.5,** Late News Bulletin. **10.15** (approx.), Close Down.

**SAN SEBASTIAN** (Union Radio), Call EAJ8 (**335 metres**); 0.5 kW.—**10.0,** The Orchestra at the San Sebastian Casino in a Programme of Popular Music. **12.0 Midnight** (approx.), Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF (**21.96 and 31.4 metres**); 30 kW.—**4.0,** Relay of Service from the First Lutheran Church, Albany, N.Y., Address by the Pastor, the Rev. Chalmers E. Frontz. **6.30 to 7.0,** Programme of the United Radio Corporation, **New York. 10.30,** Concert from **New York. 11.0,** Programme of the American Legion Band, relayed from **Boston, Mass. 12.0 Midnight,** Lehigh Programme, relayed from **New York. 12.30 a.m.** (Monday), Relay from the Capitol Theatre, **New York. 2.0 a.m.,** Talk by the Editor of the "United States Daily," relayed from **Washington, D.C. 2.15 a.m.,** Atwater Kent Half-Hour, from **New York. 3.15 a.m.,** Television Signals—Experimental Transmission. **3.30 a.m.** (approx.), Close Down.

**SEVILLE** (Union Radio), Call EAJ5 (**434.8 metres**); 1 kW.—**2.0,** Concert by the Seville Station Orchestra. **10.0,** Concert of Popular Music. **11.15,** Selections of Dance Music. **12.0 Midnight** (approx.), Close Down.

**STAMBOUL** (**1,200 metres**); 5 kW.—**3.30,** Orchestral Concert. **4.30,** Stock Exchange Quotations. **5.15,** Concert of Turkish Music. **7.30,** Weather Report and Time Signal. **7.40,** Concert of Orchestral Selections. **9.0,** Late News Bulletin. **9.30** (approx.), Close Down.

**STUTTGART** (**379.7 metres**); 4 kW.—Programme relayed by **Freiburg** (577 metres).—**10.0 a.m.,** Instrumental Concert followed by Musical Programme, and Gramophone Records. **1.0,** Children's Corner relayed from **Berlin. 2.0,** Talk. **5.0,** Time Signal and Sports Notes. **7.0,** Concert. **9.0** (approx.), Programme of Light Music followed by General News Bulletin and Sports Notes.

**TOULOUSE** (Radiophonie du Midi) (**391 metres**); 3 kW.—**12.30,** Weather Report and Market Prices for Toulouse. **12.45,** Concert of Popular Selections. **1.0,** Time Signal (Carillon). **1.45,** Press News. **8.0,** Stock Exchange Quotations from Paris, and Prices of Cereals, followed by News from the Fournier Agency. **8.15,** News from "La Dépêche" and "Le Petit Parisien." **8.30,** Orchestral Selections. **8.50,** Concert arranged by the "Association des Commerçants Radio Electriciens du Midi": "Manon" by Massenet, (a) Overture to First Act, (b) Allons, Manon, plus de chimère, (c) Duo de la lettre, (d) Gavotte, (e) Ballet, (f) Duo de Saint-Sulpice. **10.15,** "Le Journal sans Papier" and Late News Bulletin. **10.30** (approx.), Close Down.

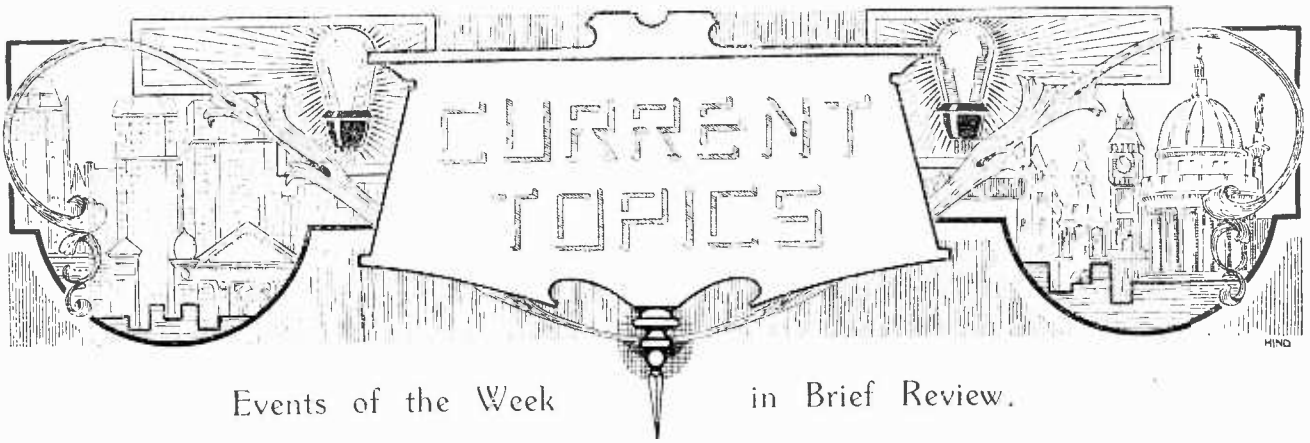
**VIENNA** (**577 and 517.2 metres**); 1.5 and 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres) and **Linz** (254.2 metres).—**9.30 a.m.,** Recital of Organ and Choral Music. **10.0 a.m.,** Concert of Classical Compositions by the Vienna Symphony Orchestra. **3.0,** Orchestral Concert. **6.0** (approx.), Concert with Soloists. **7.5,** Mam'selle Nitouche, Musical Farce in Three Acts by Hervé; German Translation by R. Genée, produced by Josef Holzer and Victor Flemming. **9.15** (approx.), Concert of Light Music. **10.0** (approx.), Close Down.

**VILNA** (**435 metres**); 1.5 kW.—**9.15 a.m.,** Relay of Cathedral Service. **11.0 a.m.,** Time Signal and General News Bulletin relayed from **Warsaw. 7.30,** Concert from **Warsaw. 9.0,** Time Signal, Aviation Route Report, Weather Report and Late News Bulletin, from **Warsaw. 9.20,** Police Notes and Sports News from **Warsaw. 9.30,** Dance Music. **10.30** (approx.), Close Down.

**WARSAW** (**1,111 mtres**); 10 kW.—**9.15 a.m.,** Relay of Cathedral Service. **11.0 a.m.,** Time Signal and Fanfare relayed from **Cracow. 11.5 a.m.,** Aviation Route Report and Weather Forecast. **11.10 a.m.** Concert by the Orchestra of the "Philharmonie de Varsovie" under the direction of J. Oziminski: Selections of well-known symphonies; Violin Solos by A. Kontorowicz. **6.45,** Talk. **7.10,** General News Bulletin. **7.30,** Concert with Vocal and Instrumental Solos. **9.0,** Time Signal, Weather Report and Aviation Route Conditions. **9.5,** Late News Bulletin. **9.20,** Police News and Sports Notes. **9.30,** Relay of Dance Music from the Oaza Restaurant in Warsaw. **10.30** (approx.), Close Down.

**ZAGREB** (**309.2 metres**); 0.7 kW.—**10.30 a.m.,** Orchestral Concert. **6.45,** Talk on Wireless. **7.0,** Relay of an Opera from the National Theatre, in Zagreb, followed by Late News Bulletin and Weather Report.

**ZURICH** (**588 metres**); 1 kW.—**10.0 a.m.,** Concert by the Zurich Station Orchestra. **11.29 a.m.,** Weather Report. **11.30 a.m.,** Orchestral Selections. **3.0,** Relay of Concert from the Carlton Elite Hotel, The Castellano Orchestra. **6.30,** Time Signal. **6.33,** Religious Address. **7.30,** "Request" Concert by the Zurich Station Orchestra, including Songs by Heidy Suter from "Der Röseligarten." At the Piano: Otto Strauss. **9.0,** Weather Report and Late News Bulletin. **9.20** (approx.), Close Down.




## Events of the Week in Brief Review.

### ALL RECORDS SMASHED

"A record show in all respects," was the description applied to the 1928 National Radio Exhibition by the Secretary of the Radio Manufacturers' Association.

"All previous records were broken in the number of stands taken, the financial return, the attendances, and the amount of public interest aroused."

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### A POLYGLOT SHOW

A feature of the 1928 Exhibition was the number of visitors from abroad. Interpreters with the command of eleven languages had a busy time.

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### FRAE ABERDEEN AWA!

A Caledonian atmosphere pervaded Olympia on Wednesday last when the turnstiles clicked to admit a special train-load of enthusiasts from Aberdeen.

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### MORE SURPRISES?

"I have still great ideas about wireless."—Senatore Marconi at the Radio Manufacturers' Association dinner.

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### EXPERIMENTS ON THE "ELETTRA."

Senatore Marconi has recently returned from a voyage in the Mediterranean on his yacht "Elettra," which carries a well-equipped laboratory for radio research. We understand that his latest experiments were concerned with developments in beam wireless and direction finding.

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### THE BRUSSELS EXPERIMENTAL CENTRE.

The new wireless experimental research centre established at Brussels by the Union International de Radiophonie will, we understand, be under the direction of M. Robert Goldschmidt, a well-known amateur transmitter, known to many DX enthusiasts as B2, Brussels.

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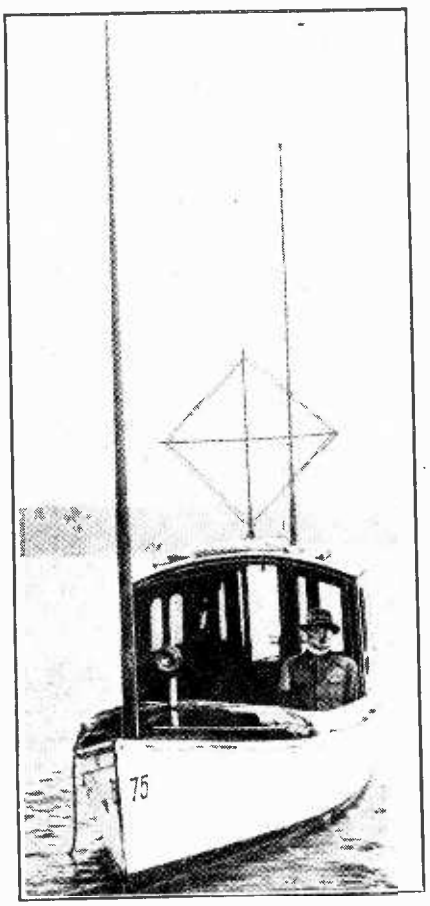
### MEDAL PRESENTATION BY WIRELESS

The Veteran Wireless Operators' Association of America has awarded a gold medal for valour to Signor Guiseppe Biagi, who was wireless operator on the ill fated Polar airship "Italia." The presentation speech was made on September 22nd by Mr. David Sarnoff, of the Radio Corporation of America, and was broadcast from the Corporation's short-wave stations to enable Biagi to pick up the speech in Rome, where he was known to be listening.




**A TELEARCHIC MOTOR BOAT. Much interest has been aroused among visitors to Lake Ammer, near Munich, by the appearance of the motor boat "Asle," which is entirely controlled by wireless and carries a dummy passenger.**

### IRELAND'S WIRELESS SHOWS.

Northern Ireland and the Irish Free State will have wireless exhibitions running concurrently during the next few days.

To-morrow (Thursday) will see the opening of the fourth annual wireless exhibition in Belfast, to be held in the Ulster Hall. It will run for a week, the closing date being October 10th.

The Dublin Radio Exhibition will open on Monday next, October 8th, at the Mansion House, and will run till the following Saturday. A feature of this show will be demonstrations of set construction in full view of visitors.

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### BROADCASTING TO BLAME.

It is rumoured that umbrella manufacturers attribute the unusually dry summer to the evil effects of broadcasting.

o o o o

### MIDNIGHT TESTS FROM HOLLAND.

PCJJ, the famous Hilversum station, has inaugurated special Thursday-Friday transmissions from 2300 to 0030 G.M.T. The wavelength is 31.4 metres.

o o o o

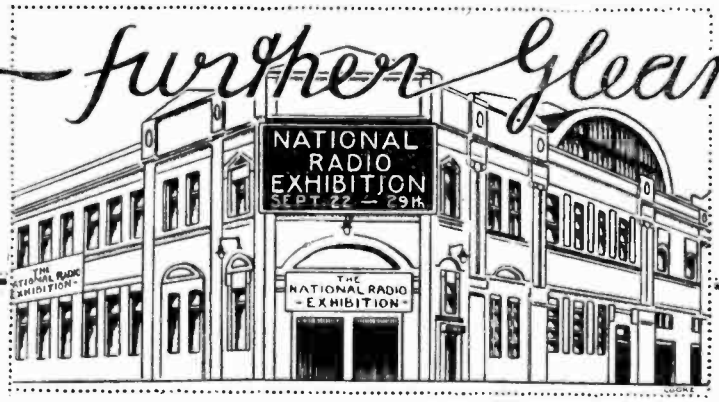
### CLOSING A JAM FACTORY.

American politicians who have been declaring that "to just own or hire a radio broadcasting station and bawl them out" was all that would be necessary in the forthcoming political campaign have received a nasty blow, according to the *Telegraph and Telephone Age*, at the hands of the Federal Radio Commission, which has just ordered WCOT, Providence, R.I., to "go off the air" for interfering with its neighbours with intent to jam.

o o o o

### OIL HUNTS BY WIRELESS.

The American petroleum industry is reported to have applied to the Federal Radio Commission for licences for about sixty short-wave transmitters for "geophysical exploration" with the object of locating new oilfields. The unqualified statement is made that 100,000,000 dollars worth of oil has already been discovered by this method, which makes use of the lag between radio and sound transmission to determine the geological formations under the earth's surface. The velocity of the sound waves is affected by the presence or absence of salt formations which generally accompany oil deposits.




# Further Gleanings from Olympia

## Additional Items of Interest.

### ADEY.

During this month delivery will commence of a new suitcase portable of unusually small dimensions. The receiver comprises a single-valve circuit for which patents are pending, and this is contained, complete with batteries, in a leather case measuring only 13¾in. × 8¾in. × 3¾in. Headphone reception of Daventry in London is guaranteed, and it is claimed that the new circuit greatly simplifies the process of tuning. Not the least interesting feature is the low price of £3 10s.

When the one-valve set is in production, attention will be directed to two-, three-, and four-valve sets of similar type with self-contained Celestion loud speaker.

*Adey Wireless, Ltd.*, 99, *Mortimer Street, London, W.*1.

### BAKELITE.

Although a census was not taken, it seems probable that there were not more than two or three stands at Olympia without an exhibit in which bakelite in some form or other was used. This material is still gaining ground in the wireless field. An interesting exhibit showing its various applications was staged; it now appears that opaque white bakelite is a practical proposition. This firm supplies raw material, and showed the products of its customers.

*Bakelite, Ltd.*, 68, *Victoria Street, London, S.W.*1.

The Burton "Micro Log" dial with two-speed drive and provision for recording station settings.

### BECOL.

It was hardly expected that any radically new departure would be introduced with regard to the products of the British Ebonite Company. However, it was noticed that the ribbed formers which, apart from panels, tubes and rods, are one of the principal manufactures of this firm, are now available in a wider range of sizes. For instance, the well-known six-ribbed tubing is made in diameters up to 4in., and a new range of formers having nine projecting ribs is now offered. These are likely to have certain advantages in the construction of coils and transformers, particularly those with sectional windings.

*The British Ebonite Co., Ltd., Hanwell, London, W.*7.

Four-valve De Luxe receiver by Cook's Wireless Company.

### COOK'S WIRELESS.

The outstanding feature of this stand was without doubt the four-valve de luxe receiver with revolving shutter front. Not only is the instrument of elegant appearance, but nothing has been sacrificed in technical efficiency purely for the sake of pleasing the eye, which regrettable state of affairs still persists in some receivers.

A close second was the five-valve portable set which has evidently been designed by a man of some considerable experience of portable receivers, judging by the excellent position of the controls. Many other receivers of a less pretentious but nevertheless sound type were also shown.

*Cook's Wireless Co., Ltd.*, 23, *St. Helen's Street, Ipswich.*

### CURRY'S.

It would be a difficult matter for any man to undertake the choice of the most interesting exhibit that was to be seen on this stand, so many and varied were the receivers and accessories shown. Perhaps, however, one might pick the "Curry de Luxe" receiver not because is is a de luxe model, but because of the all round excellence of its design.

Another most interesting feature is the Curry "Wonder" receiver, which is supplied in parts for home assembly, including a complete blue print or design sheet, as they prefer to call it. In addition, this firm exhibited a large number of proprietary receivers and components on their stand.

*Curry's, Ltd.*, 24-28, *Goswell Road, London, E.C.*1.

### ENTERPRISE.

Among the numerous receivers and components handled by this firm we would direct attention to the "Beethoven" portable and the range of "Peke" cabinets.

The general layout of the "Beethoven" portable is well thought out. The controls are arranged below the self-contained Celestion loud speaker, and fall conveniently to the hand. The circuit comprises five valves with a patented coupling for the two H.F. stages. The L.F. circuit employs a Ferranti transformer and feeds into a pentode output valve. All components are of the best, and include Dubilier condensers and

"Emaco" H.F. choke made by the Enterprise Manufacturing Co., Ltd.

Siemens batteries. Special attention has been directed to the cabinet work, and this may be obtained with lacquer finish in a wide range of colours to match any furnishing scheme as well as in polished mahogany. A patented waterproof cover enables the set to be played out of door.

**Further Gleanings from Olympia.**—in the wet without detriment to the woodwork. The initial letter of the purchaser will be embroidered on the cover free of charge if required.

The "Peke" cabinets supplied by this firm are also attractive, being low in price and of sound construction. The Pedestal cabinet costs £4 10s., and is supplied to take any panel from 12in. × 7in. to 21in. × 7in.; the overall dimensions are Height 2ft. 8in., width 2ft. 2in., and depth 1ft. 6in. In addition to ordinary table type cabinets and loud speaker cabinets, a useful series of accumulator crates is made, both in walnut and oak.

"Peke" pedestal cabinet.

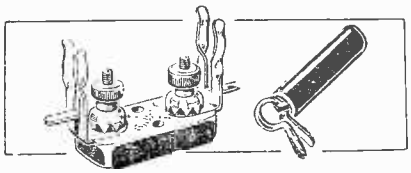
The crates, which are made to fit all standard sizes of accumulator, range in price from 1s. 7d. to 3s. 8d. in walnut.

*Enterprise Manufacturing Co., Ltd.*, 83, *Merton Road, Wimbledon, London, S.W.*19.

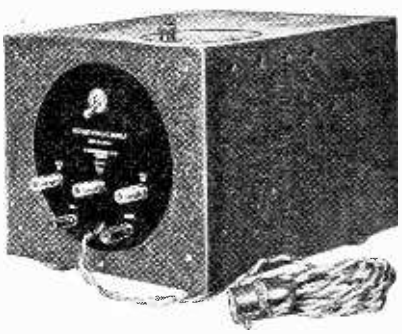
## ETON.

Specimens of the Eton wet H.T. battery and a collection of its component parts, such as jars, zincs and sacs, were displayed on Messrs. Sells' stand. The parts are sold separately as complete cells, or as complete batteries assembled in wooden trays. The firm issues a most useful little booklet describing their products at considerable length, and give valuable instructions on the maintenance of wet H.T. batteries.

*The Eton Glass Battery Co.*, 46, *St. Mary's Road, Leyton, E.*10.



"Gripso" grid leak holder and earthing clip.



The Henderson A.C. battery eliminator. It uses a valve rectifier.

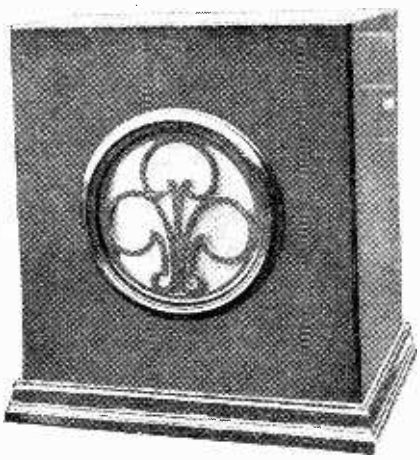
## MAINTEN.

"Mainten" battery eliminators are characterised by unusual neatness and simplicity. The 1928-29 range consists of variations of two principal models, the D.C.M.1 with series feed resistances for D.C. mains and the A.C.M.2 with half-wave valve rectifier for A.C. mains.

The D.C. model provides 40, 60, 120, and a power voltage, and is built into a metal container, the parts being embedded in wax. The price is 52s. 6d., and the same model in wood cabinet (D.C.1) is priced at 50s.

Both the D.C.M.1 and A.C.M.2 are capable of supplying up to six valves, but other models are available for four- and five-valve sets.

*The Mainten Manufacturing Co.*, 126, *Portland Road, Hove, Sussex*



A moving-coil loud speaker cabinet designed to accommodate any of the well-known units. A product of W. & T. Lock, Ltd.

## OLDHAM.

The well-established range of Oldham batteries remains practically unchanged for the coming season, but three new trickle charger units have been produced which embody many novel features.

The L.T. unit, or "Auto Power Unit," is made for A.C. mains only and comprises either a 2-volt or 6-volt Oldham glass-case accumulator and a Balkite rectifier built into a standard Oldham glass cell. The whole unit is housed in a metal case provided with an earthing terminal, and a window is cut in the side for inspecting the colour of the accumulator plates, gassing, etc. A change-over switch completely isolates the battery from the receiver while on charge, and from the mains while receiving. The charging rate is 0.5 amp., and as this is the average L.T. current taken by most sets, the charging time need be only slightly in excess of the discharge time.


"Mainten" D.C. battery eliminator, type D.C.M.1.

The price of the complete unit is 52s. 6d. for the 2-volt size, and 65s. for the 6-volt.

For H.T. charging two units are available, one for A.C., and the other for D.C. mains. The A.C. model comprises a Westinghouse metal rectifier and regulating resistance with a flash lamp bulb indicator and fuse. The charging rate for a 60-volt battery is 60 mA., and for a 150-volt battery 25 to 30 mA. The D.C.

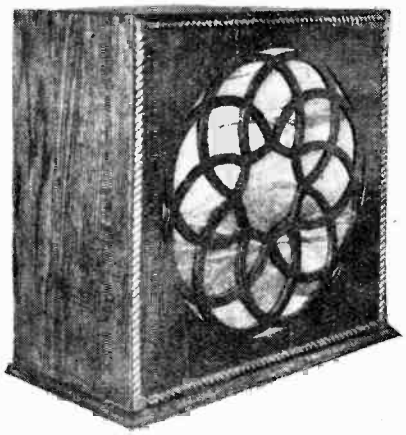

"Mainten" A.C. eliminator, type A.C.M.2.

**Further Gleanings from Olympia.**—model is fitted with a neat polarity indicator taking the form of a small compass unit. Full instructions are given, and there can be no possible excuse for charging a battery backwards. The charging rates are about the same as in the A.C. unit.

**The Met-Vick 5-valve portable set which at the option of the user can derive its current from A.C. mains or batteries.**

Both models are designed to fit on the sides of Oldham H.T. battery crates, and the prices are 40s. for the D.C. unit and 55s. for the A.C. unit.

*Oldham and Sons, Ltd., Denton, Manchester.*



**New Neophone loud speaker.**

## PAREX.

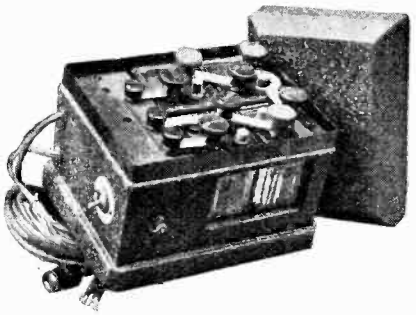
This firm specialises in the manufacture of screens and screening boxes; they are made almost exclusively in copper of comparatively heavy gauge, and thus have ample mechanical strength. It was observed that screens for the new "Megavox Three" are already in production, specimens being exhibited on the stand. The metal, which is polished, has a mottled finish, and the products have a good appearance.

A special type of holder for screened grid valves is also manufactured; it is easily adapted to either the "single end" or "double end" variety.

E. *Paroussi*, 10, *Featherstone Buildings, High Holborn, London, W.C.*1.

## PETO & RADFORD.

This company specialises in H.T. and L.T. accumulators. An unspillable cell, which is so arranged that the plates are covered whether it is upright or on its side, will have obvious appeal to those who are interested in portable sets. A demonstration revealed that, however roughly one of these batteries was handled when upside down, no acid whatsoever was spilled. A feature of interest is that only one acid trap is employed, the unspillable device being contained within a long vent plug. An indicating device is incorporated in the L.T. accumulators whereby the state of charge is immediately discernible by a glance at the position taken up by three coloured floats.

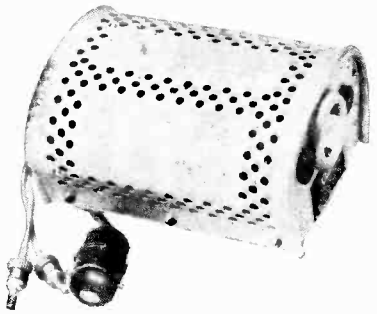


**Oldham "Auto-Power" unit with self-contained battery and Balkite charger for supplying L.T. current.**

These floats are calibrated to sink or rise according to the density of the acid, and therefore give an accurate indication of the state of charge.

In the high-tension accumulators special attention has been paid to the prevention of surface leakage by arranging internal lids to each cell. Shrouded vents are employed, which still further assist in avoiding loss of charge during open circuit periods.

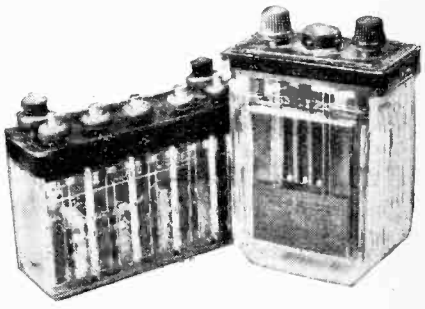
*Peto and Radford*, 50, *Grosvenor Gardens, London, S.W.*1.



**Oldham H.T. charger for D.C. mains; the A.C. model is similar in appearance and employs a metal rectifier.**

## REDFERNS.

The pneumatic valve-holder which has enjoyed such popularity during last season has been reduced from 2s. 6d. to 1s. 9d. Its elastic properties ensure that insulation from shock is of the highest order. The S.R.S. ultra-short wave coil and holder suitable for the Cossor Melody Maker is being exploited by this company. Many new examples of artistically finished surfaces for ebonite are being put on the

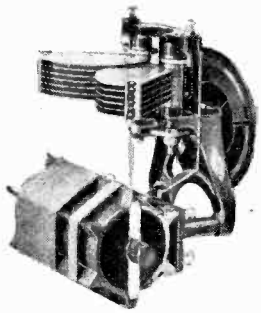


**Peto and Radford accumulators. In the L.T. battery calibrated floats are provided which give an accurate indication of the state of charge.**

market for the coming season. A wavy surface provides a most pleasing finish, while a moiré silk ebonite should satisfy the æsthetic taste of the most exacting listener.

There are a number of coil formers of different sizes, and a selection of acid trays to prevent damage to furniture by acid from accumulators.

*Redfern's Rubber Works, Ltd., Hyde, near Cheshire.*



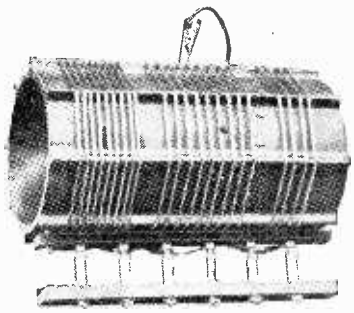
**The new "Pranco" short-wave tuner and condenser unit.**

## SELFRIDGE.

One of the principal exhibits on this stand was a range of Cleartron valves, which sell at 4s. and 6s., the latter price being applicable to power amplifiers and high-magnification types. Two of the most useful valves in this range would appear to be the C.T. 25b, which consumes 0.25 amp. at 6 volts, having a stated amplification factor of 20 with an A.C. resistance of 20,000 ohms, and the C.T. 25X, a 6-volt super-power valve consuming 0.5 amp. The impedance and amplification factor are respectively 4,000 ohms and 5.

The Vauxhall portable and transportable sets are sold at the comparatively

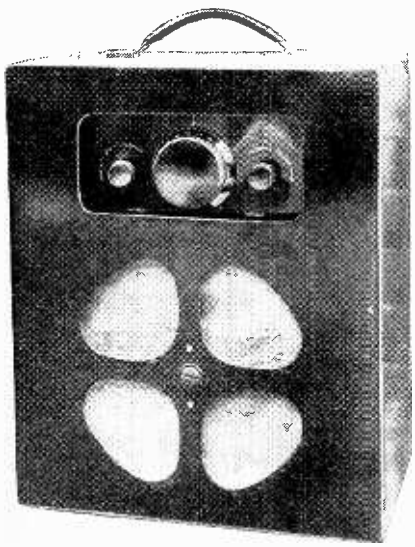
**Further Gleanings from Olympia.—** low price of £14 10s. In receivers at this figure one might expect to find component parts of doubtful antecedents, but this is not so; they are fitted with Six-Sixty valves, Hellesen 99-volt H.T.



**The S.R.S. short-wave adaption for the Cossor Melody Maker marketed by Redferns.**

batteries, and a lithanode unspillable accumulator. The circuit is the conventional combination of two aperiodic H.F. stages, a valve detector, and two L.F. amplifiers with reaction. A frame aerial with wave-band changing switch and a cone loud speaker are included.

Both the portable and transportable models are mounted in containers of conventional design, the former being housed in a hide suitcase, and the latter in a polished wood cabinet.



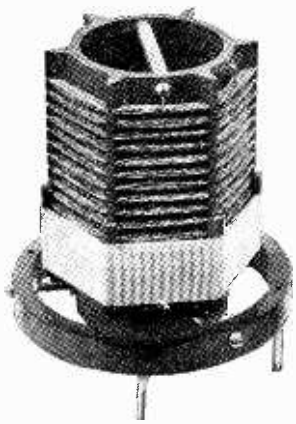
**Selfridge's "Vauxhall" transportable set.**

There was also on show a combined radio-gramophone receiver; on the "wireless" side it comprises a det.-2 L.F. set with resistance coupling, there being a waveband change switch, a gramophone-wireless switch, and reaction control. The turntable is driven by a spring motor, and batteries are accommodated in the lower part of the cabinet.

*Selfridge and Co., Ltd., Oxford Street, London, W.1.*

## SIMMONDS.

Messrs. Simmonds Bros. are pioneers in the commercial production of coils and transformers described by *Wireless World* contributors; specimens of their products were exhibited on the stand of Messrs. Williams & Moffat, Ltd. Among the many coils available are "Regional" H.F. transformers; the original design has been slightly modified in order to facilitate manufacture, the pins being mounted on a large ebonite ring secured to the lower end of the former by means of radial arms. These alterations, it should be observed, are such that the efficiency of the coils is in no way impaired. The large-diameter transformers for the Indirectly Heated Cathode Receiver are now made with interchangeable plug fittings if required.

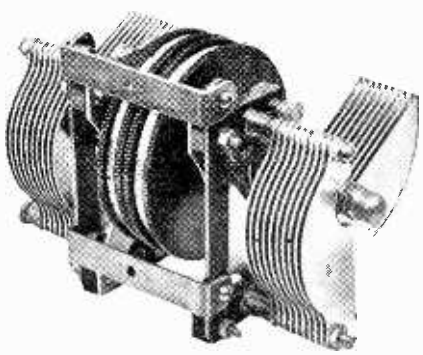


**The "Berclif" version of the "Regional" transformer.**

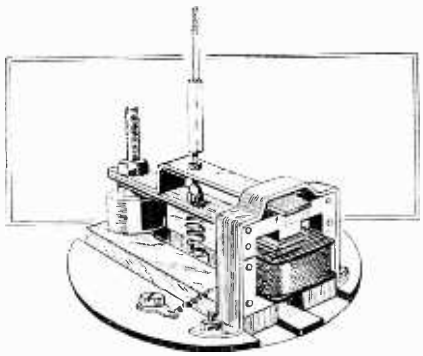
The firm also produces astatic plug-in coils, of which the main field of usefulness is in the construction of H.F. amplifiers with screened-grid valves.

A new double "Simplicon" variable condenser with drum drive was noticed on this stand; it is intended for "semi-gang" tuning, there being four edgewise milled discs mounted side by side. The outer pair are connected directly to the spindles of the two condensers, while the inner pair control a reduction drive; as the spacing between these is very small, the assembly will be found convenient for tuning two circuits over a limited band of wavelengths with one or two fingers, depending on whether the direct or reduction drive is used.

*Simmonds Bros., Shireland Road, Smethwick.*



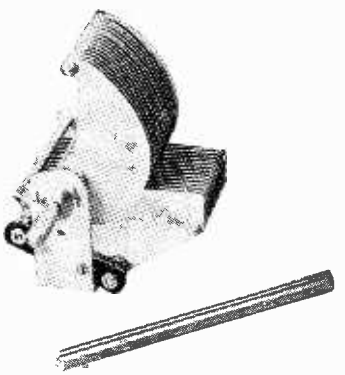
**A double "Simplicon" condenser (Williams & Moffat) with direct and slow motion edge-wise dials intended for the simultaneous tuning of two circuits.**



**"Lassophone Triangle" double-fork reed cone unit.**

## WEBB.

The new "Wavemaster Minor," apart from being a condenser of excellent finish and rigid construction, is especially noteworthy on account of its adjustable spindle. The main spindle carrying the moving vanes is hollow, and the adjustable spindle is provided with a keyway for a set screw in the hollow spindle. It will be appreciated that the spindle can be extended to fit any type of slow-motion dial or thickness of panel, and is particularly well adapted for ganging. A dustproof ball race forms the main bearing, and a friction washer is fitted in the plain end bearing. Tension is adjusted by the stiffening bar across the U-shaped frame, which also acts as a vane stop. The price is only 5s.



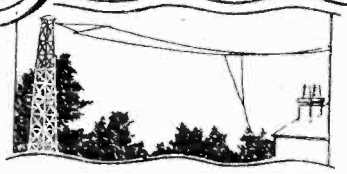
**Webb "Wavemaster Minor" condenser with adjustable spindle.**

The "Lassophone Triangle" cone-drive unit for which this firm are the agents employs two reeds, one for high and the other for the low range of frequencies. A ¼in. spindle loading the two reeds is claimed to prevent overlapping of the two frequency bands. The two reeds require special laminated pole pieces, which are magnetised by two parallel bar magnets. The unit is designed for free-edge cones, and the price is 17s. 6d.

*The Webb Condenser Co., 42, Hatton Garden, London, E.C.1.*

# What do they know of Radio who only "Radio" know?

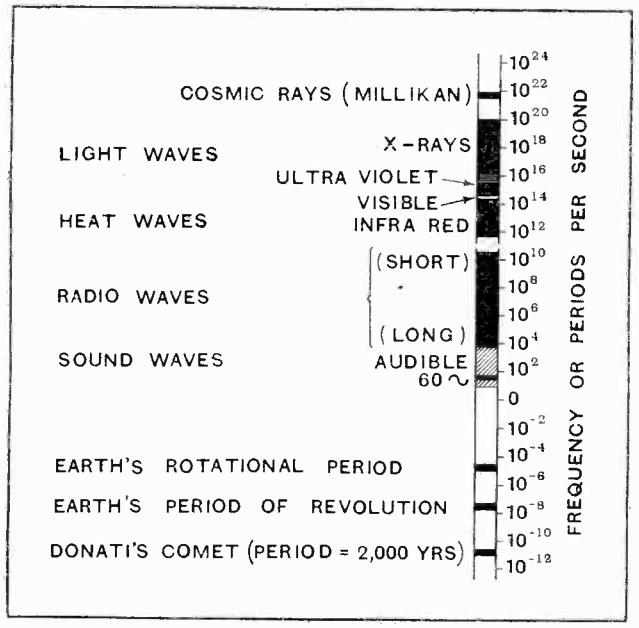
## A Flippancy with an Undercurrent of Seriousness.



By D'ORSAY BELL, M.A.

THIS is not the right way to treat an article for a serious, sober-minded journal such as *The Wireless World*. I know it—I regret it; but I cannot help it. "I have tried, too," said Mr. Edwards wistfully to Dr. Johnson, "in my time to be a philosopher; but—I don't know how—cheerfulness was always breaking in." I have tried to write with the cold, dispassionate diction of Science; but the subject simply refuses to be treated like that . . . .

And yet there is quite a lot in it. It has haunted me, on and off, for some years; and it has finally been precipitated into print by the sight, in the American "Bell System Technical Journal," of the fascinating Frequency Spectrum, plotted on a logarithmic scale, reproduced on this page.[1] My point is this: that while hundreds of thousands of experimenters are busy about that one little portion of the spectrum labelled "Radio," and are so well catered for by so many excellent journals that they know when the slightest novelty is discovered in the appearance, habits, tastes, pet-names, or other peculiarities of any single wave in that part of the scale, the whole of the rest of the Spectrum is left out in the cold; or at best, is only patronised by little groups of workers whose results, however enthralling, do not reach a public of any respectable size. Look, for instance, at the little white gap in the Spectrum at about $10^{11}$ per sec. on the scale. You all know it is there: you take for granted that it is more or less accidental; you know that there is no real break in continuity there—that very short "radio" waves have been, for instance, put through the processes of reflection, refraction, and so on, just as if they were heat or light waves. But in your heart of hearts, does this not seem a little inconclusive—rather as if someone tried to convince you of the common origin of man and monkey by pointing out that both walk on their hind legs and that some of them look very like each other? Whereas what you really need to convince you is this kind of thing: if it could be proved to you that the male ape is constantly in the habit of saying to his friends "I don't know much about Art, but I know what I *like*." . . .




Frequency spectrum.

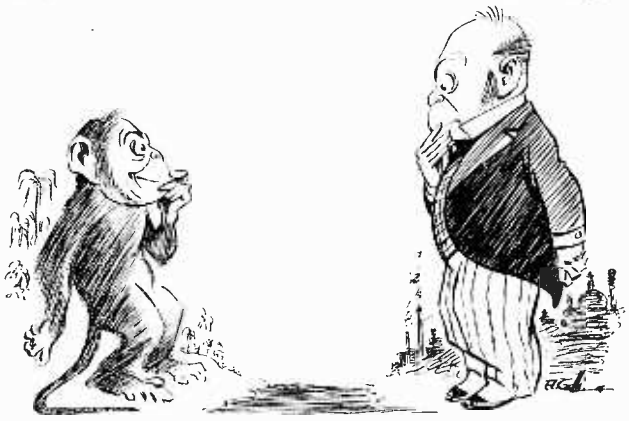
Very well, then: do you know that just this kind of thing has recently been done to "radio" and light waves? Put roughly, what a gentleman named Lewitsky has just done is to make a Hertz oscillator on so small a scale[2] that it will oscillate at light-wave frequencies. He then directs on to this electric oscillator a mixed bunch of light-waves, and finds that the ones most powerfully reflected are the ones corresponding to the pre-calculated radio frequencies of the oscillator. Not content with this, he then excites the oscillator electrically, directs the radiation from it on to a surface of Iceland Spar, and finds that it behaves like a light-wave in bringing out the "residual waves" of the spar. I admit that I have not come across a full account of these experiments, but from what I have seen it appears definite that he gets it both ways—not only

[1] Without leave, I'm afraid; but as this is not a scientific article, I feel sure the publishers will forgive me. I would just mention that it occurs in a very excellent description of the problem of Transatlantic Telephony, in the issue for April, 1928.

[2] The oscillator was made of pieces of wire, 0.1 mm. long, cemented by Canada balsam to a glass plate.

**What do they know of Radio who only "Radio" know?**—does he get the ape to utter platitudes about Art, but he gets the human being climbing about upside down and gibbering.

A very interesting bit of work, don't you think? And the odds are that if I had not written this article, you



"Some of them look very like each other."

would never have heard of it: unless, indeed, the gentleman who prepares the radio abstracts published monthly in *Experimental Wireless* happened to come across it.

So if any of you are led by this article to successful research on these fascinating and lucrative lines, I shall be pleased to accept a small percentage as honorarium. For when I say "lucrative," I mean lucrative; and if you ask me what I am driving at, I will merely mention that a certain luminous insect (pyrophore) produces its light with an efficiency two thousand times as great as that of our best incandescent lamps, and seven times as great as that of the sun itself; not because it is particularly hard-working or clever, but chiefly because it has the knack of localising its light in the part of the spectrum which is best for the eye; in other words, it generates the useful band of wavelengths and doesn't waste energy on heat and ultra-violet light.

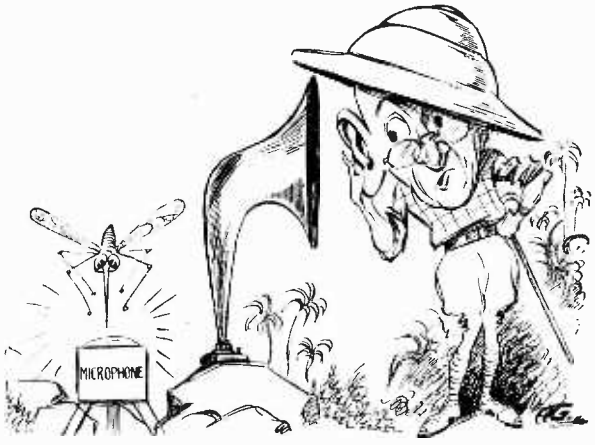
### A Link between Radio and Light.

Before leaving this very attractive part of the spectrum-scale, I might mention another experiment, a quite recent one which, from quite a different viewpoint, bridges that same gap in the spectrum. This one was carried out by E. Rupp, who, being bored with modulating one radio wave by another radio wave of different frequency, determined to modulate one light wave by one radio wave. Accordingly, he took a ray of light (from the Green Thallium Line) and modulated it by electric waves of wavelengths between 24 and 100 cms., and by suitable apparatus he showed the presence of partial frequencies in the resultant waves. The modulation was carried out by means of the Kerr effect—that quaint example of a subtle and high-brow phenomenon which is quickly seized upon for practical purposes (it forms the basis of the very successful Karolus photo-electric cell used by Telefunken).

Now let us go on to another part of the spectrum, the shaded part labelled "sound." The middle portion is pretty well known, and thanks to broadcasting and the fact that musical people have made "quality of reproduction" an important point, the upper portion is, at any rate, talked about. But only from a very one-sided point of view—the point of view, if I may so put it, of the human ear. So far as other properties are concerned, these waves are left severely alone; in fact, directly they are too rapid to interest even the most fastidious ear, they are not even talked about. Even the respected producer of that frequency spectrum picture ignores them, otherwise he would show the shaded part of the scale continued upwards to overlap for a little way the black zone of "radio" frequencies. And yet among its own particular little band of friends, the "sound" wave zone about $10^4$ is of special interest. I myself am a little bitter about the public neglect of these little waves, for a reason which I will explain.

### An Irresponsible Reflection.

In irresponsible moments it had often occurred to me to wonder what the effect of ultra-audible sound-waves would be on small winged insects such as the mosquito. Finally, one day in July, 1927 (having probably been bitten by such an insect), I wrote to a very distinguished "radio" engineer (one whose name is a household word, who has great resources at his command) more or less in the following words: "Have you ever (I said) felt the weird effect of certain low notes of an organ, which seem to hit on a particular natural frequency in your own body, so that you feel not only your eardrums but your whole frame throbbing in unison? Well, then, please imagine yourself a mosquito, and suppose that the note—while retaining the same power behind it—is adjusted to the corresponding frequency of you, a mosquito. Would you enjoy the experience, or would it finish you? At any rate, would it not have a very decided effect of one kind or the other? If you agree that it *would*, will you further human knowledge, possibly revolutionise life in the tropics, benefit humanity, and incidentally yourself and *me*, by rigging up a suitable heterodyne




"Close-quarters test on a mosquito."

circuit and some form of loud speaker which will respond to ultra-audible notes, and making a preliminary, close-quarters test on a mosquito? I will provide the mosquito. . . . Don't forget that an attractive effect, though

**What do they know of Radio who only "Radio" know?—**

less probable than a repulsive or destructive effect, would be almost as useful, for we could then do the Pied Piper act on a large and continuous scale.—*P.S.*—Work out the comparative sizes of a gnat and a human being,

"We could then do the Pied Piper act on a large and continuous scale."

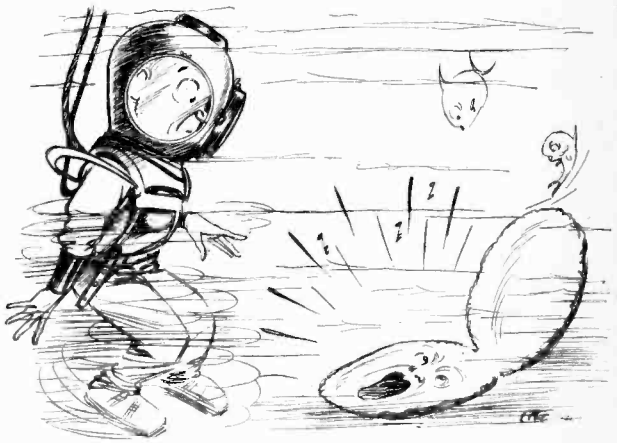
and compare the ratio with that of a bat's cry to the deep note of an organ. You will find yourself wondering whether the bat's cry is not, perhaps, intended to paralyse the insect which it pursues." The reply began by begging me not to assume from it that the writer thought I had a bee (or even a mosquito) in my bonnet; continued by enumerating an impressive list of jobs in hand which would tax him to the very limits of his ability—"which is a very long way indeed" (a whimsical touch which almost betrays his identity) and ended by offering his advice and assistance in getting out an apparatus which would "produce the kind of air-wave *which you think would produce an effect.*" The emphasis is mine, but the words themselves were sufficiently depressing; for if he—a broad-minded, brilliant experimenter with imagination—felt like that about it, the prospects were bad. So, against my convictions, I let the matter drop, and the next thing that happened was nine months later, when I read that an American savant named Wood, having observed the fatal effect of ultra-audible sound-waves on fishes, was now experimenting on the destructive effect of these waves on bacteria. Of course, from fish to mosquitos is a far cry, and so it is from mosquitos to bacteria; but I cannot help thinking that some positive and interesting result would have come of that experiment of mine.

An interesting item of news, by the way, concerning these same waves, was mentioned the other day in the daily Press under the heading, "Singing Oysters Spoil Wireless," or words to that effect; an instance of the unfair way we have of looking at everything from the human standpoint. Apparently certain trials of under-water signalling had to be suspended owing to the din in the receivers caused by vociferous oysters. It was assumed that these creatures were wantonly interfering with perfectly harmless scientific experiments by humming at the tops of their voices. Undoubtedly, the real truth was that the thoughtless experimenters were lacerating the feelings of the oysters by emitting, at considerable power, ultra-audible waves, and the humming was possibly the death-cry, or at least the cry of agony, of these worthy but usually inarticulate molluscs.

For it is to be noted that ultra-audible waves, as they are now produced for purposes of submarine signalling, etc., are no puny weaklings such as could be obtained from a heterodyne and loud speaker. It is a commonplace, nowadays, for them to have a kilowatt or so behind them. This is, thanks to the discovery of the piezoelectric method of producing them, and it is hoped and anticipated that very soon these waves will be doing splendid work for humanity in preventing collisions at sea, more especially with icebergs, to say nothing about bacteria and mosquitos!

### Ultra-audible Sound Waves.

While on the subject of ultra-audible sound waves, the distinguished French physicist, who is one of the pioneers of this form of signalling, writes—as an indication of its freedom from interference: "*Il n'y a pas d'ultrasons dans la nature.*" This is an arresting statement; for if it were true, I imagine it would be one of very few examples of a form of energy, produced by mankind, which is not also produced by Nature. But it is not, of course, strictly true; it is only true for the purposes he has in mind. In this connection it is of interest to read what Dr. Shope, of America, said the other day:—"Contrary to a very common impression, birds have ears and very acute hearing, especially for tones that are too high for the human ear. Because of this Nature has not provided birds with the external flaps we call ears. Our ears are to collect all low-pitched tones—tones that do not interest birds. I think that when we really know something about the migration of birds we shall find that it is this power of hearing waves high above the human range that gives them a sense of direction."



Din in the receivers caused by vociferous oysters.

Continuing our irregular tour of the Spectrum, I will not dally with the part devoted to X-rays, because they are already fairly well in the limelight. All the same, I cannot forbear to point out that they are generally regarded from a rather one-sided point of view. For instance, what do you know about thrilling researches, recently carried out, on the formation of new stable

**What do they know of Radio who only "Radio" know?—**

races among the lower classes of mushrooms, under the influence of X-rays? You may answer, "Nothing, nor do I want to." I admit that the particular result does not seem to affect our daily lives to any serious extent; and yet, from a long-sighted point of view, the news is by no means without interest. However, I will pass on right to the top of the scale, where the cosmic wavelengths lie. These last few words have a solemn, poetic lilt. And this is only right when you remember that these rays, whose mere existence was undreamed of a few years ago, are now known to come to the earth from the Spiral Nebulæ far beyong the Milky Way; that they form one-tenth of all the energy received on earth from the stars; and that they will penetrate five solid metres of lead before being completely absorbed. By no means rays to be ignored; though even I do not recommend them for experiment, seeing that most research on them seems to consist in holding electroscopes 57 metres deep below the surface of lakes fed by melting glaciers. But I should like to mention one nice homely piece of work recently done in France by a French professor, whose work was repeated and confirmed by, I think, a German.

This Frenchman took a number of plants—I forget their exact kind—but let us call them begonias. He infected them all with a disease which produces a fatal kind of malignant growth. One of the infected plants he surrounded with a small, free-ended wire helix insulated from earth and from the plant. This helix, it is said, caught the cosmic waves, and thus kept the plant surrounded with weak oscillations of frequency of the order of $10^{22}$ per sec. During the next few weeks the malignant growth on this one plant developed far more quickly than those on the other plants, and in some different way, apparently; for one fine day it fell right off, and the plant recovered completely. The others, without exception, died.

. . . . . .

Next month I hope to write something really exciting about a frequency right at the other end of the scale: that of Donati's Comet, whose period is 2,000 years. On second thoughts, I think I will leave this to some abler pen than mine, especially as there seems to be a lot of doubt about this comet and its frequency. Apparently no one had had much practice in tuning it in. And anyhow, I think I have done enough to establish my point, and to justify my asking the Editor to extend the scope of his magazine so as to include all these other fascinating portions of the frequency spectrum.

# SELECTIVITY AND SCREENING.

ALTHOUGH a certain amount of prominence has at times been given to the effect of screening a receiver in order to improve selectivity, it is perhaps not fully appreciated how considerable is the increase in selectivity that can be obtained in this way. The extra selectivity is chiefly to be found, of course, in the greater ease of eliminating the local station when it is desired to hear some much fainter and more distant transmitter on a neighbouring wavelength.

It has often been stated in print that shielding, as a defence against the intrusion of the local station, is mainly effective in that it prevents direct pick-up of this station on the coils of the receiver, which have a tendency to behave like small frame aerials. As a corollary to this, the suggestion has often been made that it is sufficient to screen the coils only, leaving the rest of the receiver unshielded. A few minutes' experimenting quickly reveals the fact that it is much more difficult to tune in the local station, using no aerial, when screens are placed round the coils, while the strength of the signals in the absence of the screens will be found surprisingly large. There is thus very considerable "direct pick-up" on the coils *when tuned exactly to the local station.* But it is not by any means safe to infer from this that this direct pick-up from the local station is a serious source of interference when, in the attempt to tune in another station on a neighbouring wavelength, the coils are no longer tuned exactly to the local station. In practice, if a comparison between screened and unscreened coils is made under the actual conditions of use, it is found that this form of screening makes surprisingly little difference to the ability to tune in distant stations without intereference. The reason for this is simply that the direct pick-up on the coils, although very large when they are exactly in resonance with the local station, is reduced to microscopic dimensions as soon as they are tuned to a slightly different wavelength.

### Screening Prevents Stray Couplings.

Now there is no doubt whatever, as a few further experiments will demonstrate, that a *fully-shielded* receiver, built, for example, on the lines of the "Wireless World Five," gains very considerably in selectivity by the presence of the screening boxes. It follows, therefore, that these boxes must have some influence in improving selectivity quite apart from the fact that they cut off the coils and the rest of the receiver from all direct pick-up, and leave it open only to signals received by way of the aerial.

On looking more closely into the effect of full shielding, it becomes clear that it is chiefly important in completely isolating each tuned circuit from the next, so that neither capacitative nor inductive couplings can carry signals straight through from the aerial to the grid of the detector valve. Every signal that arrives at the detector must, in such a receiver, have passed through all the tuned circuits in due sequence, and cannot possibly have taken any unauthorised "short cuts" such as are made possible by the stray couplings in any receiver in which shielding is altogether omitted, or is restricted to the coils alone.

It may therefore be considered necessary, whenever the maximum possible selectivity is required, to isolate each tuned circuit, including the condenser and valve, in a separate closed metal box, whether or no the degree of amplification aimed at is high enough to render such complete screening necessary for stability.

# BROADCAST BREVITIES

*By Our Special Correspondent.*

***Television on Trial.—Langham Place Site for "Broadcasting House."—A Chat with "Control."—The Close of the Promenade Concerts.—Talks Technique.***

### Television Tests by the B.B.C.?

In an endeavour to obtain an independent licence for the introduction of a television service, the Baird Company recently gave a demonstration to officials of the Post Office, the outcome of which was a discussion between the G.P.O. and Savoy Hill. As a result the television company is being formally invited to give a demonstration to the B.B.C. engineers.

It is too early to speculate upon the possible developments, but I understand that a satisfactory demonstration might lead to experimental television transmissions, probably from Daventry, after regular broadcasting hours.

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### B.B.C.'s New London Premises.

With reference to the forthcoming move of the B.B.C. to new premises in the West End (on a site mentioned exclusively in last week's *Wireless World*), the following official statement is now issued :—

"The premises now occupied by the B.B.C. in Savoy Hill are proving inadequate. It is proposed, therefore, to secure more commodious offices for the new headquarters of the broadcasting services. To this end negotiations are now proceeding with respect to the construction of a new building on a site at the corner of Portland Place and Langham Street."

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### "Broadcasting House."

"Broadcasting House," as the new headquarters will almost certainly be designated, will be one of the most imposing buildings in the world used exclusively for broadcasting purposes. One of the most original departures from current practice will probably be the abandonment of "studios" in favour of small halls not unlike the Chenil Galleries with acoustic properties far superior to those of the studio as we know it to-day. Studios will, of course, be retained for talks and solo items.

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### No More "Stations."

No one speaks at Savoy Hill now of broadcasting stations. The official term is "transmitter," and this is used exclusively in all microphone and printed references.

### A Chat with "Control."

That omniscient personage, the control engineer, was human enough to be drawn into conversation when I asked a few polite questions. I reminded him that complaints of "over-control" were being made and that the B.B.C. was accused of over-modulating for the benefit of that "antiquated" creature, the crystal user.

"You can rule out the crystal user," was the abrupt reply of the control engineer. "The man at control is not thinking specially of crystal users."

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### An Awkward Situation.

He was ready to agree that the broadcast voice sometimes sounds unnaturally loud, especially after a musical item, but claimed that the volume is always reduced to normal proportions within a second or two. "The difficulty," he said, "is that the man at control can never be sure whether the speaker will be two, three, or four feet away from the 'mike,' and matters can only be adjusted when the speech begins.

"When once the item gets going—whether it be a pianoforte solo, orchestral piece, or a radio play—control is comparatively easy."

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### The Blind Man Upstairs.

Here surely is a clear case for a control room from which it is possible to see the studio. The silence cabinets at Savoy Hill, which are only separated from the studio by a sheet of glass, are used by the musical control man, not by the engineers. This means that the control engineer upstairs is blind to what is going on in the studio. Not a happy state of affairs.

Incidentally, the thought that an orchestral item is being controlled by two outside people—the musician and the engineer—must be very comforting to nervous conductors.

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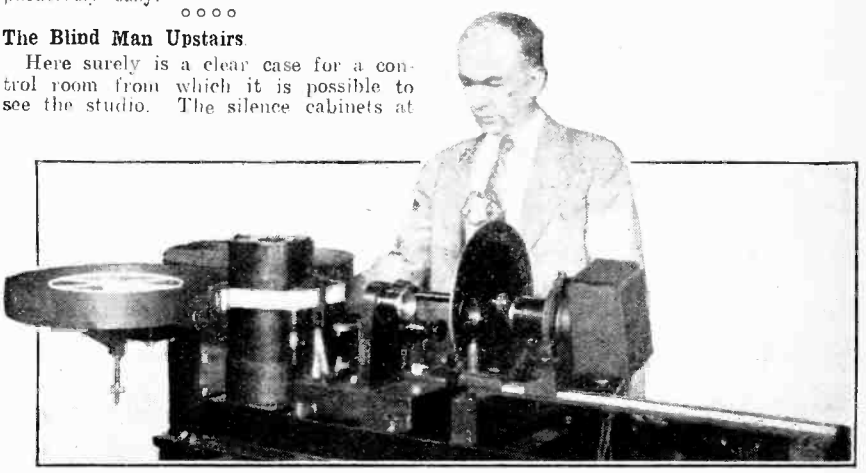
### The "Proms" Audience.

A few nights at the "Proms" soon reveals the hardy annuals among the audience. This year I have noticed several faces familiar from last season. There is the charming elderly gentleman always in the front who turns to the audience at the end of each item and leads the applause. There is the old lady with the peppermints, and the young man who sways his body in time with the music and comes "back to earth" with a look of embarrassment. A dear crowd!

Crowd is the right word, too; the place is always well filled, and, strangely



**FILM TRANSMISSION IN AMERICA. Dr. Frank Conrad, of the Westinghouse Electric and Manufacturing Company, with his motion-picture transmitter which was recently demonstrated at Pittsburgh. Note the scanning disc through which a spot of light from a mercury arc lamp explores the whole surface of each picture. The film is projected on a ground glass screen in the receiver.**

enough, I have noticed that the crowd is biggest when the concert is being broadcast!

The "Prom" season closes on Saturday next after the most successful run for many years past.

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**Yes or No?**

Extract from letter received at Savoy Hill:—

". . . for instance, 2LO is notified as 361.4 m, 830 k.c. Is this first number the fixed coil and the k.c. the moving one?"

How would you reply?

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**Breakfast-time Story.**

They carried him, raving, to the madhouse.

"On what grounds?" asked the principal of the establishment, addressing the two doctors who had certified the gibbering wretch.

"Maniacal tendencies," replied the two doctors. "He tuned in to 2LO's wavelength, expecting to hear a transmission at the unreasonable hour of 3 o'clock on Sunday afternoon. Moreover——"

"That's quite enough," said the principal, smiling sadly.

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**"Running Commentary" on the Stage.**

One of the thrills in a drama called "Ringside," now running in New York, is a broadcast running commentary. The second scene of the third act is laid at the boxing ring in Madison Square Garden, where a championship battle is in progress. Ashley Cooper, the actor, who takes the part of the broadcast announcer, gives an impersonation of Graham McNamee, one of the most popular announcers in America. A real microphone is used, and the audience hears the "radio" account of the bout on loud speakers while witnessing it on the stage.

An air of reality is given by a racy description of the crowd before the fight begins.

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**A Handel-Beecham Arrangement.**

An interesting item in the first programme which Sir Thomas Beecham is to conduct for the B.C.C. on October 12th is his own arrangement of excerpts from Handel, entitled, after the Diaghilev ballet, "The Gods go a-begging." The music was included in the last Russian ballet season, but its first concert performance will be that given by the B.B.C.

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**Salaries and the Sexes.**

"Should women be paid as much as men?" is the title of a discussion to be broadcast from 2LO on October 9th between Miss Ellen Wilkinson, M.P., and Mr. W. H. Thoday, ex-president of the London Schoolmasters' Association.

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**Many Happy Returns!**

To-day is the fifth birthday of KDKA, the famous broadcasting station of the Westinghouse Company at Schenectady.

**Sweet Broadcast Drama.**

If anyone doubts the value of broadcast drama let him note that WEAF, New York, has just transmitted "a dramatic playlet illustrating the use of sweetened condensed milk in cooking."

Now, Mr. Hannen Swaffer!

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**Is There a Talks Technique?**

If there is one opinion about the broadcast talks which enlists at least a semblance of unanimity, it is that the subject matter is more wisely chosen than it used to be. But what of the technique of the broadcast talk? Does such a thing exist?

Talkers are told not to rustle their papers, not to cough or sneeze near the microphone, not to speak too quickly. In fact, they are reminded of the conventions which govern polite conversation anywhere. They are schooled on every point except the most important.

When will they be told to *talk*?

**FUTURE FEATURES.**

**London and Daventry (5XX).**

OCTOBER 9TH.—De Courville's Hour (1).
OCTOBER 10TH.—"The Betrothal," a play by Maurice Maeterlinck.
OCTOBER 11TH.—Hungarian National Programme.
OCTOBER 12TH.—B.B.C. Symphony Concert (first of the season), conducted by Sir Thomas Beecham, relayed from the Queen's Hall.

**Daventry Experimental (5GB).**

OCTOBER 8TH.—"The Betrothal."
OCTOBER 9TH.—The Liverpool Philharmonic Society's First Concert, relayed from the Philharmonic Hall.
OCTOBER 12TH.—Music from the Musical Comedies and Comic Operas.

**Cardiff.**

OCTOBER 8TH.—"The Vicar of Wakefield," selections from the Romantic Light Opera by Liza Lehmann.

**Manchester.**

OCTOBER 11TH.—"The Highwayman of Knutsford," a Ballad Operetta.

**Newcastle.**

OCTOBER 9TH.—"The Bridge of Tyne," a fantasy specially written for broadcasting by Lt.-Col. G. R. B. Spain.
OCTOBER 10TH.—The opening of new Tyne bridge by His Majesty the King.

**Glasgow.**

OCTOBER 13TH.—"A Nicht wi' George," a programme devised, arranged, and produced by Arthur Black.

**Aberdeen.**

OCTOBER 11TH.—A Hebridean Programme.

**Belfast.**

OCTOBER 9TH.—Three Centuries of Italian Opera, an orchestral and vocal concert.

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**Less Formality Needed.**

Reading aloud can sound very much like genuine spontaneous talk if the speaker employs a little conscious art; on the other hand, it can sound very much like a penny reading in the village hall (tea and buns in the annexe). If broadcast talkers would only realise that they are speaking to individuals and not to massed audiences, I think their efforts would sound more like the informal chats which the B.B.C. intend them to be.

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**A Good Talker.**

Mr. G. A. Atkinson, the film critic, is a true "master of the microphone" in this respect. How difficult it is to imagine, when listening to Mr. Atkinson, that he is chained to a remorseless manuscript just like all the other folk! Those little artful pauses, hesitations, gropings for the right word—how tantalisingly they are introduced and what a difference they make!

They turn a stereotyped talk into a witty conversation, and when Mr. Atkinson has finished we feel like offering him a cup of coffee before he goes.

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**Plea for Longer Talks.**

Talking about talks, I think attention should be drawn to a very significant passage of arms between Sir John Reith and Dr. H. J. W. Hetherington, vice-chancellor of Liverpool University, during a debate on broadcast education by members of the British Institute at Cambridge on September 22nd.

Dr. Hetherington, who evidently belongs to the growing body of savants who are in favour of extending the time allotted to educational broadcasting, pleaded for longer talks. Twenty minutes, he affirmed, was too short a period for the adequate treatment of a subject. In his reply Sir John Reith stressed the responsibilities of the B.B.C. in conducting a service whose primary function was the provision of entertainment, and he claimed that in all branches of its work the Corporation adhered to principles not inconsistent with the high ideals of education.

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**What is "Adequate Treatment"?**

While no specific reply was given to the plea for longer talks, I have since been informed by a high official at Savoy Hill that there is not the remotest chance that the talks will be lengthened. The longest talk on the schedule is the half-hour lecture from 5XX on Tuesday evenings, but while this is on the ether 2LO and 5GB are each giving separate programmes, so the anti-talks party has little to complain about.

As to what constitutes "adequate treatment" of a subject, to use Dr. Hetherington's term, opinions are pretty sure to differ!

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**Lessons for Grown-ups.**

Next week's conference at York on broadcast education for adults may ventilate some extremist views. The Lord Mayor of York will be the chairman, and among those who will address the conference are the Archbishop of York; Sir Henry Hadow, vice-chancellor of Sheffield University; Sir John Reith, Director-General of the B.B.C.; Professor T. H. Searls, of the British Institute of Adult Education; and Mr. P. E. Meadon, Director of Education for Lancashire.

Besides the speeches and general discussion, there will be demonstrations of wireless reception and an exhibition of educational literature and wireless receiving apparatus suitable for use by wireless discussion groups.

# USEFUL DATA CHARTS. (No. II.)

## The Value of Resistances in Parallel.

WHEN a battery delivers current through two resistances in parallel, as in Fig. 1, we can always find a single resistance which will be *equivalent* to the two separate resistances, the test of equivalence being that the same current should be delivered by the battery in each case. Now, the current flowing through $R_1$ is battery volts $\times \frac{1}{R_1}$, while the current through $R_2$ is battery volts $\times \frac{1}{R_2}$; hence the total current equals volts $\times \left[\frac{1}{R_1} + \frac{1}{R_2}\right]$, and if the two resistances are replaced by a single equivalent one, the current will be volts $\times \frac{1}{R}$; accordingly we get the formula:

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

which may be expressed by saying that when resistances are in parallel we add their reciprocals; when they are in series we add them directly.

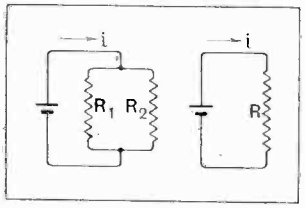



**Fig. 1.—When current is passed through two resistances in parallel an equivalent single resistance can always be found. The value of two resistances in parallel is equal to the reciprocal of the sum of the reciprocals of the values of individual resistances.**

The abac is constructed by drawing three lines meeting in a point, the outer lines being equally inclined to the middle one, which is vertical. Equal linear scales are engraved along the two outer lines (this is one of the few cases in which linear scales must be used instead of logarithmic ones), and the middle scale is made so that if any horizontal line is drawn across the abac, the outer readings are each twice the middle one. Thus, if $R_1 = R_2 = 4$ ohms, then $R = 2$ ohms, which is obviously correct.

The writer thinks that this theorem about three lines expressed in the equation above is one of the prettiest in geometry: it is so simple to state and yet most of us would find it a difficult matter to prove mathematically.

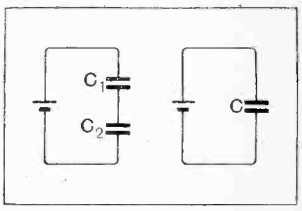



**Fig. 2.—The total capacity of two condensers in series is calculated in the same way as two resistances in parallel.**

You will soon find that wherever the straight edge is placed, the middle reading is always smaller than either of the outer two; this is natural, since the second resistance acts as a shunt to the first one, allowing extra current to flow, and so giving a smaller equivalent resistance.

### Example with Three Resistances.

Let us suppose that we want to charge a 30 v. H.T. battery from 110 v. D.C. mains at a rate of 30 milliamperes, and that we have available three resistances of 6,000, 8,000, and 10,000 ohms. The effective voltage available for charging is 80 v., and on dividing

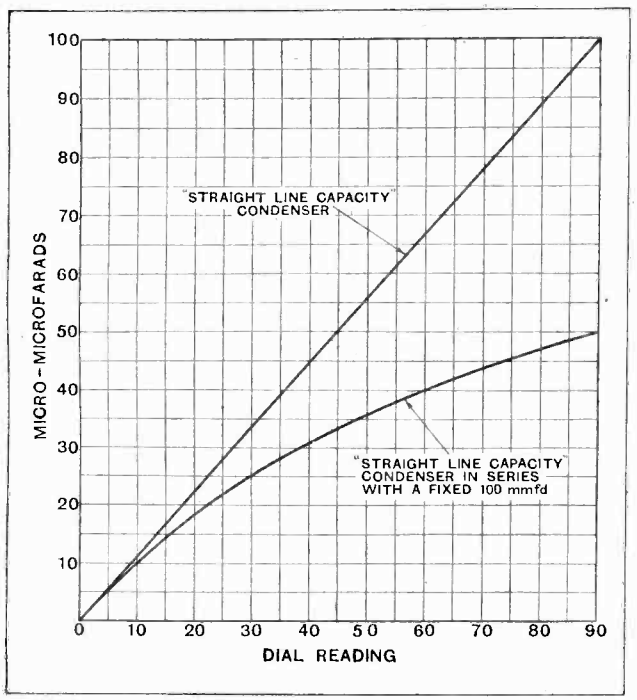



**Fig. 3.—"Straight line capacity" condenser.**

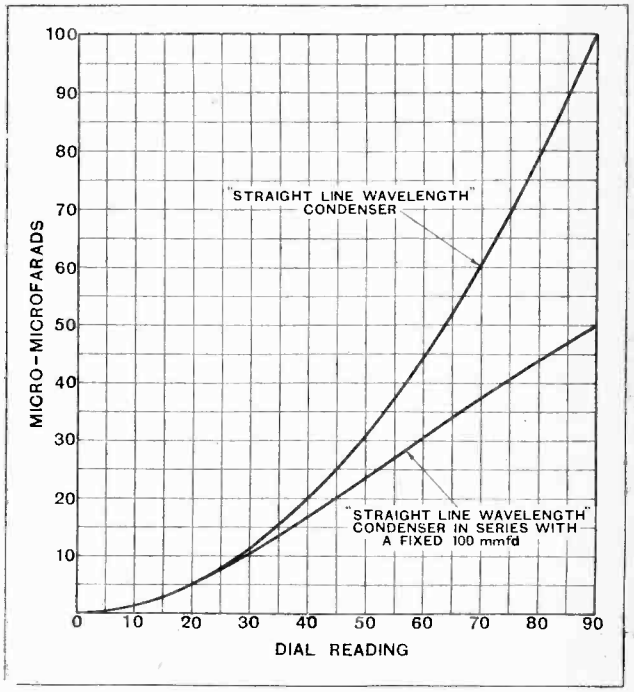
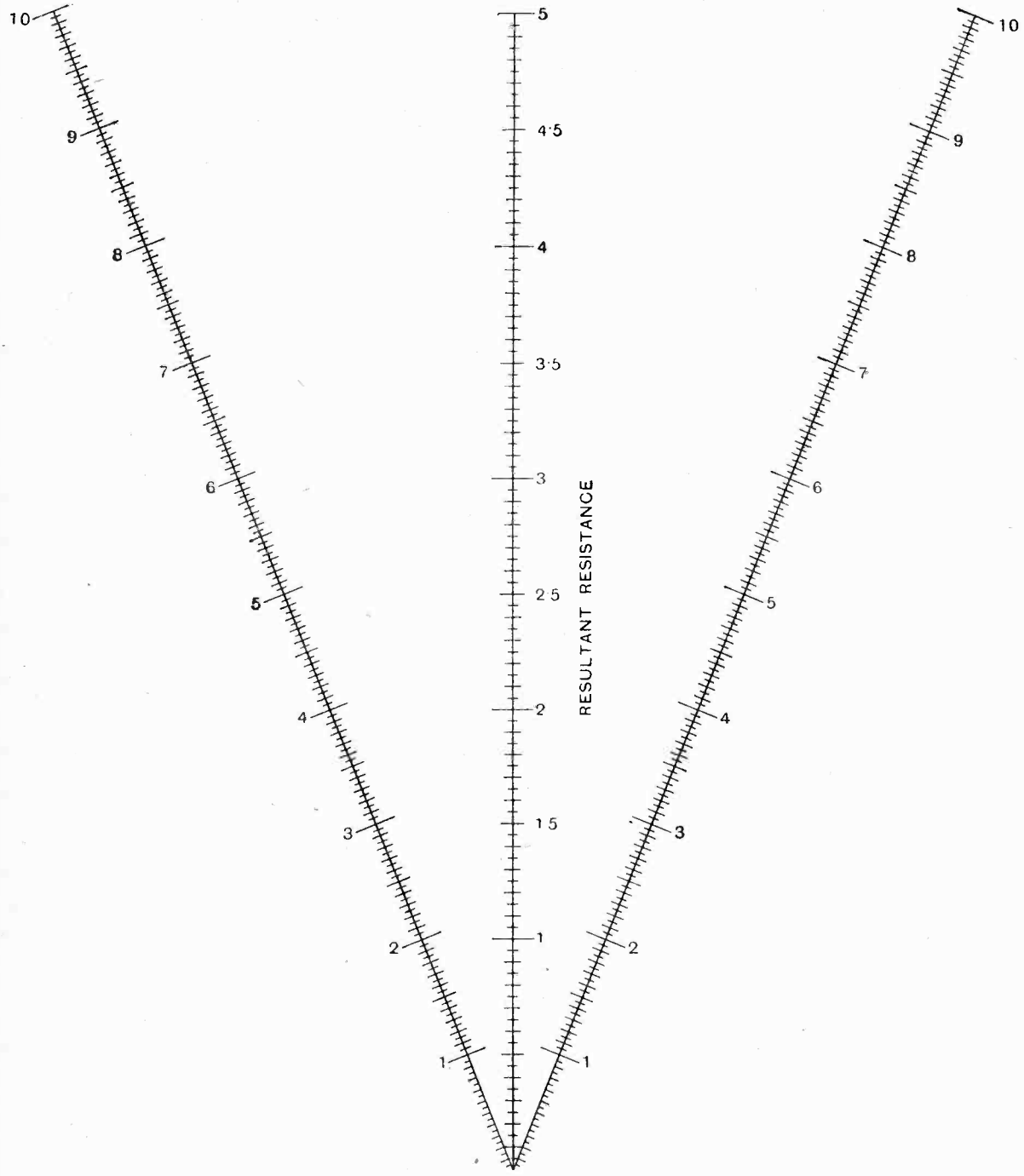



**Fig. 4.—"Straight line wavelength" condenser.**




## TWO RESISTANCES IN PARALLEL

W W ABAC

No 11

**Useful Data Charts. (No. 11.)—**

this by 30 mA., the necessary charging resistance works out at 2,670 ohms.

How must the three resistances be joined to give this value? Evidently they must be paralleled to get the small figure required; 6,000 and 8,000 in parallel give 3,430, and 10,000 in parallel with this gives 2,550. which is the nearest approach that can be got.

### In How Many Ways can Three Resistances be Combined ?

Take three filament resistors of 4, 6, and 8 ohms; the various combinations are shown below, and can be verified from the abac. There are eleven possible combinations:

| Ohms. | | Ohms. | |
|---|---|---|---|
| 1.84 | 3 in parallel. | 10 | 2 in series. |
| 2.4 | 2 in parallel. | 12 | |
| 2.7 | | 14 | |
| 3.4 | | 18 | 3 in series. |
| 7.4 | 2 in parallel. | | |
| 8.7 | 1 in series. | | |
| 10.4 | | | |

### Condensers in Series.

Two condensers, $C_1$ and $C_2$, in series may be replaced by a single condenser C, and the correct value for C is given by

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$$

that is, *series condensers are added in exactly the same way as parallel resistances*, and so the same abac could be made to do for both; to avoid confusion, however, a separate abac for condensers will be given next week.

It has already been pointed out in connection with abac No. 2 that in short wave work a fixed condenser is often put in series with a variable one when it is desired to alter the range, and that the law of the tuning scale will be altered thereby. Fig. 3 shows the result in the case of a " straight line capacity " condenser; the scale is no longer linear, and the capacity increases rapidly at first as the dial is turned, and more slowly afterwards. In Fig. 4 a " straight line wavelength " condenser has its scale straightened out beyond 20 degrees on the dial, and it then approximates to a " straight line capacity " law.

R. T. B.

# FADING AND THE DETECTOR.

## Advantages of Leaky Grid Detection in Minimising Effects of Fading.

THE phenomenon of fading, as everyone knows, is due to variations in the atmospheric conditions between the transmitting station and the receiving aerial. These variations have the effect of making the amount of energy picked up by the aerial, and passed on from it to the receiver, change quite rapidly over a wide range of values. It is hardly surprising, then, that the signal strength given by a receiver tuned to a station at a sufficient distance for fading to take place should suffer from uncontrollable and rapid fluctuations. These variations in strength are often astonishingly large, it being no uncommon thing for a programme to be completely inaudible at one moment and then, perhaps half-a-minute later, to be coming in at such strength that the output valve of the receiver is being overloaded to the extent of several hundreds per cent.

It is clearly impossible to smoothe out these changes completely at the receiving end unless very elaborate apparatus indeed is used for the purpose. Even if it were possible to do this, the tremendous extra sensitivity required of the receiver during the moments of fading would result in the amplification of all the " background noises." As a result, the usual experience of fluctuating signals, heard against a background of constant intensity, would be replaced by a constant signal, heard through background noises whose intensity varied in sympathy with the changes in sensitivity of the receiver.

But though the complete solution of the problem of fading is not at present practicable, it possible in a very simple way to limit the range of the fluctuations in signal strength by suitable choice and operation of the detector valve.

The outstanding characteristic of the anode-bend detector is that the louder the signal the more efficiently it rectifies it. If the high-frequency input to an anode rectifier is doubled the output of rectified signals that it gives is increased approximately fourfold; if the input becomes ten times greater or smaller than its original value the corresponding change in signal strength (in volts) is of the order of a hundred times. Consequently any change in input due to fading is very considerably accentuated by the rectifier, which is exactly the reverse of what we want. An anode rectifier, therefore, has its drawbacks in the reception of distant stations.

The behaviour of the leaky-grid rectifier is quite different from this. Generally speaking, it rectifies a feeble signal more efficiently than a strong one, and so tends to smoothe out any differences that may exist between the high-frequency inputs at different times; at the very least, it refrains from emphasising them. If the valve is deliberately overloaded with signals quite a considerable increase in the input results in no increase whatever in the rectified output; under these conditions, unfortunately, the quality is very poor.

From this we may conclude that when we are listening to a station which is causing annoyance by fading, we shall do well to convert our anode rectifier, if we are using one, into a grid rectifier for the time being. In quite a number of receivers a grid condenser and leak is used with an anode rectifier, the negative grid bias required for rectification being supplied through the grid leak. In such a case the conversion amounts to no more than the moving of a wander-plug from one end to the other of a small grid battery, or perhaps interchanging the red and black plugs.

# REVISION OF TRANSMITTING PERMITS.

## Regulations of the International Radiotelegraph Convention.

**The New Regulations.**

In our issue of September 15th we drew the attention of amateur transmitters to the new conditions under which experimental transmitting licences will be issued and renewed subject to the Regulations annexed to the International Radiotelegraph Convention of Washington, 1927, also to the revised "Q" code and authorised abbreviations for use in transmitting, and to the International Prefixes which will probably supersede those drawn up by the International Amateur Radio Union, at Hartford, Connecticut.

The new Regulations will come into operation on January 1st, 1929, but have already been adopted, as far as amateurs are concerned, in the United States; that is to say, all new and renewed licences in America will be subject to these Regulations as from October 1st.

We propose, therefore, briefly to review the new Regulations and indicate the changes which will affect amateur transmitters in Great Britain.

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**Validity of the Regulations.**

Under Article 13 of the Convention, the Regulations are divided into two categories:—(1) General Regulations, which have the same validity and come into force at the same time as the Convention; (2) Additional Regulations, which bind only the Governments which have signed them. These latter are mainly concerned with the procedure and organisation of traffic with ship and aircraft stations.

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**Type of Wave Permitted.**

Under Article 4 of the Regulations, the permissible types of wave are divided into two classes, (A) Continuous waves, (B) Damped waves. The use of Type B waves below 800 metres is forbidden as from January 1st, 1930, except as regards existing land stations. No new Type B installations shall be fitted on ships or aircraft after January 1st, 1930, except low-power transmitters of less than 300 watts, and the use of damped waves will be entirely forbidden, except for low powers, after January 1st 1940 for ships, or January 1st 1935 for land stations.

Class A (Continuous) waves, are subdivided into three types:—

*Type A1*, Unmodulated continuous waves of which the amplitude or frequency is varied by the operation of telegraphic keying.

*Type A2*, Continuous waves modulated at audible frequency, of which the amplitude or frequency is varied in a periodic manner at audible frequency combined with telegraphic keying.

*Type A3*, Continuous waves modulated by speech or music.

Type A2 waves will not be permitted between 2,000 and 3,000 metres, except for time-signals on 2,400-3,000 metres.

Type A3 waves (Telephony) will not be permitted between 1,875 and 3,000 metres, therefore broadcasting stations on this waveband will eventually have to come into the 1,340-1,875 metre waveband.

The wavelengths reserved, either wholly or in part, for amateur use are: 150-157 metres (1,715-2,000 kC.), 75-85 metres (3,500-4,000 kC.), these two wavebands being also shared by fixed and mobile stations: 41-42.8 metres (7,000-7,300 kC.); 20.8-21.4 metres (14,000-14,400 kC.); 10-10.7 metres (28,000-30,000 kC.); and 5-5.35 metres (56,000-60,000 kC.). Each Administration may assign to amateur stations one or more of these wavebands.

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**Accurate Wavemeters Essential.**

Under Article 3 of the Regulations, the Administrations concerned must take the measures necessary to assure themselves that the frequency metres (wavemeters) used for the adjustment of the sending apparatus are calibrated as accurately as possible by comparison with their national standard instruments. Under Article 4 the waves emitted by a station must be maintained at the authorised frequency as exactly as the state of technical development permits, and their radiation must also be as free as practicable from all emissions which are not essential to the type of communication effected. Freedom from harmonics is especially particularised. In the case of Great Britain and Northern Ireland it is understood that every amateur transmitter will be required to use a piezo-crystal wavemeter or other type approved by the G.P.O.

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**Nature of Amateur Communications.**

Under Article 6 of the Regulations the Administrations concerned are empowered to forbid the exchange of communications between private experimental stations in different countries if one of the countries has notified objection to such exchange.

Communications in general must be conducted in plain language and must be limited to messages relating to the experiments and to remarks of a personal character, which, by reason of their unimportance, would not in the ordinary course be sent by the public telegraph service. In the case of Great Britain the misuse of this privilege may render it liable to withdrawal.

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**Call-signs.**

The call-signs officially allotted to the various commercial and Government stations will be retained, except that the combinations of letters beginning with A or B, being reserved for the geographical part of the International Code of Signals, will no longer be used as call-signs.

Three-letter call-signs will be used for fixed and land stations, four-letter signs for ships, and five-letter signs for aircraft stations. Amateur stations will use the first or first two letters indicating their nationality, and a single figure followed by a group of not more than three letters.

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**Nationality Prefixes.**

The new nationality prefixes appeared in our issue of June 6th, but, owing to an error, those for Chile and Honduras were given as CI and HP instead of CA and HR.

Great Britain will continue to use G, and Northern Ireland GI. The United States will, as from October 1st, use W within their continental limits, and K for Alaska, Hawaii, Porto Rico, and the Virgin Islands. As Great Britain has the sole use of both G and M, it is possible that the latter prefix may be used to distinguish British possessions which have not otherwise a distinctive group of call-letters. At present M is used commercially only in ships' call-signs.

Spain, having the entire group EAA to EHZ, will, presumably, retain EAR for her amateurs. Accented letters are excluded, so there will probably be a few alterations necessary among French amateur call-signs.

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**Test Calls.**

The "CQ" call will be forbidden to amateur transmitters, but a reasonable use of the general call "Test" will be allowed. When making test signals in order to adjust apparatus, these signals must consist of a series of Vs in which the call-sign of the transmitting station is interpolated several times.

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**Revised "Q" Code.**

The revised "Q" code and the authorised abbreviations will be found in the Appendix attached to the General Regulations, and amateurs will be well advised to make themselves familiar with the new code, as it differs greatly from the old "Q" code, which was devised in the days when wireless was almost exclusively confined to ships.

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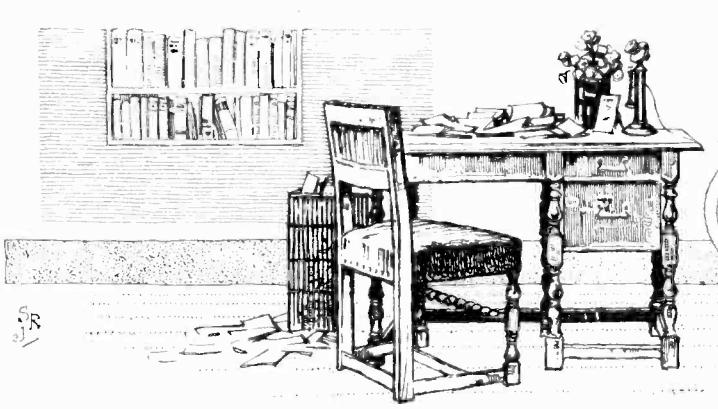
**Technical Consultative Committee.**

An International Technical Consultative Committee has been formed for studying technical and related questions submitted to it by the participating Administrations or private enterprises. It will transmit its opinions to the International Bureau for communication to the Administrations or private enterprises concerned. This Committee is composed of experts from the Administrations and authorised private enterprises which desire to participate in its work and share in the general expenses, and, as a general principle, will meet every two years.



# The Week's Postbag

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, Tudor Street E.C.4, and must be accompanied by the writer's name and address.

## *STANDARDISATION OF VALVE IMPEDANCES, ETC.*

Sir,—I venture to ask whether there is ground for advocating a closer measure of agreement between valve manufacturers as to the published constants of their valves?

Taking one instance, that of valve impedance. We are nowadays advised to match with care the impedance of our anode circuits with those of their valves, or vice versa, and are therefore led to select our valves or choose our circuits in accordance with published valve-impedances (magnification, etc.).

The latter may, however, be to some extent misleading unless the conditions on which the makers' ratings are based be also taken into consideration.

For example, valve manufacturer "A" states the impedances of say his L.F., H.F. and power valves at x, y and z ohms respectively; maker "B" gives quite different range of impedances for valves designed for similar duties, whilst maker "C" gives a list which may differ from the others by some thousands of ohms. We are apt to choose from these figures the valves which we think will "match" the impedances of a given circuit without further enquiry.

But consideration shows us that maker "A," for example, measures all his valve constants at 100 volts anode potential (grid zero understood), whilst maker "B's" valves may be referred to an anode voltage of 75. Maker "C" may base his valve impedances on several different ranges of a.p.; 30-50 v., 50-70 v., and 80-120 v., according to their designed employment. Might not many of these impedances be found in closer agreement if all were measured at the same range of anode potential? The impedance of an L.F. valve at 30-50 v. will usually differ considerably from that at 75 or 100 anode v.

Thus, comparing makers' details for two well-known 2-volt valves designed for detector and low frequency purposes, we have:—

| | Valve A. | Valve B. |
|---|---|---|
| Impedance measured at ... ... | 100 anode volts | not stated |
| H.T. battery volts ... ... | 40 to 120 | 120 max. |
| A.C. resistance or impedance ... | 14,000 ohms. | 22,000 ohms. |

In the case of valve B it is not stated upon what anode potential the impedance is based, but a graph is given with curves for 30 v. and 50 v. a.p., from which simple calculation shows the average impedance between these voltages to be, as stated by the makers, approximately 22,000 ohms.

In case A, the published graph gives curves for 120 v., 100 v., 80 v., 60 v., and 40 v.; although this valve is correctly specified as of 14,000 ohms impedance at 100 v. a.p., its average impedance between 40 and 60 v. can be calculated from the graph to be 20,000 ohms.

Here are two valves, designed for similar service and approximately of the same impedances (at any rate for their lower anode potentials, since the curve for higher values is not given in graph B) which are yet rated by their makers at 8,000 ohms apart because based on different anode potentials.

This seems to be a case of "distinction without difference"; yet, for circuit "matching" the amateur constructor might well be led to base his selection of one or the other according to their specified "impedances." H. L. S.

Brondesbury Park.

## *MOVING-COIL REPRODUCTION.*

Sir,—May I add a few remarks to the already large volume of correspondence in your valuable columns on moving-coil speakers?

In the first place, it seems to me utterly impossible adequately to reproduce large orchestral concerts or organ recitals in an average living room, owing to the acoustical features of the room itself. But the nearest possible approach to realism can, in my opinion, only be attained with a volume of sound which compares relatively with the original volume. For the three main components of any musical note are frequency, timbre (this, being mainly a question of harmonics, is closely related to frequency), and volume. I suggest that if any one of these is falsified, the other two are likely to become unbalanced. In my search for perfection I therefore postulate a large volume.

Owing to the unfortunate policy of the B.B.C., the modulation percentage of different items is adjusted to a constant level, with the exception of the speaking human voice, which is definitely over-modulated in the majority of talks and news items. It is this fact, I think, which is responsible for the grouse several of your correspondents have against the unnatural reproduction of the human voice by their moving-coil speakers.

Incidentally, it is nearly always the amplifier which is at fault in such cases. I find in practice that it is necessary to adjust the amplifier so that no overloading occurs when nearly double the required volume of music is handled. If the volume is then controlled and set so that it is bearable, the speaking human voice is very much more natural. As I postulate a large volume of music for faithful reproduction, it is obvious that the amplifier must be capable of handling grid swings of a very much higher voltage than even the average "LS5 brigade" amplifier can successfully deal with. I use two LS5A valves in a push-pull output staged biased to —180 volts and with 450 volts H.T.

I am in agreement with your correspondent, Mr. F. W. Wolstenholme, that the flux obtained with a six-volt pot winding is quite inadequate. My own winding is 1,450 turns, and consumes 2.5 amps. at 13 volts. There is no appreciable heating-up, as the coil is self-supporting and taped, and is a tight fit on the core.

My annular gap measures $\frac{3}{32}$in. across the face of the pot. I put it this way deliberately because I confess that I cannot

readily follow your correspondent, Mr. W. C. Lee, in his rather subtle distinctions between "length," "width," and, later, "broadened." But I think he raises an important point, though I propose to criticise his suggestion of compensating for a decreased flux by an increase in the number of turns in the moving coil, as this number is definitely limited by considerations of high-note cut-off.

In conclusion, I must say that the moving-coil speaker, though it may be a "laboratory monster," as Mr. William B. West authoritatively states, is, nevertheless, the only satisfactory reproducer of the audible frequencies, whether electrical or mechanical or both, in existence to-day. If Mr. West truly prefers his horn speaker, I suggest that he should continue to use it with his (doubtless) much overloaded semi-power valve output. I confess I once owned one myself. But do not let him try to stop what small progress is being made towards the goal. H. PATRICK HOLDEN.

Bolton.

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Sir,—How nice to be one of the fortunate individuals who, with the most primitive of apparatus, obtain perfect results! How we poor "Frankensteins" must envy them! A similar state of affairs exists in the gramophone world, where a number of diehards still refuse to acknowledge the superiority of electrical recording over the acoustical method.

I have noticed the effect of realism mentioned by Mr. Pohu, obtainable when wearing headphones in a room in which a loud speaker is operating, but the illusion is spoilt owing to the inability of the phone diaphragms to respond to the very high and the very low frequencies. In conclusion, I should like to point out to Mr. Kennard that the General Electric Co., in their booklet on super-power valves, give the negative grid bias for an LS5A operating on 400 volts as 130.

London, N.1. H. W. SULLIVAN.

September 5th, 1928.

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### *THE L.S.5 BRIGADE AND NOW THE PENTODE.*

Sir,—The growth of correspondence on questions dealing with moving-coil speaker reproduction has been followed with much interest, and it is thought that the experiences of the writer may be of interest both to the L.S.5A and the D.E.5A devotees.

It would appear from the experiences of correspondents as set forth in your columns that both the L.S.5A brigade as well as the more humble D.E.5A-ites suffer from the same form of distortion, variously described as "dither," "rattle," "blasting," etc., but none of your correspondents appears to have observed that this form of distortion is seldom observed when reproducing gramophone records, provided, of course, that the amplifier is above reproach.

Some time ago it appeared certain to me that, where coil-driven speakers of high quality were concerned, both grid and bottom-bend rectifiers were equally guilty of sufficient distortion to be objectionable, and I have found that only a valve operating as a diode detector can give quality worthy of the coil-driven speaker. For the benefit of those interested the following details of valves, etc., are given: $V_1$, $V_2$, screened grid H.F., $V_3$ PM1HF, as Diode, R.C. coupled to $V_4$ (PM1HF), R.C. coupled to $V_5$ (PM1LF), which is coupled by an AF3 to a Pentode, $V_6$.

Volume control is incorporated in the H.F. stage and there is no reaction—the strength obtained when the grid of the pentode is taking its maximum swing is more than adequate for domestic use, and, in fact, it is found possible to overload the output valve by as much as 10 per cent. without introducing the least sign of audible distortion.

Incidentally, the maximum H.T. used is 160 volts, and I can definitely assert that I now obtain far better quality than I hitherto enjoyed with high values of H.T. and all the rest of the L.S.5A paraphernalia; moreover, the volume is more than any sane person could tolerate with the pentode fully loaded. Under these conditions one cannot hear oneself think.

It is my firm conviction that if the L.S.5A brigade will concentrate a little more on the input end of their sets instead of working on the assumption that perfection lies in the anode dissipation of the last stage, they may achieve something a little nearer their heart's desire. They must be prepared for a painfully insensitive device in the diode rectifier, but, as this can be compensated for by an extra stage of amplification, it should not constitute a serious drawback.

Colchester. HENRY C. RYLATT.

September 6th, 1928.

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### *REALISTIC REPRODUCTION.*

Sir,—The letter from Noel Bonovia-Hunt, in your issue of Aug. 29th last cannot but provide many of your readers with grave doubts as to the superiority of his apparatus. Your correspondent has noticed "wonderful progress" in amplifier design, but it is difficult to gather from his letter whether he has applied modern knowledge to the design of his amplifier.

Is it not general practice to so design the layout of wireless apparatus so that no grid-current flows? Do we not bias our grids so that under no circumstances can the coupling condensers become charged to the extent of passing current?

Yet Mr. Hunt would have us believe that we have to consider the "discharge of each signal from the grid," and that the formula $T=CR$ is an important factor.

Seeing that the coupling condensers in a *well designed* amplifier are virtually on open-circuit, where can we apply the time factor? Further, there being no conductive path from grid to filament, where can we apply the current factor? It would appear that Mr. Hunt is confusing the issue in question by regarding the coupling condensers in the same light as the output condenser feeding the L.S.

Apparently the writer of the letter is merely quoting phrases from some back-dated literature. If this is not so, then the only conclusion to be drawn from his letter is that he positively revels in allowing grid-current to flow, and then utilises subterfuges to conceal its effects.

Would it not be more in keeping with modern design to lay the bogey at the door and see to it that our amplifiers do not suffer from this defect? F. W. WOLSTENHOLME.

Retford, Notts.

September 3rd, 1928.

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### *REPRODUCTION STRENGTH.*

Sir,—May I beg space in your columns for an appeal in connection with the above? Many letters have appeared on such matters as whether a brass band ought to be reproduced at the original volume in order to secure faithful reproduction, or whether a mere half-strength will do, and no doubt much valuable work for the cause of wireless acoustics is being done by your scientific contributors. But, unless they inhabit houses either soundproof or a considerable distance from their neighbours, may I ask them to consider those neighbours?

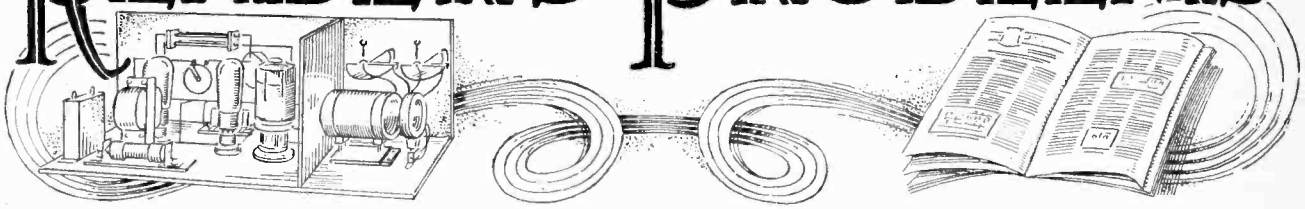
Just now attention is being drawn to the very serious problem of city noises, and by no means too soon. In crowded suburbs, where houses are often built so that one can almost hear one's neighbours winding up their watches, a really stentorian loud speaker can be an intolerable nuisance, especially to those who are sick or who have spent their working day in the racket of the city, and need quiet in their homes at the end of the day.

In my personal experience I have usually found the genuine experimenter to be considerate. But such doctrines as that of full-blast reproduction are often picked up by thoughtless people who happen to be interested in wireless and able to afford the necessary apparatus, with dire results to the peace of the district in which they live. Will they please, for the sake of that good citizenship and consideration which is even more important than perfect reproduction, keep the volume down so that others are not troubled, even if it means a slight sacrifice of the low notes? They will be rewarded by the grateful thoughts of many who need peace after the stress of exacting work, and may take further credit from the fact that they are preventing their fine hobby from appearing in the list of noise-nuisances.

In the hope of reaching as many as possible of the actual and potential sinners of the moving coil, I have addressed this letter to our premier wireless journal. F. S.

Birmingham.

# READERS' PROBLEMS



"The Wireless World" Supplies a Free Service of Technical Information.

*The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.*

### Set or Speaker?

*Why is it that my moving-coil loud speaker gives a buzzing sound on certain notes? I am fairly certain that the set is free from blame, as the reproduction is free of this fault when I use a reed-driven cone.*

P. F. L.

The production of a buzzing sound is an almost certain indication that one of the parts of the loud speaker is either loose or is vibrating at its natural frequency on account of insufficient damping. You should pay special attention to the cone, its suspension, and to the baffle board, if one is used, and you should assure yourself that the design followed is a sound one. Incidentally, we doubt if you can assume with confidence that your receiver is altogether free from blame; it may be that the moving coil instrument shows up imperfections which would not be noticeable with a less perfect reproducer.

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### Accumulator Charging.

*Is it possible to charge my 120-volt H.T. accumulator battery from 110-volt A.C. mains with a rectifying valve, but without a transformer?*

F. A. W.

It is essential that there should be a voltage in the charging source in excess of that of the battery to be charged, so you will require a step-up transformer between the mains and the anode circuit of the rectifying valve. In any case, it would hardly be possible to dispense altogether with a transformer, as one should be used for filament heating of the rectifying valve, to avoid the excessive waste of energy resulting from the insertion of the large series resistance which would otherwise be required.

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### H.F. Currents in the Phone Leads.

*I am experimenting with a set having two stages of H.F. amplification and a detector valve with phones in its anode circuit. I have managed to achieve fair stability, but am troubled by hand-capacity effects, which sometimes produce oscillation. Can you suggest a cure?*

F. D. P.

Your trouble is by no means uncommon, and we expect it is due to the fact that some of the high-frequency energy in the anode circuit of the detector is transferred back to the input end of the set through phones and body capacity. We recommend you to adopt the arrangement shown in Fig. 1 (a), or, better, a choke output system (diagram (b)). The anode by-pass condenser should be of about 0.001 mfd. capacity.

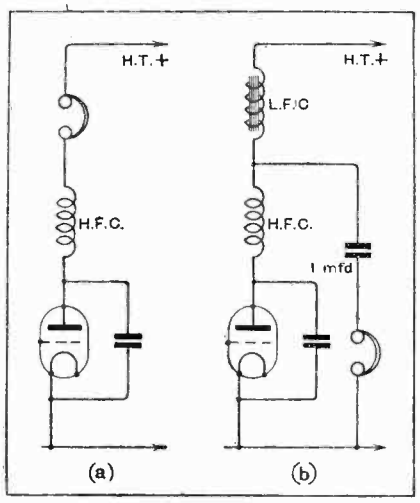


**Fig. 1.—High-frequency currents may be deflected from the phones by either of these circuit arrangements.**

*RULES.*

*(1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."*

*(2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.*

*(3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.*

*(4.) Practical wiring plans cannot be supplied or considered.*

*(5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.*

*(6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.*

*Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.*

You should assure yourself that the H.F. choke does not couple up with the detector grid coil, or the cure may be worse than the disease.

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### Tuned L.F. Amplification.

*With reference to the tuned note filter of which the circuit diagram was given in the "Readers' Problems" section of your issue for August 15th, I should like to know if it is possible to increase its amplification by using reaction in the same way as in H.F. circuits. It is assumed that this addition would narrow down the band of audible frequencies to which the L.F. amplifier would respond.*

M. S. M.

Yes, L.F. reaction is quite possible, and its effects would be as you say. It could be applied by inserting a reaction coil between the plate of the output valve and the telephones; this coil would be coupled to $L_1$ (Fig. 1, page 212). At the same time, it will probably be necessary to increase the capacity of the phone by-pass condenser.

A still simpler way of obtaining a similar effect is to arrange for variable coupling between the coils L and $L_1$.

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### Short-wave Reception.

*Do you think it is really worth while for me to include a separate reactor valve in the short-wave receiver which I am about to construct?*—P. W. A.

If one is limited to a detector-L.F. combination for short-wave work, it cannot be denied that a separate reactor valve is distinctly helpful, but we are inclined to think nowadays when real H.F. amplification on these wavelengths is possible, it would be better to use the extra valve in this way.

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### A Correction.

In the diagram of a parallel-feed H.F. circuit which appeared in the "Readers' Problems" section of our issue of September 19th a fixed condenser was inadvertently omitted from the drawing. This may be of 0.001 mfd. capacity; it should be inserted between the point where the H.F. valve anode joins its associated choke and the junction between detector grid coil and grid condenser; the purpose of this condenser is to prevent a short-circuit of the H.T. battery.

### For the "Short-Wave III."

*Will you give me winding data for the set of coils (from 10 to 150 metres) used in the "Short-Wave III" described in "The Wireless World" for September 14th last year?*

E. S. W.

All the coils have a diameter of 3 inches, and are wound with No. 18 D.C.C. wire, spaced ten turns to the inch. There is a spacing of ¼in. between the reaction and grid sections. An aerial winding of five turns is used with each of the coils. Below is given data for the complete set :—

| | Grid Winding. | Reaction Winding. |
|---|---|---|
| (*a*) | 16 turns. | 8 turns. |
| (*b*) | 8 ,, | 4 ,, |
| (*c*) | 3 ,, | 2 ,, |
| (*d*) | 1 turn. | 2 ,, |

o o o o

### Modified Transformer Construction.

*Is it possible to apply the general idea of the design of "Wireless World" transformers to compact coils wound in the form of a series of "pancakes," both as regards the secondary, primary, and neutralising windings? If so, I should be grateful for any information you can give me as to the correct relative position of the various sections, and especially with regard to the connections of the various ends of the windings.*

H. B. N.

Quite good transformers of comparatively small dimensions may be constructed on the lines you suggest, and we think you would be well advised to adopt the method of assembly shown in Fig. 2 (a). This diagram represents a section through the coil, and in it the secondary wires are shown by large circles, the primary winding by black dots, and the neutralising coil by smaller circles. All windings are in the same direction. You should be careful to follow exactly the connections shown; the various ends are marked with lettering which corresponds to that in the circuit diagram (b).

The primary and neutralising windings should occupy approximately the same depth as the secondary, and the spacing between these sections should be approximately 1/32in. You may encounter some little difficulty in devising a method of winding whereby the fine wire coils wound as single-layer banks may have the necessary spacing between adjacent turns : this applies more particularly to the short-wave transformers.

Regarding the design of the secondary winding, we think you will be well advised to read articles which appeared in our issues of December 8th and December 15th, 1926, where coils on these lines were discussed.

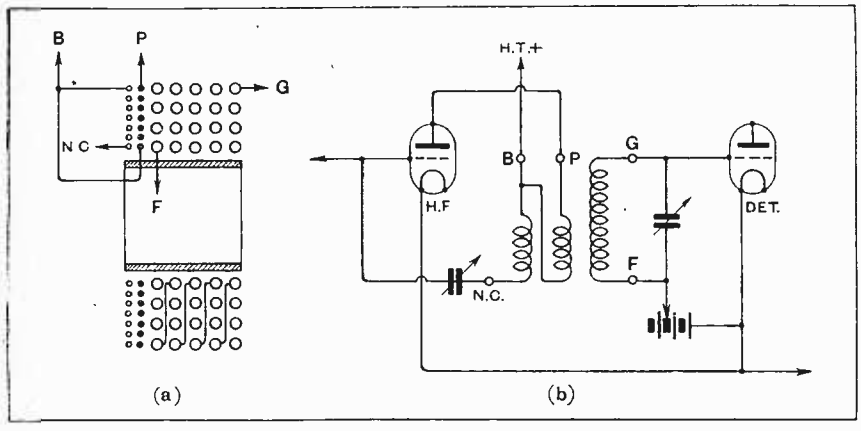


**Fig. 2.—Sectional diagram (a) showing disposition of windings in a neutralised H.F. transformer with "pancake" coils. The lettering, corresponding with that in the circuit diagram (b), indicates the external connections.**

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### A Defective Winding.

*The coupling between the detector and first stage L.F. amplifier in my receiver consists of a "double impedance" arrangement in which there is a choke in both anode and grid circuits. I am troubled by a very bad crackling, which is at times almost deafening, but which occasionally disappears for a considerable length of time. Can you make a suggestion as to what is wrong?*

W. T.

Assuming that you have carefully tested the various connections in your set, we consider it certain that the fault will be traced to a defective winding in the double impedance coupler, in which there is probably an intermittent open circuit. You can test this by substituting externally for the anode winding the primary of a disused transformer or a resistance, while the grid impedance may be replaced temporarily by a leak of about one megohm.

By this procedure you will be able to decide which winding is faulty.

### H.F. and Reinartz.

*I should be glad if you could tell me if it is possible to work a stage of H.F. amplification in front of a Reinartz detector followed by two L.F. valves.*

E. K. T.

The Reinartz circuit depends essentially for its operation on the critical control of reaction, and we consider that its advantages are largely lost when an attempt is made to add H.F. amplification. In any case, this must be interposed between the present aerial tuning circuit and the detector valve, and the alterations are so extensive that in practice it becomes necessary to re-design the receiver. The difficulties in the way of effecting the modification you desire were discussed in an article entitled "Adding H.F. Amplification" in our issue of June 27th, to which you are referred.

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### Where Reaction is Unnecessary.

*In "The Wireless World" for August 31st last year you described a method of adding reaction for use on the long waves to the original "Everyman Four." Would a modification of this same plan be applicable to the "Standard Four"?*

C. F. H.

We do not recommend you to attempt the addition of reaction to the "Standard Four," which already includes H.F. amplification on both wavebands.

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### Ohms Law and the Eliminator.

*I have an eliminator with a single output of about 130 volts, which gives very satisfactory results, but I should like to try the effect of applying a somewhat lower voltage to the anode of my detector valve. How can one calculate the value of the series resistance, which I understand can be inserted to absorb the surplus voltage?*

D. F. C.

Having decided on the voltage you require, the first step is to estimate the anode current which will be passed by the valve at that voltage under normal operating conditions. This can be ascertained by actual measurement with a milliammeter if a battery is available, but, failing this, you can obtain a sufficiently close approximation by consulting the maker's curves. The value of the resistance (in ohms) is then obtained by dividing "volts to be dropped in the resistance × 1,000" by "current consumed by the valve (in milliamps)." "Volts to be dropped" is ascertained by substracting the desired voltage from the actual voltage output of the eliminator.

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### Neutralising and Sensitivity.

*I have recently constructed the original "All-Wave Four" as described last year, and am obtaining very good results on the long waves, but on the normal broadcast band I can receive only two stations. Is this because the set is not correctly neutralised?*

J. E. H.

We think it probable that your medium-wave H.F. transformer is faulty, or that its pins are not making good connection with the sockets. Provided that the set does not oscillate uncontrollably (we take it that it does not), it is certain that the poor sensitivity of which you complain is not due to incorrect balancing; the effect of this would be rather to increase sensitivity, due to the fact that the H.F. valve would be nearer the point of oscillation.

# The Wireless World AND RADIO REVIEW

*(16th Year of Publication)*

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## CONTENTS OF THIS ISSUE.



## A RESPONSIBILITY.

IN our issue of August 29th, in announcing the appearance of many new types of valves, we said "It so happens, no doubt, that progress in the development of components other than the valve has coincided to some extent, but it is quite certain that the progress in receiver development as a whole could not have proceeded very far unless valves had at least kept pace with the times. As it is to-day, it is probably correct to say that it is the valves which lead the way in efficient receiver design, and probably at no time in the history of broadcasting has the wireless user had placed at his disposal all at once such a wonderful choice, both in new valves and improved types, as become available to him this autumn."

### Dependence upon Valves.

A chain is as strong as its weakest link, and the comparison between a chain and a wireless receiver is apt, especially if we consider the valves as links in the chain. Many new receivers have been specially designed on the basis of the characteristics and performance of new types of valves, and in many cases the designers of the sets are not associated in any way with the designers and producers of the valves, so that these producers of sets are virtually at the mercy of the valve manufacturers and depend entirely upon them and their products to make or mar the success of their receivers.

### Past Disappointments.

This is, of course, a very grave responsibility for the valve manufacturers to have to shoulder, and we may, perhaps, be excused if we feel some little anxiety as to whether this responsibility will be met in such a way as to give satisfaction both to the set producers and, in turn, the public. We cannot overlook the fact that at the Radio Show of 1927 certain valves were exhibited which never actually came on the market, whilst other new valves shown then were practically unobtainable in many parts of the country for quite a long while after the Show, and those which were available often showed a distressing deviation from type. We hope that the lessons of the past have been learned and that we have really no cause for anxiety. Hitherto the standard of valve production in this country, when once new types have been established, has been admittedly high, and failures in sets have very rarely been attributable to valves, except where, through old age or mishandling, the filament has suffered.

It would be a very sad day in the history of broadcasting in this country if, in production, the new types of valves failed to maintain the standard expected from theoretical considerations, and the public were driven to adopt the attitude of first suspecting the valve in the event of any failure in their sets.

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## OUR SHOW COMPETITION.

AS we go to Press with this issue entries for our Show Competition are reaching us in very large numbers by every post. Readers will appreciate that the sorting out of votes under so many headings and with so large a number of entries is likely to take a considerable time, and the sorting could not commence until after October 8th, which is the last date for entries to reach us. The task has, however, been undertaken by a firm of chartered accountants with a wide experience in handling ballots of this nature, and as early as possible an announcement will be made concerning the result of the voting. We feel sure that the results will prove of very considerable interest.

# Screened Grid Valve as a Detector

## Some Interesting Data Based on Actual Measurement.

By
A. P. CASTELLAIN, B.Sc.,
A.C.G.I., D.I.C.

SOME time ago the writer required to use a screened-grid valve as an anode-bend rectifier and made certain measurements to find, experimentally, the best operating conditions. As there appears to be little information on this subject, it is thought that the results obtained would be of sufficient interest for publication.

The specific problem was to find the best operating conditions for typical screened-grid valves now on the market when following an H.F. amplifier, where the detector input might be expected to be fairly large—perhaps of the order of half a volt. Before proceeding to the actual measurements, it is interesting to consider the ordinary static characteristics—*i.e.*, the plate volts—plate current curves—for the valve when different screen voltages are used. A set of curves for five different screen voltages is shown in Fig. 1. Each curve is seen to consist of four main parts: first a rise A B, then a fall B C, in which the plate current may actually reverse due to secondary emission; another greater rise C D, the large increase of current occurring for quite a small change of plate volts, and finally a nearly horizontal portion D E, where the current does not change very much with change of plate voltage. When we wish to use the valve as an *amplifier* it is the portion D E which is of interest, but when we wish to use it as a *rectifier* the curved portions of the characteristics must be used, preferably portions such as B, C, and perhaps D, where the curvature is a maximum. The portion B does not appear to depend on the screen volts for its position—*i.e.*, it occurs at about 10 volts on the plate for any screen voltage between 20 and 60, while the positions of the parts C and D most definitely do depend on the screen voltage.

It is difficult, if not impossible, even to estimate the best operating conditions of the valve as an anode-bend rectifier from the curves in Fig. 1, as

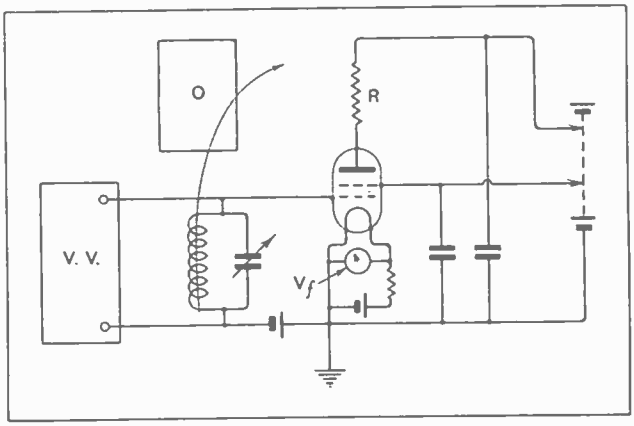



Fig. 2.—Apparatus for experimental investigation of rectifying properties of a screened-grid valve. A 500-metre oscillator was coupled to a tuned circuit across which was connected a valve voltmeter.

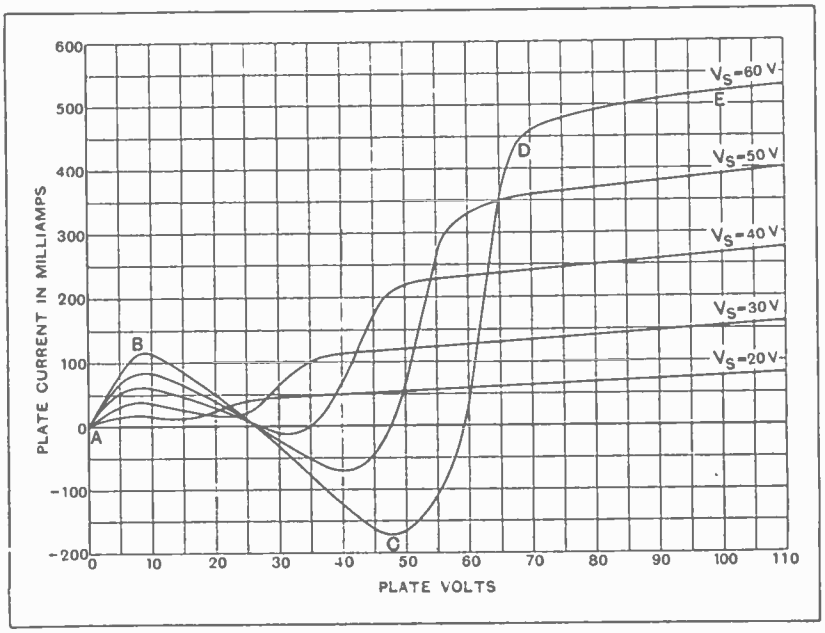



Fig. 1.—Anode-voltage anode-current curves for various screen voltages using a screened-grid valve. Note the negative resistance portion B C D due to secondary emission.

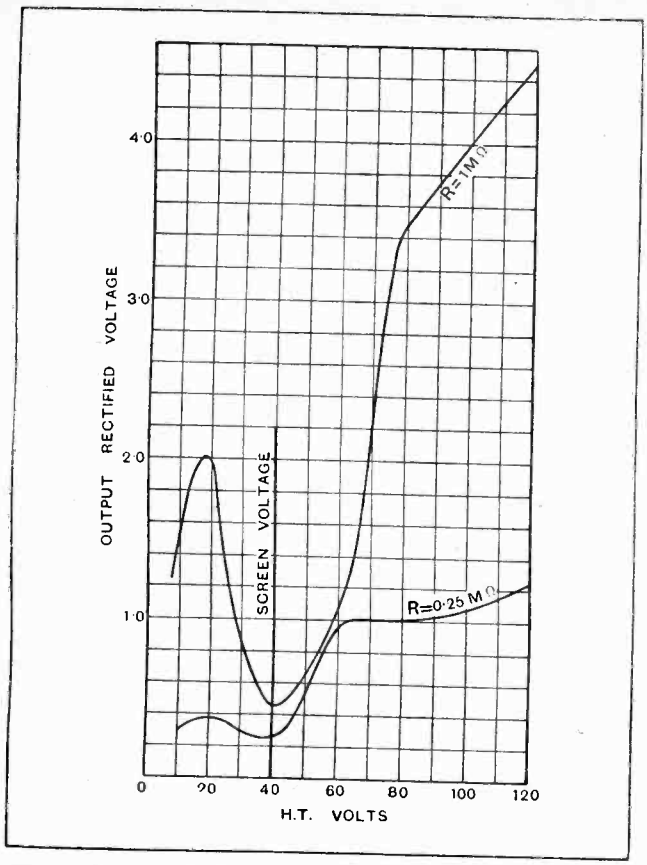



**Fig. 3.—Rectified output for the screened-grid valve. The voltage on the screened grid was 40 and 0.41 volt input was impressed on the control grid.**

the mutual conductance and amplification factor are varying all over the portion A to D.

The circuit of the apparatus used in the experimental investigation is given in Fig. 2. A 500-metre oscillator was used as the source of H.F. input voltage coupled to a tuned circuit across which a valve voltmeter was connected. The valve voltmeter was of the dead-beat reflecting type, giving quite a large deflection for half a volt, and was used both to measure the input voltage and to check the constancy of the latter.

The input E.M.F. was of sine wave form (unmodulated), and the results to be described giving rectified voltage therefore refer to rectified H.F. voltage obtained by the product of the rectified current and the plate resistance R.

Taking values of R at random, and plotting rectified current against H.T. volts supply to the plate, with constant screen voltage and constant H.F. input voltage, the curves obtained have the same general shape as the static characteristics of Fig. 1. Curves plotted for a screened-grid valve, with 40 volts on the screen and 0.41 volt input, are shown in Fig. 3. These show that quite good rectification can be obtained with only 20 volts H.T. with 1 megohm in the plate circuit, but the plate voltage is rather critical, while better rectification can be obtained with much higher plate voltages with both values of resistance R, and, moreover, the H.T. value is not so critical provided it is above 70 to 80 volts.

A further series of measurements, to show the effect of varying the anode resistance R for several values of H.T. and screen voltages, with a constant H.F. input

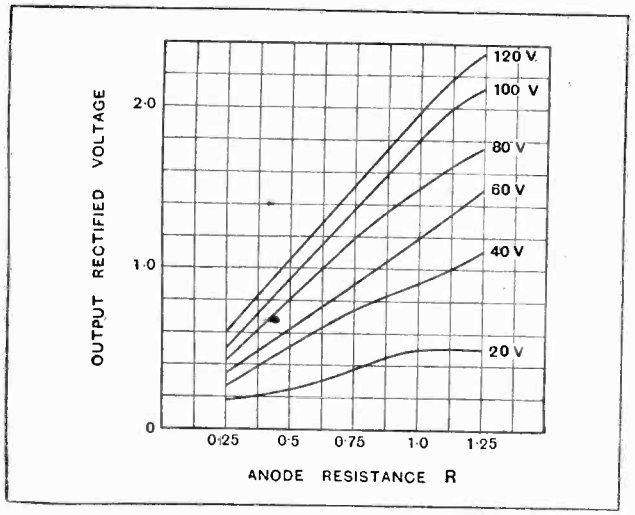



**Fig. 4.—Various values of anode resistances plotted against rectified output for a screened-grid valve. The screen voltage was 20.**

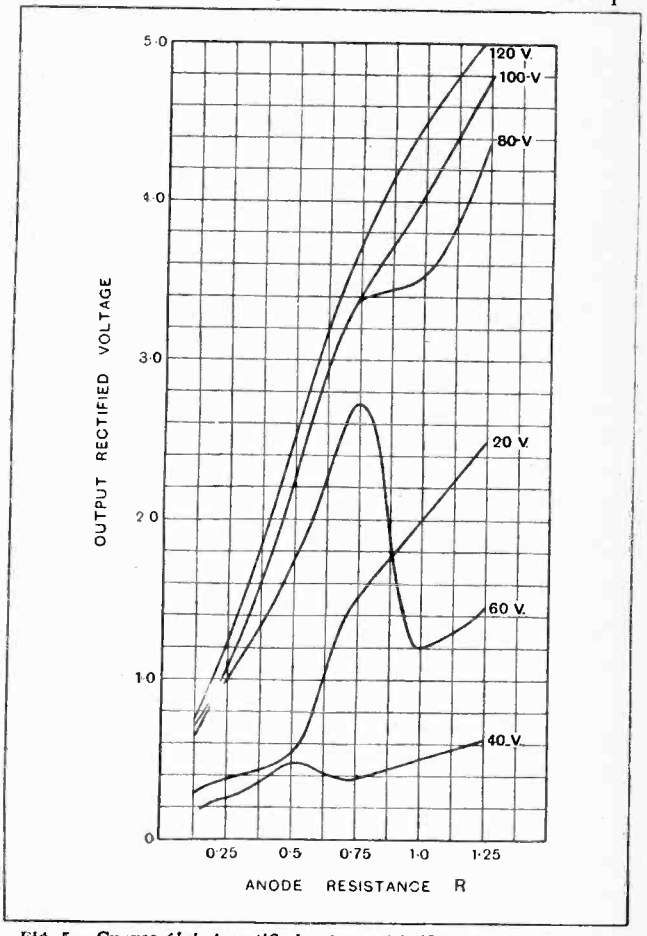



**Fig. 5.—Curves giving rectified output with 40 volts on the screened grid. At 60 volts anode potential an increase of anode resistance from 0·75 to 1 megohm causes a decided drop in rectified output.**

**Screened-grid Valve as a Detector.—**

was undertaken, and three specimen sets of curves obtained are shown in Figs. 4, 5, and 6. In Fig. 4 the screen volts are quite low—only twenty—and the curves indicate that the output rectified *voltage* is very nearly proportional to the anode resistance, or, in other words, the rectified *current* is nearly independent of the anode resistance. For certain classes of work, notably measurement of A.C. voltage, this property may be extremely valuable, for it means that the rectified current for a given input voltage will not vary with change of battery resistance or D.C. measuring instrument, and, incidentally, that very high resistance sources of H.T. may be used. With higher screen voltages, as in Figs. 5 and 6, some curious effects may be shown, unless the H.T. voltage is considerably higher than the screen voltage. For instance, in Fig. 5, for 60 volts H.T. there is a very decided reduction (about 50 per cent.) in output rectified voltage on changing the anode resistance R from 0.75 to 1 megohm, whereas with 20 volts H.T. there is almost a corresponding increase.

This effect is almost certainly due to a change in the operating point on the characteristic, for one value of resistance the change of slope is quite different from that with another value of resistance. This effect is most marked in Fig. 6, where, for 40 volts H.T. and about 0.9 megohm anode resistance, the rectifying conditions are quite good. Such values of R and H.T. are very critical, and for most purposes it will be more convenient to use the higher values of H.T.

Here, again, the effect just referred to may be utilised to detect the change of a high resistance from a predetermined value, and may be most useful for apparatus using relays of any description or for photometric or other work, where a balance of some sort is required.

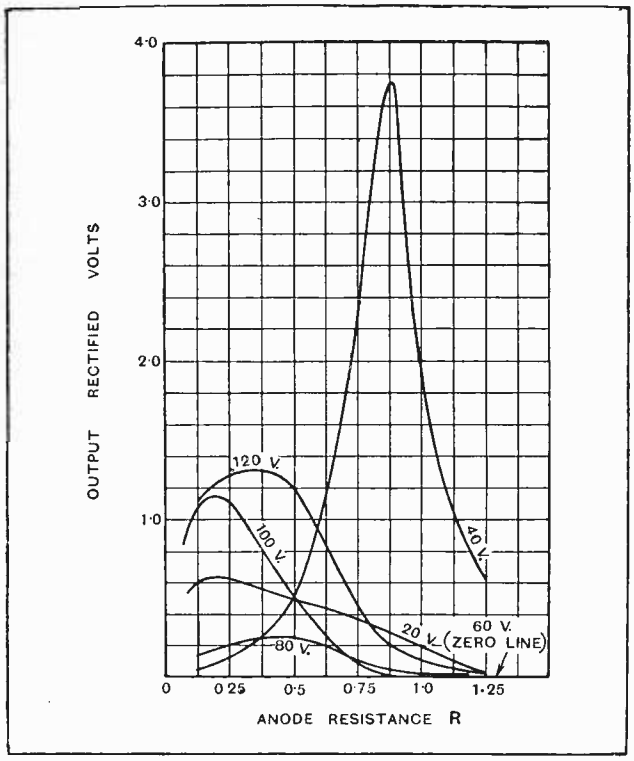



**Fig. 6.—Here the screen voltage is 60. The drop in rectified output as the anode resistance is increased is very marked.**

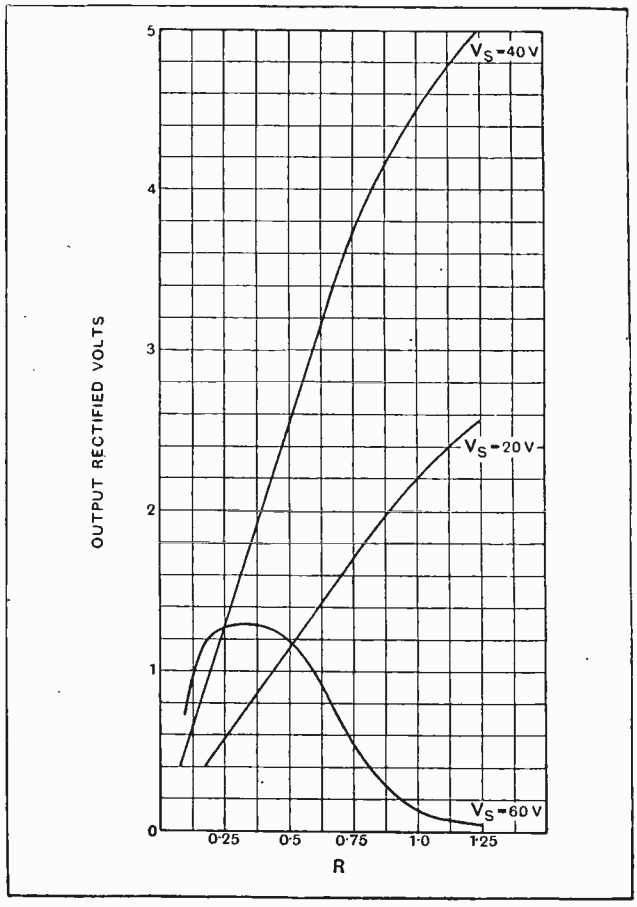
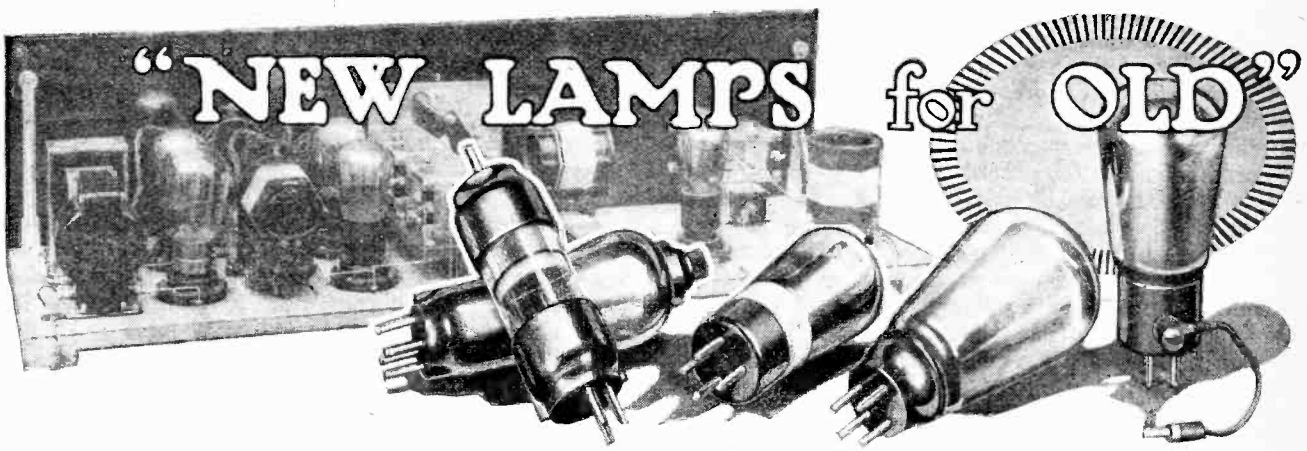



**Fig. 7.—With a constant anode voltage of 120 the curves show the rectified output for various anode resistances and screen volts.**

From what has already been said, it would appear advisable to use a high value of H.T. voltage, and to show the effect of screen voltage on the output the curves of Fig. 7 have been plotted to the same scale, with an H.T. voltage of 120. These show that if comparatively large values of anode resistance R are employed, a screen voltage of about 40 is the best, while for smaller values of R below 250,000 ohms, a higher screen voltage will give better results. Screen voltages up to 80 were tried, but a decided reduction in output for all values of R was found on increasing the screen volts much over 60.

When using the valve as a rectifier in a broadcast receiver, where modulated H.F. input will be dealt with, the anode resistance R should not be excessively high, owing to the shunting effect of the stray and input capacities of the following L.F. amplifier. Taking 0.5 megohm as about the limit, the best rectification efficiency obtained in the measurements was $\frac{2.5}{0.41} = 6.1$, which compares very favourably with a three-electrode valve under similar conditions. The rectification efficiency is here taken as the rectified output voltage divided by the input voltage (unmodulated).




# Some Notes on Re-modelling a Receiver for the New Valves.

By H. B. DENT.

DURING the past few months there have been strong and persistent rumours current concerning improvements in the design of existing valves and the development of new types. That these were founded on fact is evinced by the remarkable characteristics possessed by some of the new valves shown for the first time at the Olympia Wireless Exhibition this year. It is certain that these will mark a new era in the design of receiving apparatus and much of the old practice will gradually die out.

More often than not a wireless receiver is regarded as a conglomeration of parts, each performing its own little function without regard to the working of other units comprising the whole. This view of the case is entirely erroneous, and it would be well to dispel it at the outset. A wireless set admittedly consists of many small parts, but to obtain anything like pleasing results each must pull its weight in the team spirit, and it is fatal to replace any component without giving careful consideration to the technical merits of the new part which replaces it. In all modern receivers the valves are the pedestals on which the design is built up, and if these are unable to carry the burden imposed on them, the whole structure becomes unsafe, and in nine cases out of ten some innocent component is blamed for the failure. It is obvious, therefore, that with new valves having improved characteristics considerable care must be exercised in substituting these for those recommended by the designer of the set.

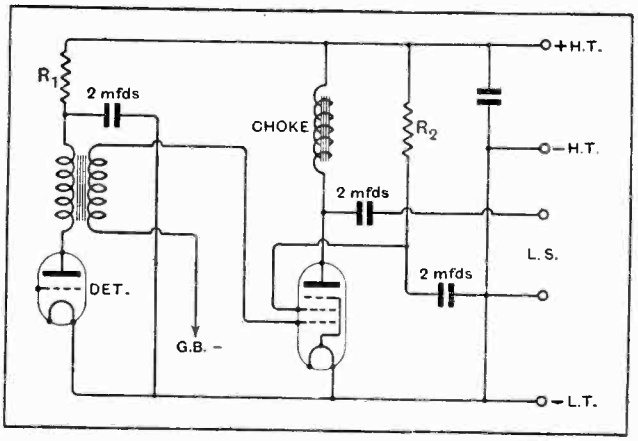



Fig. 1.—When the pentode valve is used it must be the only L.F. amplifier in the set. Note the de-coupling resistances in the detector anode, and the pentode screened-grid; $R_1$=20,000 ohms., and $R_2$=5,000 ohms as used in the Megavox-Three.

Of the new valves available the one which is most likely to lead to difficulties, in spite of its wonderful characteristics, is the pentode. This opens up a new vista in low-frequency amplifier design which will surely see the end to practically all the troubles so often associated with this portion of the equipment.

### The Output Stage.

Let us first consider the possibilities of utilising this valve in the output stage of a popular type of set. A receiver justifying this description would consist of one efficient H.F. stage, followed by an anode bend detector, probably a resistance-coupled amplifier, and terminating in a good super-power valve. Unless due consideration is given to the matter it might at first appear somewhat ridiculous to devote space to discussing an apparent simple change, but when it is realised that the pentode at present will not handle grid swings greater than 18 volts, it becomes obvious that, to substitute this for a valve which hitherto was dealing with grid swings in the order of 40 volts or more, will certainly result in the new valve being overloaded. A 20,000 or 30,000 ohm valve used as an anode bend detector and resistance-capacity coupled to the following stage can reasonably be expected to deliver a peak voltage of about 5, or a grid swing of 10 volts, to the grid of the first low-frequency amplifier. Therefore, if a pentode follows this the penultimate stage must not give an overall amplification of more than 2, otherwise the permissible grid swing on the output valve will be exceeded and distortion will follow. Under these conditions the first L.F. amplifier

**New Lamps for Old.—**

hardly justifies its existence and could conveniently be omitted. If a transformer is used in place of the resistance coupling following the detector, it would be possible just to fill up the grid of the pentode without overloading the detector. There will be no loss in L.F. amplification, as the pentode has a magnification factor of between 60 and 80, according to the type used, and this is comparable with what could normally be obtained from any two-stage amplifier using a good super-power valve in the output position. Furthermore, the omission of one L.F. amplifier will greatly diminish the risk of low-frequency oscillation, although the detrimental effect of battery resistance cannot be entirely ignored, in view of the peculiar construction of the new valve. One factor which should weigh heavily in favour of the pentode is its power-handling qualities. Used with an anode potential of about 150 volts, it will deliver to the loud speaker an electrical input comparable with that given by an L.S.5A type of valve with 350 volts H.T., assuming, of course, that both are being worked under favourable conditions.

In addition to the other advantages conferred, this brings the moving coil type of loud speakers within the reach of all. Hitherto, only those who had access to a high H.T. voltage could expect really good results, but now that this only obstacle is removed, coil-drive loud speakers should enjoy the popularity they rightly deserve.

Although battery resistance is not likely to prove so harmful when a pentode is employed in place of the two L.F. stages usually fitted, the construction of this valve demands that certain precautions should be taken to prevent L.F. currents from getting access to the screen-grid. This can be accomplished by fitting a 5,000-ohm resistance between the screened grid and the H.T. battery with a 2-mfds. by-pass condenser from the valve side of the resistance to the L.T. minus. It would be advisable to take similar precautions with the detector, although in this case the resistance should be made somewhat larger; about 20,000 ohms is suggested. The general arrangement is shown diagrammatically in Fig. 1.

Substituting one of the improved three-electrode valves for the detector should not present any difficulty or call for special comment, as the usual values for the interstage coupling following a high impedance detector will be quite suitable. It might be advisable to mention before leaving this subject that a valve of the Mullard P.M.4DX type now permits a transformer to be employed following an anode-bend detector valve without incurring the low note loss usually associated with this combination.

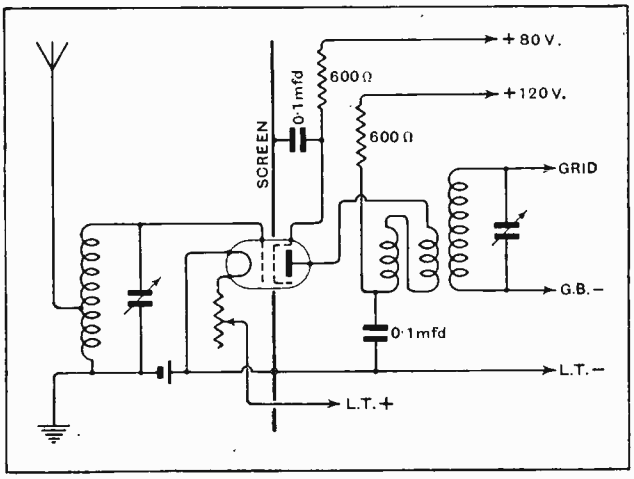



**Fig. 2.—Suggested modification to the connections of the primary and neutralising windings on a "Wireless World" type of H.F. transformer when used with a screened-grid H.F. valve.**

The very high A.C. resistance of the screened-grid valves seems to present some difficulty unless the reader is prepared to redesign completely the H.F. amplifier. That a slight re-arrangement will be required is inevitable, as in most cases the valve must be inserted through a hole in the screen separating the aerial-grid and H.F. transformers.

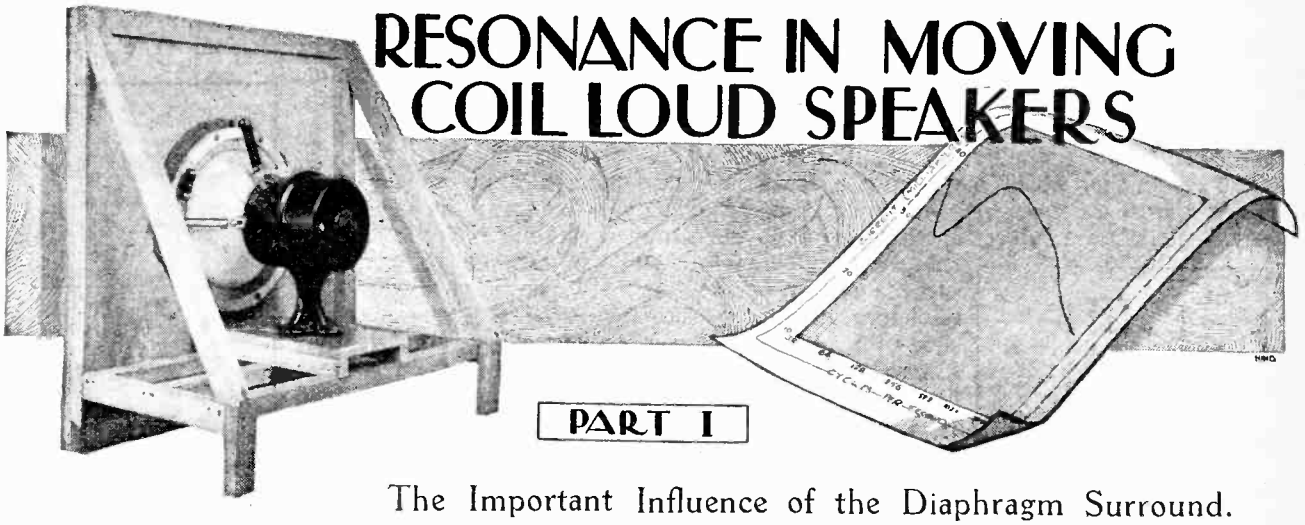
**The H.F. Amplifier.**

By shifting some of the unimportant components, such as by-pass condenser, valve-holder, and taking advantage of the space previously occupied by the neutralising condenser, which is now no longer necessary, the valve should be accommodated with ease. As the object is to separate by screening the grid and plate circuits, the valve must be pushed through the screen from the side where the grid coil is mounted, consequently the L.T. wiring should be extended.

In view of the higher A.C. resistance of these valves, the usual primary winding of about 15 turns on the normal broadcast wavelength H.F. transformer is inadequate to enable the best results to be obtained, and an increase should be made. A transformer ratio of about 1 to 1½ is desirable, but this would necessitate re-winding the coil. This course is recommended, but those who do not wish to go to these lengths could obtain very fair results by retaining the present transformer and utilising the idle neutralising winding to augment the primary, thereby decreasing the ratio to a little over 1 to 2. The modification is quite simple and can be carried out without altering the transformer in any way. It is immaterial whether or no interchangeable coils are fitted; the alteration will be the same in either case.

The H.F. transformers used in *Wireless World* sets have the primary and neutralising windings wound over the secondary, and as these are virtually connected in series, all that is required is to remove the H.T. positive lead from the junction of the primary and neutralising coils and connect this to the point on the coil, or base-board fitting, to which the neutralising condenser was attached. Any associated components, such as by-pass condenser or series resistance, should be removed also from the old position and connected to the new. These modifications will be more easily followed by referring to Fig. 2. It would be advisable to take steps when making these alterations to prevent our old enemy, the H.T. battery resistance, from making its presence felt in the shape of H.F. instability, due to a common resistance in both plate and screened-grid circuits. As an antidote it is suggested that 600 ohms resistances be connected in both circuits with by-pass condensers of about 0.1 mfd.

# RESONANCE IN MOVING COIL LOUD SPEAKERS



PART I

## The Important Influence of the Diaphragm Surround.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

IN a former contribution we discussed some measurements of the alternating current in a coil-drive loud speaker.[1] By making the resistance of the power valve sufficiently low, marked variations in the coil impedance caused perceptible irregularites in the coil current. One irregularity was particularly prominent, namely, the sudden fall in current when the resonance frequency of the diaphragm *surround* was reached. The object of this article is to discuss this resonance phenomenon in a fairly detailed manner.

These resonances pertain to the lower part of the audio-frequency spectrum. The physiology of the aural organs is such that the effect does not cause so much annoyance and irritation as it would at a higher frequency where the ear is much more sensitive. There is a degree of blurring in the bass, but the general result is to give one a sense of "out of balance music" and lack of precision in transients. Whether the frequency be high or low, a limit is reached beyond which the resonance becomes intolerable. Surround resonances exist in every coil-drive loud speaker, but some are very definitely worse than others. I have in mind a comparatively small cone with a form of leather surround. The model in question has a resonance at about 75 cycles, which spoils the reproduction and makes music more like that from a hurdy-gurdy, whilst human speech emulates the deep-throated night cries of the jungle. We must not be too academic and rule resonances out of our practical problems entirely. It is granted that we do not desire them, but, like the poor, they are likely to be with us for some æons hence. In other words, whilst attempting to allay resonance effects and eliminate as many of them as possible, we must at the moment accept these phenomena as inexcludable evils. If the surround resonance can be relegated to the sub-audio frequency region (say below 30 cycles) it will be fairly harmless. From the curve of Fig. 1 we see that the resonance is so sharp that matters are substantially normal at a frequency range of 20 cycles on each side. Now, it is never safe to dogmatise, but one's experience drives one in quite a definite direction. Thus, in making a statement concerning the best material to be used as a diaphragm surround, we must take up a definite attitude. There is no material at present in existence—what are the chemists doing!—which is entirely satisfactory as a diaphragm surround. I cannot claim to have tried more than a few materials. Only the first of the following list approaches satisfaction.

(1) Good brown rubber sheet. (2) Rubber apron. (3) Chamois leather. (4)

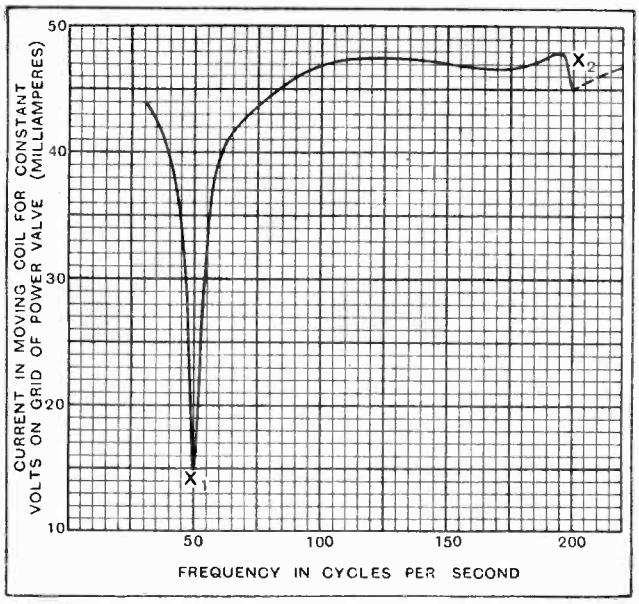



**Fig. 1.—Curve showing alternating current in moving-coil loud speaker at low frequencies. The fall in current at $X_1$ is due to resonance of diaphragm on surround, while the fall at $X_2$ is due to resonance of diaphragm apart from the surround.**

[1] *The Wireless World*, August 8th, 1928, p. 154.

**Resonance in Moving Coil Loud Speakers.—**

Kid leather. (5) Rubberised silk. (6) Woollen stockinette. (7) Silk stockinette. (8) Jap silk. (9) Thin paper.

In a good grade of thin brown rubber we have—in my opinion—a material which will give a mechanical resonance below audibility. True, it is subject to climatic conditions, which necessitates a fairly large air gap and frequent re-centring of the coil. Some of the other materials are subject in lesser degree to the same complaint, and they are incapable of giving the low resonance frequency possible with rubber. Whatever material is used, care must be taken to ensure that when contraction occurs the resonance frequency does not encroach on the audio range. It is not easy to differentiate between two somewhat similar surrounds by tests on broadcasting, unless the overall intensity is adequate to make the bass appreciably audible as it is in the original sounds. This is where the advantage of measurements, such as those illustrated in Fig. 1, resides. Again, a surround ought to be perfectly elastic over the amplitude of travel of the diaphragm. Paper is not elastic, nor are items (5) to (9), whilst the two leathers are half and half in this respect. There is a definite amplitude limit with all materials, but it is greatest for rubber.

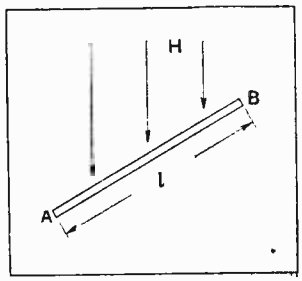



Fig. 2.—A conductor A B carrying a steady unidirectional current in field of strength H lines per sq. cm.

In practice the diaphragm should move purely axially. But anyone who has reproduced the pedal notes of the organ knows full well that it gets up a sideways wobble and bangs on the pot. This is due to two causes: (*a*) the coil and the magnet pin are neither co-axial nor concentric, (*b*) the constraining force of the surround is unequal round the periphery of the diaphragm. We can illustrate the point quite aptly by aid of a diagram supplementing the dynamics of the issue.

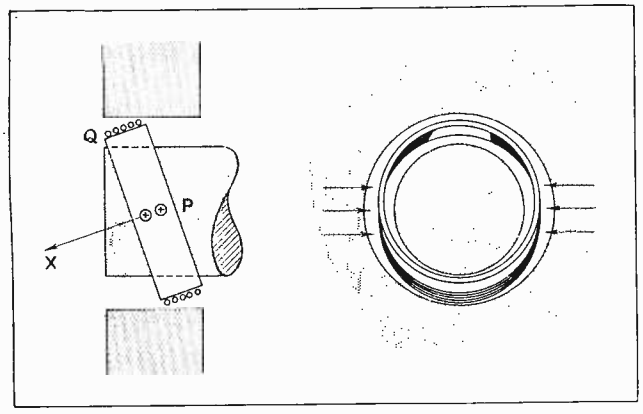



Fig. 3.—Showing coil tilted in pot magnet.

In Fig. 2 AB represents a conductor carrying a steady unidirectional current, and it is situated in a magnetic field of strength H lines per square centimetre. There is a force on the conductor which acts in such a way that the conductor is driven out of the field, unless it is constrained to stay in position. The force in the case under consideration acts in a direction perpendicular to the plane of the paper. The conductor will, therefore, be propelled so as to hit us in the eye. This well-known electromagnetic law can be stated thus: "When a conductor situated in a steady magnetic field carries a current, there is a mutual action between the steady magnetic field and that of the current in the conductor. By virtue of this, a force exists which propels the conductor at right angles to itself and at right angles to the field." Now this is a really simple case. The general case where the field and conductor are at an angle in space, and when the conductor is curved and not straight, is more difficult. It is in reality the case we have in point, i.e., the coil-drive loud speaker.

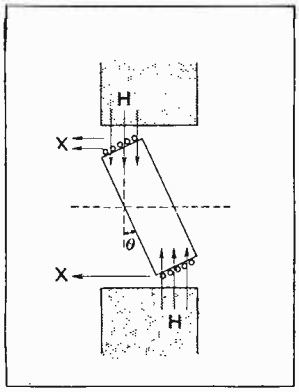



Fig. 4.—Diagram showing coil tilted in pot magnet. The arrows X show the direction of the force on the coil at the upper and lower points. H represents the magnetic field. The central pin has been omitted. Note that θ is the angle of inclination of the coil to vertical.

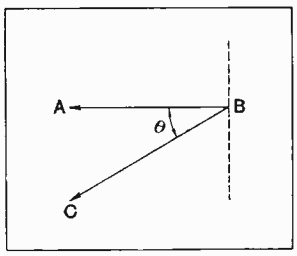



Fig. 5.—Diagram showing direction of forces in the coil. A B is the direction of the force at the top of the coil. B C is the direction of the force at the centre of the coil (see Figs. 3 and 4).

To simplify the problem we must take a single turn and imagine it to consist of myriads of extremely small, straight portions (i.e., chords) arranged to form a circle. Then the force on each of these minute chords is considered separately, and afterwards all the forces added up to make a grand total. This latter, as is well established in mechanics, can be represented in magnitude and in direction by a single force. At the moment we are not so concerned with its actual magnitude as with its direction relative to the axis of the coil.

Turning to Fig. 3 we have an exaggerated view of the coil in the pot when the diaphragm surround is loose and flabby. The side view consists of two ellipses, one representing the front and the other the back of the coil. At the point P the wire of the coil is in the plane of the paper. The magnetic field is at right angles to the paper. Remembering that motion occurs at 90 deg. to both field

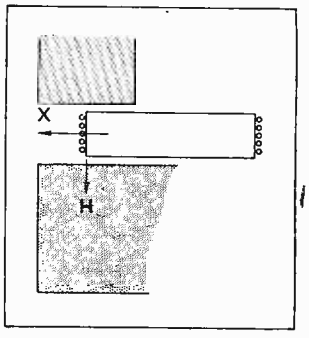



Fig. 6.—Diagram illustrating coil in an extreme (hypothetical) position. The lower part of the pot is not shown.

**Resonance in Moving Coil Loud Speakers.—**

and conductor, what is the result? Obviously, the force acts along the arrow X, which is inclined to the axis of the pot at the same angle as the coil. Clearly, the same result is attained at the opposite side of the coil.

Now let us focus our attention on the top of the coil. In Fig. 4 the lines of force are in the plane of the paper, as shown by the arrows H, but the wire of the coil (at the top or bottom only) is at right angles to the paper, i.e., the tangent to any particular turn of wire is at 90 deg. to the paper. The force on the coil being at 90 deg. to both wire and field is in the direction X. Between the points P and Q the problem resolves itself into solid geometry, which is beyond our present purpose. However, we can argue from the two preceding cases. At the top or bottom of the coil the force acts parallel to the axis, whereas at the centre it acts downwards. For any intermediate position the force acts at an angle between AB and CB of Fig. 5. But, in addition, there are forces acting on opposite sides of the coil which tend to increase its diameter. These forces are substantially balanced. Moreover, the resultant force is in a downward direction (obliquely). This force can be resolved into two component forces: (*a*) along the axis, (*b*) at right angles to the axis.

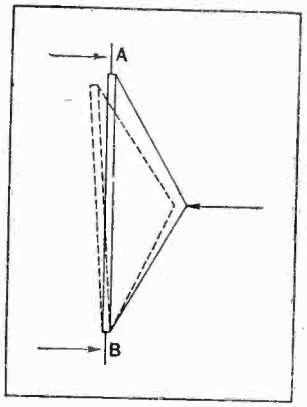



Fig. 7.—Illustrating effect of inequalities in constraint of surround.

Hitherto we have confined our attention to static conditions, i.e., constant current in the coil. In practice the current is alternating, so also are the forces. Since the forces change in direction (*a*) causes the diaphragm to move to and fro on its axis, whilst (*b*) causes it to rock or wobble at right angles to its axis.

The forces acting at each side of the coil, and alternately tending to burst and squash it, can be visualised more readily by selecting a limiting position for the purposes of illustration. In Fig. 6 the coil is shown in such a position. The field is H, and the direction of the current at 90 deg. to the paper, hence the force is in the direction X, tending to burst the coil.

These forces will, in the case of Fig. 4, cause the coil to alter its shape with the frequency. At a certain frequency resonance may occur.

An additional system of forces is also called into play due to the mutual actions of the current in the wires of the coil. When two parallel wires carry currents in the same direction, there is a force of attraction between them. Thus there will be an attraction *each* half alternation, i.e., the frequency of attraction will be double that of the supply. The coil will, therefore, expand and contract radially and longitudinally (like bellows) twice every cycle, and there may be resonance. The forces are larger than one would suspect, since the wires are quite close together, especially if the insulation is enamel. The forces are greater with a low resistance (transformer coupled) than with a high resistance coil, owing to the larger current. Force $= \frac{2i^2}{d}$ per unit length of wire where $i$ = current and $d$ = distance between wires.

If the action of the force were purely axial, it is possible to get wobble if the constraint of the surround is asymmetrical. For example, in Fig. 7 if the constraint at B is greater than that at A, the diaphragm will move further to the left at A than at B. Clearly, this will culminate in a wobble. Inequality of constraint in an irregular manner round the periphery of the diaphragm will give rise to a wobble combined with a rotary motion,

(*To be concluded.*)

**Short-wave Stations.**

A correspondent in Ceylon sends us the following list of short-wave transmitting stations in French Indo-China :—

| | |
|---|---|
| **HVA 1** | Hanoi, Tonkin, 30.80 metres. |
| **HVA 2** | Hanoi, Tonkin, 29.50 metres. |
| **HVA 3** | Hanoi, Tonkin, 36 and 44 metres. |
| **HVN** | Saigon, Cochinchina, 28.80 and 24 metres. |
| **HVJ** | Dalat, Annan, 27.50 metres. |
| **HVK** | Vientiane Laos, 36.50 metres. |

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**Belgian Amateurs.**

Mr. Louis Era (EB 4BC), the district manager of the "Reseau Belge" for Antwerp, has been working with a portable transmitter while on a holiday at Bois de Villers, Namur. The call-sign used is 4KA and the transmitter is of the Hartley type with an unput of 6 to 8 watts to a TB 04/10 Philips valve. As there were no facilities for charging accumulators, Mr. Era was obliged to take his supply from the A.C. mains, which gave a rather rough note. He used a single wire aerial 120ft. in length, stretched about 12ft. above ground level, and worked on 45.32 and 22 metres. With this little set he was able to communicate with the New Zealand stations 4AO, 4AE, 2GA and 1FE, and with districts 1, 2, 3, 4 and 8 in U.S.A. he also got into touch with Tomsk and Algiers. His signals were reported as R9 from Finland and Yugo-Slavia.

Mr. Era wishes to express his thanks to the following British stations who have helped him in his tests from 4KA :—6WT, 5YN, 5PH, 6CO, 6BB, 5RS, 5BZ, 6NZ, 6QC, 6GS, 2JU, 6CL, 6IY, 6DH and 6YX. He greatly appreciates the good work done by British amateurs, many of the stations being crystal-controlled. He hopes to convert his own station at Antwerp to crystal-control this winter.

Belgian amateurs have been busy during the past month, especially 4FE, 4GK, 4EA, 4JD, 4GW, 4RA, 4VO and 4EW.

Mr. K. Mahieu, 4AU, has been in communication with stations at Accra, on the Gold Coast, and at Recife and Bahia, in Brazil; he is also the first Belgian amateur to get into two-way communication with Paraguay, the South African station being SG A2.

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## TRANSMITTERS' NOTES

**A Short-wave Listener.**

Mr. J. Speakman (BRS 98) informs us that he is willing to listen for any station on 8 or 10 metres. Up to the end of September he had heard eight stations on these wavelengths, but three of these were subsequently discovered to be harmonics of 20-metre waves. The remaining five comprised one British and four American stations.

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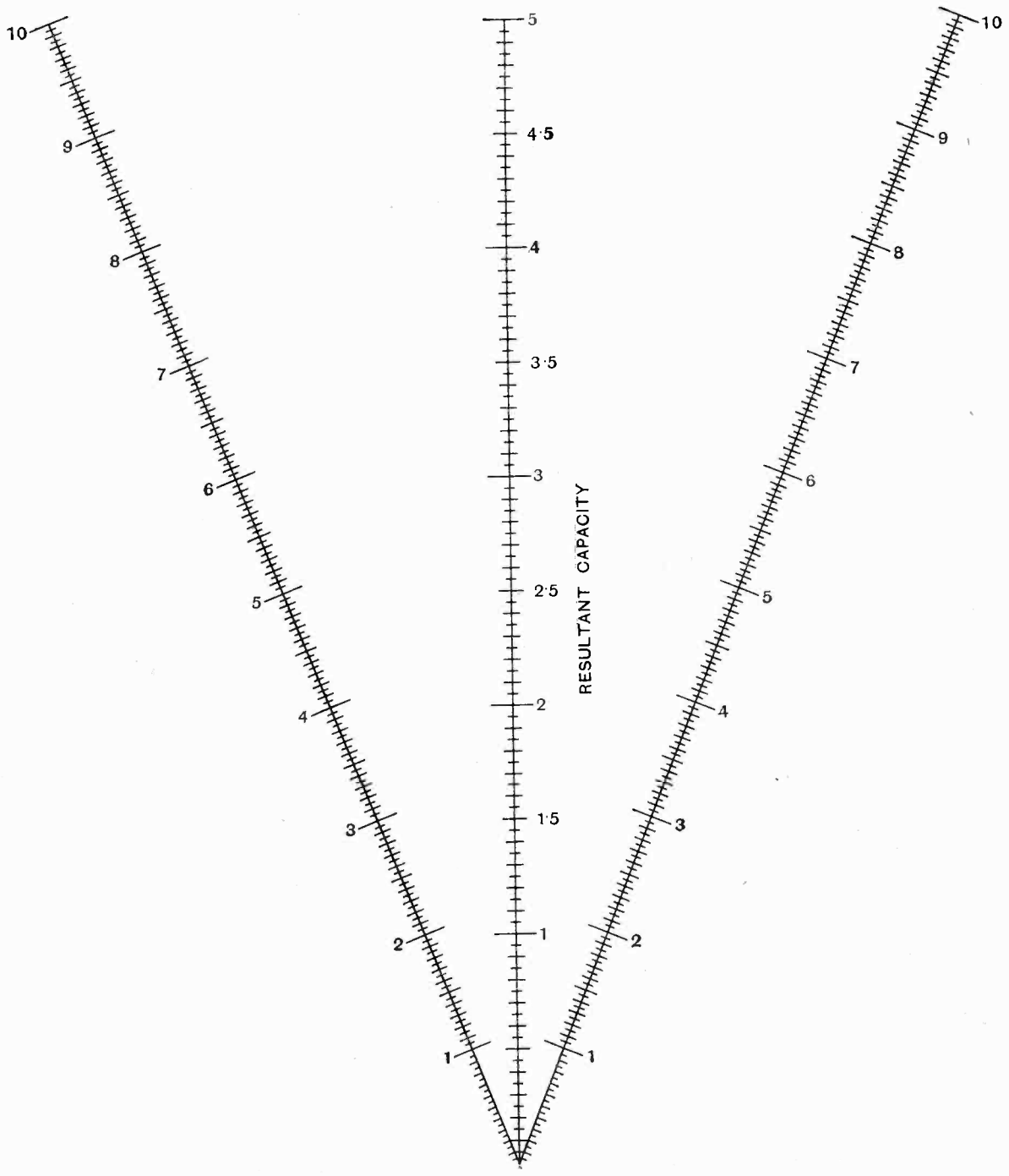
**Australian and New Zealand Amateurs.**

Referring to the note on page 390 of our issue of September 26th, Mr. K. C. Wilkinson, G5WK, suggests that the difficulty which Australian and New Zealand amateurs are stated to have experienced in picking up British stations may be due to the fact that they are uncertain of the wavelength on which these stations are working. He and several other transmitters in South London are on the air every morning looking out for A's and Z's, and from September 23rd to 26th he established connection with several stations in the Antipodes on 23 metres.




## TWO CAPACITIES IN SERIES

W. W. ABAC

Nº 12

**USEFUL DATA CHARTS (No. 12).**

**The capacity of condensers in series. For explanation see text which accompanied last week's abac.**

# PORTABLE TRANSMITTER.

## Simple Design with Interchangeable Coils and One-dial Tuning.

By R. L. SMITH-ROSE, D.Sc., A.M.I.E.E., and E. L. HATCHER.

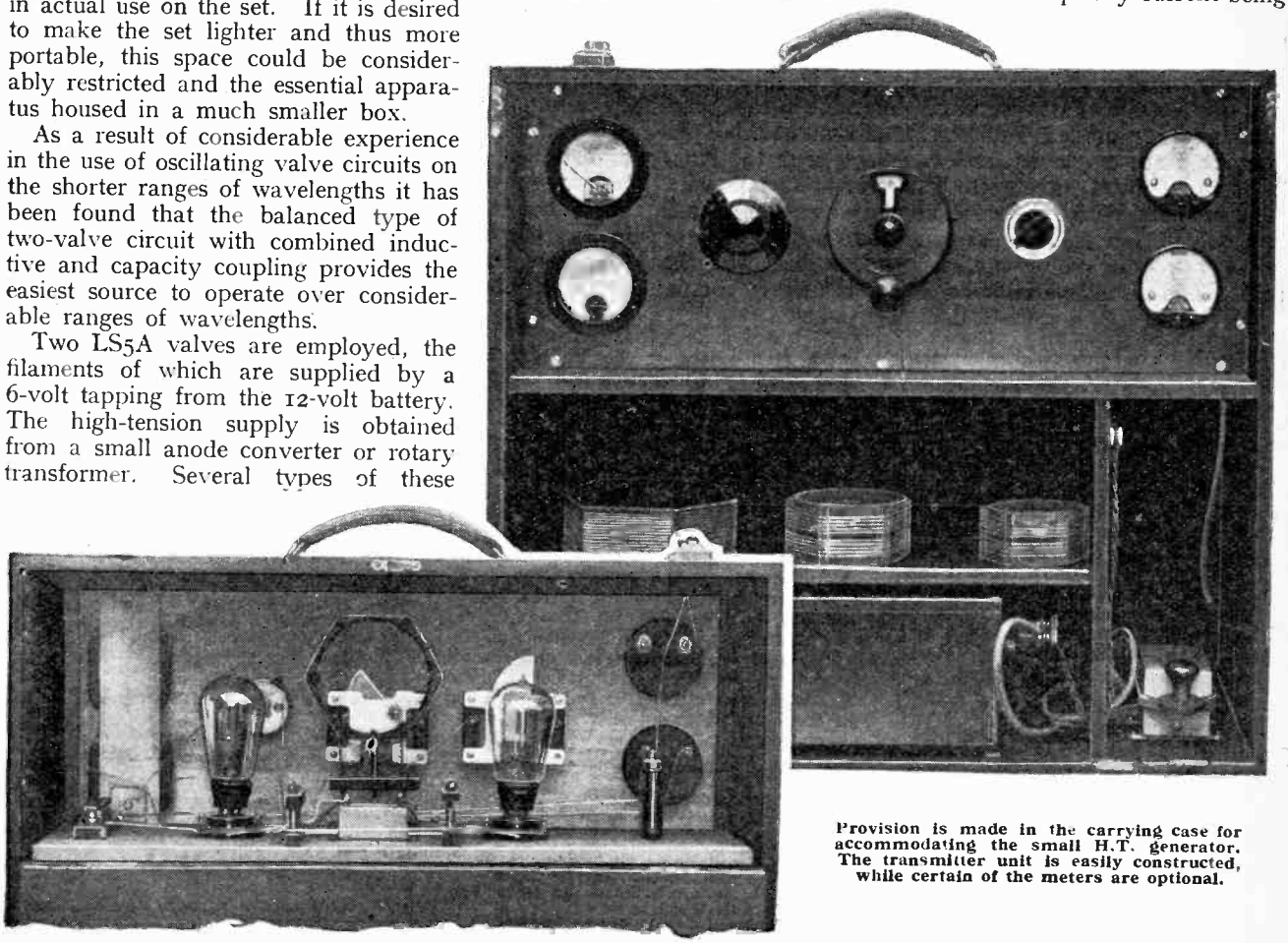
IN practically all branches of wireless experiment and research it is found necessary at some time or other to make use of a transmitting set which can be moved about, by hand over short distances or by motor car over longer distances. The transmitter described in this article was designed to provide a lower-power source of radio-frequency radiation operating over a moderately large range of wavelengths and suitable for working to a wireless direction-finder at distances of the order of ten miles. This set operates entirely from a 12-volt accumulator battery, and in the case of the transport of the set by motor car it can be run direct from the car battery, if this be of the 12-volt type.

With the exception of the battery the whole set is comfortably contained in a box 24in. by 21in. by 13in., and weighing about 56lb. It will be seen from the accompanying illustration that the box leaves ample accommodation for housing coils, spare valves, etc., not in actual use on the set. If it is desired to make the set lighter and thus more portable, this space could be considerably restricted and the essential apparatus housed in a much smaller box.

As a result of considerable experience in the use of oscillating valve circuits on the shorter ranges of wavelengths it has been found that the balanced type of two-valve circuit with combined inductive and capacity coupling provides the easiest source to operate over considerable ranges of wavelengths.

Two LS5A valves are employed, the filaments of which are supplied by a 6-volt tapping from the 12-volt battery. The high-tension supply is obtained from a small anode converter or rotary transformer. Several types of these machines are now available operating from a 12-volt input, and delivering from 25 to 100 milliamperes at from 250 to 1,000 volts. If adequate portability is required one of the smaller sizes of these machines must be used which gives an ample power supply for the valves in question. The machines can be obtained with a suitable smoothing circuit incorporated in a self-contained unit. In actual transmission tests this smoothing arrangement has been found to be quite adequate for continuous wave working, and it is only at the shortest distances that the generator hum can be heard in the receiver as a slight modulation. The actual output given by this generator is controlled by a rheostat in series with the low-tension armature winding.

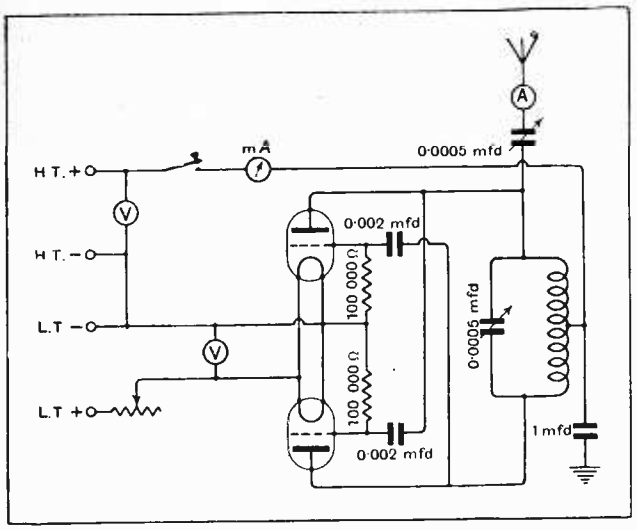
On the transmitter panel, instruments are provided for reading the applied voltages to the valve filaments and anodes respectively, the combined anode currents of the two valves, and the radio-frequency current being



**Provision is made in the carrying case for accommodating the small H.T. generator. The transmitter unit is easily constructed, while certain of the meters are optional.**

**Portable Transmitter.**

fed into the aerial. A suitable rheostat with an "off" position provides a control for the valve filaments, while signalling is simply carried out by the use of a Morse




**Balanced two-valve transmitting circuit with capacity coupling suitable for covering a wide wavelength range.**

key in the high-tension circuit. A great advantage possessed by this balanced two-valve circuit is that there is only a single circuit to be tuned, and the capacity coupling between the valves can be fixed in value for a very wide range of wavelengths. Special centre-tapped inductances, provided with a suitable type of three-pin mounting, are employed, and can be seen in the illustrations. Typical wavelength ranges of these coils with the condenser of 0.0005 mfd. employed are 80 to 200 and 200 to 500 metres. Thus a wavelength range of from 30 to 4,000 metres can easily be obtained with six coils. The second variable condenser is used to couple the aerial to one end of the coil, the earth connection being taken from the centre of the coil, *i.e.*, the H.T. +, through a by-pass condenser of 1 mfd. capacity.

On any wavelength the aerial current obtained depends upon the actual aerial employed and the input power supplied to the set. It is also desirable to decrease the earth resistance as much as possible, and where an efficient buried earth connection cannot be obtained, the use of a large copper-gauze earth mat is to be recommended. In some field experiments in which the transmitter has been used recently, an aerial having a constant length of 35ft. was employed in conjunction with an earth mat of dimensions 14ft. by 2ft., and the H.T. input power was restricted to about 6 watts 25 milliamperes at 250 volts. The current obtainable in the aerial under these conditions varied from 125 milliamperes at 100 metres to about 60 milliamperes at 500 metres. This radiation was found to be quite adequate for taking very accurate bearings on a small portable direction-finder at a distance of six miles, and would provide a signalling range of several times this distance. By suitably adjusting the aerial to the wavelength employed, the aerial current can be maintained in excess of 100 milliamperes over the full range of from 30 to 4,000 metres. On the longer wavelengths, however, the dimensions of the aerial required detract somewhat from the portability of the outfit.

While the above-mentioned values of aerial current were adequate for the particular experiments required at that time, these values can be considerably increased by supplying the set with greater high tension power and voltage, for the LS5A valves employed are capable of handling an input of 20 watts. It has not so far been required to use the set for telephony transmissions, but it would be a comparatively simple matter to fit a telephony attachment for modulating the radio-frequency oscillations, using one of the standard circuit arrangements.

## BOOKS RECEIVED.

"Wireless Step by Step," by "Dictron." A simple outline of the principles of radio communication, intended for the non-technical reader. Starting with elementary facts and early history and leading gradually to transmission and reception by wireless telephony, with a chapter on telephones and loud speakers, batteries, accumulators and mains supply. Pp. 185, with 46 diagrams. Published by George Newnes, Ltd., London, price 2s. 6d.

o o o o

"The Past and Future Development of Electricity and its Bearing on World Peace," by H. G. Massingham. A lecture given at Brighton for the benefit of the local branches of the League of Nations Union. The author visualises a time when the water power of the Victoria Falls, at present running to waste, may be converted into electrical energy on the spot and transmitted by wireless to suitable receivers in this country. Pp. 31, with frontispiece of the Victoria Falls. Published by Hutchinson and Co., Ltd., London, price 6d. net.

## SOUTH AMERICAN AMATEUR STATIONS.

**South American Amateur Stations.**

We are indebted to our contemporary, *Revista Telegraphica*, for the following new call-signs allotted in Argentina, Chile, and Brazil, which supplement and correct the lists previously published in the R.S.G.B. Annual for 1928 and in our issue of September 26th :—

**Argentina.**

| | |
|---|---|
| DI1 | C. A. Tamburini, San Lorenzo 71, Ramos, Mejia. |
| DI3 | E. A. Martinez, Calle 48 No. 665, La Plata |
| DI4 | E. A. Stegmann, Estancia Los Toldos, Partido Ramallo, Estacion La Violeta, F.C.C.C. |
| DI6 | A. Furiati, Moreno 301, Tres Arroyos. |
| DI7 | E. Campoamor, 25 de Mayo 420, Moron. |
| DI9 | I. L. Curtoy, Boulevard San Martin 584, Coronel Brandsen. |
| DJ4 | R. Ferrari, Calle 13, 57 y 58, La Plata. |
| DJ5 | N. Saracco, Constitucion 514, S. Fernando. |
| FK1 | A. A. Fazzio, Calle 4 de Enero 2591, Santa Fe. |
| FK2 | C. L. Cuneo, Cordoba 2413, Rosario. |
| LB2 | J. C. Castells, Independencia 473, Resistencia (Chaco). |
| EK4 | J. Grana Jr., N. de la Riestra. |
| EN2 | E. Packmann, Calle 20, No. 734, Bolivar. |
| EO9 | A. Arroyo, Mechita. |
| EL6 | J. J. Del Carril, Recalde. |
| PA1 | E. Sanchez, Caucete. |
| GG5 | B. Corradi, Pilar (Santa Fe). |
| EM8 | S. Labal, General Lamadrid. |
| EJ4 | J. H. Grigera, Pergamino. |
| FP2 | F. M. Fontan, Cuartel 12, Olavarria. |
| FG8 | J. A. Arenaza, Soledad (Santa Fe). |

*Delete.*

| | |
|---|---|
| EA4 | B. S. Ramos, Azul. |
| EF4 | C. Del Carril, Monte (B.). |
| EG7 | D. Videla Dorna, Monte (B.). |
| EJ7 | L. A. Rojo, Pergamino. |
| GE6 | N. Quijano Varela, Santa Teresa. |
| HA9 | R. Cordoyro, Canada Verde. |
| VK3 | P. Richeri, Bariloche (Rio Negro). |

*Corrections.*

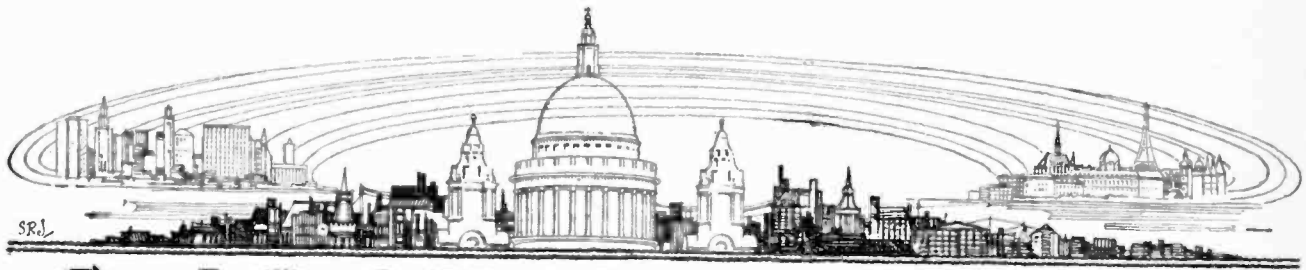
| | |
|---|---|
| BY1 | For L. A. Grecco read L. A. Gnecco. |

**Chile.**

| | |
|---|---|
| 3CM | L. Rocatagliata Freire 669, Santiago. |
| 3CW | F. Correa, M. Rodriguez 59, Santiago. |
| 3CO | H. Munoz, Toesca 1982, Santiago. |
| 4AD | A. Brito, Casilla 336, Talca. |

**Brazil.**

| | |
|---|---|
| 3CTP | Commissao de Terras de Palmeira Palmeira (R. G. do Sul). |
| 3CAI | Thermas de Irahy, Palmeira (R. G. do Sul). |



# CURRENT TOPICS

## Events of the Week in Brief Review.

### RUSSIA WANTS MORE LISTENERS.

Russia remains the "dark horse" in European wireless, but it is believed that there are sixty-seven broadcasting stations working. The estimated number of receiving sets in use is only 250,000, or fewer than 4,000 to each transmitter!

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### FOREST FIRE THREATENS BORDEAUX STATION.

The famous high-power wireless station at Croix d'Hins, twelve miles from Bordeaux, was threatened by a forest fire last week. The station is owned by the French Post Office, and is officially known as Bordeaux Lafayette.

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### WINGED WORDS.

"When one thinks of the advance of wireless from 1914 to 1918, and then from 1918 to 1928, one can hardly imagine what will be achieved by 1938."—Commander E. L. C. Grattan, R.N., Assistant Controller of the Central Telegraph Office, G.P.O.

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### BRITISH APPARATUS FOR GERMANY.

The German State Telegraphs have just placed an order with Messrs. Newton Bros. (Derby), Ltd., of Kingsway, London, W.C.2, for a 50-kilowatt, 10,000-volt, D.C. generating set. This generator is motor driven and is similar in type, size, and voltage to the sets installed at 5GB, Daventry, and the Marconi Beam station at Dorchester.

The new generator is intended for the Zeesen broadcasting station near Königswusterhausen.

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### WHEN "C.O.D." IS COSTLY.

Where large orders are concerned the Cash on Delivery system is not expensive, but it may not be generally realised that for small parcels the system sometimes doubles the cost to the customer. The system is only applicable to parcel post, and the cheapest parcel post rate is 6d., which, with the minimum charge of 4d. for collection, involves a total of 10d. for a small package which can often be sent for 2d. or 3d. by letter post.

Users of the miscellaneous advertisements section would be well advised to consider the cost of the goods before making use of the C.O.D. system.

### FOR SICK SETS.

The Bristol Listeners' Club runs a wireless hospital for sick and crippled sets.

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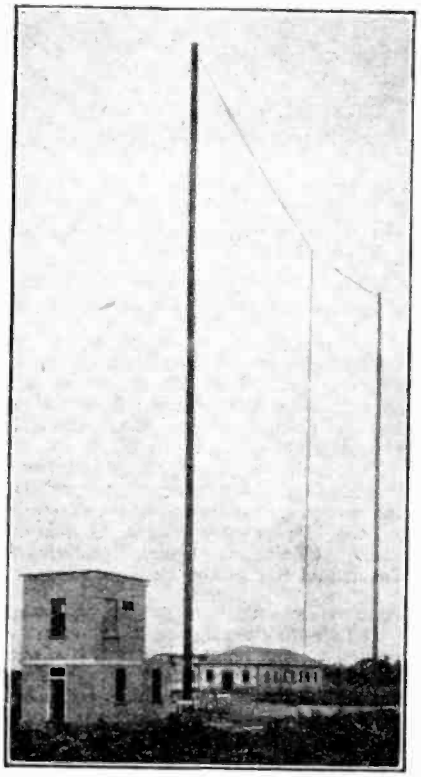
### LOUD SPEAKERS *v.* HECKLERS.

The new loud speakers in the Prussian Landtag at Berlin have been installed, it is stated, to enable Ministers to shout down interruption. The microphones are fitted in front of the President's seat, the speakers' tribune, and the Ministerial bench. They are under the control of the President.



**WELL KNOWN TO ETHER SEARCHERS. A glimpse of the Milan broadcasting station (IMI), which can be heard daily on 549 metres. The station is owned by the Unione Radiofonica Italiana, and is equipped with a Marconi transmitter giving 7 kilowatts in the aerial.**

### A GOOD CAUSE.

South African listeners are subscribing to a fund for equipping lighthouses with broadcast receivers.

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### AERIAL BELONGS TO THE TENANT.

A discussion over the ownership of an aerial had a sequel in the Bridlington County Court last week, when Miss Tipler sued Samuel Gryman, her tenant, for 75s., the reputed value of a wireless aerial attached to her building. The plaintiff admitted that she had refused to permit Gryman to take down the aerial, contending that it was her property. Judge Beazley held that the aerial was the tenant's fixture.

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### SIR THOMAS BEECHAM AGAIN!

The efforts of research engineers during the past year in the perfecting of cone and moving-coil loud speakers have failed to convert Sir Thomas Beecham, whose annual denunciations of wireless are becoming a British institution. Sir Thomas has just described the music of the loud speaker as "this terrible sound, this grinding and grunting of all the hogs out of all the hoggeries in the world."

It is understood that the British wireless industry has bravely decided to continue for another year.

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### THE ZEPPELIN'S WIRELESS.

The Graf Zeppelin which flew over Suffolk last week made the utmost use of its wireless equipment. During the trip over the North Sea a running commentary was provided by a journalist on board and relayed through a number of German broadcasting stations. Messages were also transmitted from time to time giving the airship's position. An "appointment" was made with Berlin for 9 o'clock on Wednesday morning, and the waiting crowds in the capital were able to see the Zeppelin fulfil its promise at the hour stated.

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### THE EXCUSE THAT FAILED.

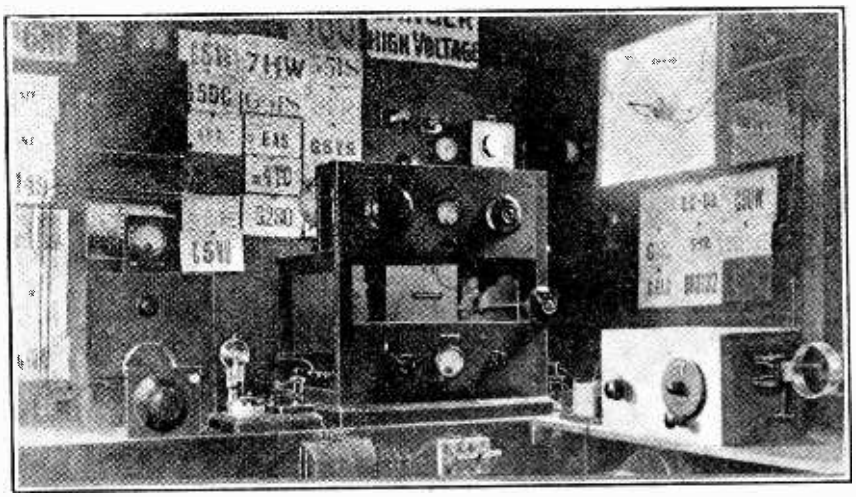
A wireless pirate fined at Plymouth pleaded that he thought that the licence owned by another tenant covered all sets in the same building. The misapprehension cost him 20s.

### AMERICA'S "GENERAL POST."

The biggest concerted wavelength shuffle in the history of broadcasting will take place in the United States on November 11th next, when 629 stations, acting upon the instructions of the Federal Radio Commission, will jump up or down the wavelength scale to their allotted places in the broadcast waveband.

This "general post" is the outcome of nearly a year's work, during which the Radio Commission has considered the claims of no fewer than 732 existing broadcasting concerns, not to mention hundreds of applicants who came forward with proposals for new stations.

The Commission has struck a blow at "chain broadcasting" by ordering that the forty stations of 5 kilowatts and



A SCOTTISH AMATEUR STATION. G 6UU, owned and operated by Mr. T. W. Readshaw, at Bonnyrigg, Midlothian. The transmitter is of the T-P T-G type, with H.T. motor-generator supply at 400 volts. The oscillating valve, Marconi T15, takes 10 ma. and with this input Belgium, France and Denmark have been regularly worked on telephony using grid control

more be restricted to one hour only per day of simultaneous broadcasting between 7 p.m. and midnight unless the transmitters are separated by a distance exceeding 300 miles, or are operated on the same wavelength.

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### U.S.-JAPAN WIRELESS LINK.

A direct wireless service between San Francisco and Tokio is about to be put into operation by the Radio Corporation of America.

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### RADIO PLANS FOR INDIAN AIR ROUTE.

The Indian Government has sanctioned the installation of short-wave apparatus at the Karachi wireless station for communication with airships and other landing grounds.

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### OSRAM VALVES AS PRIZES.

The General Electric Company offered prizes of a set of valves to members of the public who gave the nearest forecast of the number of enquiries at the Osram stand on each day of the National Radio Exhibition. The winners are as follows: J. Sulley (Sheffield), W. B. Jago (Hampton Wick), C. Durnford (Eastbourne), H. Franklin (London, S.W.7), W. E. Wilkins (Cardiff), B. Goodex (London, E.6), C. Utteridge (London, E.16), and J. A. Pillinar (Sutton).

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### MILK PRESERVATION BY WIRELESS.

Wireless finds yet another application, according to a message from Vienna, in the preservation of milk. The announcement is made by the Department of Agriculture in Vienna, which states that the discovery is due to Professor Seidel.

The first step in the prevention of sour milk being its sterilisation, Professor Seidel carries out this process, not by the usual method of boiling, but by gently warming the milk and then submitting it to a bombardment of high-frequency oscillations. He has discovered that milk submitted to this treatment will remain in good condition for a month.

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### COURT LINE WIRELESS.

Five complete wireless installations for the new Court Line steamers have been ordered from the Marconi International Marine Communication Co., Ltd., by Messrs. Haldin and Co., Ltd.

The equipment, comprising 1½ kilowatt transmitters, emergency transmitters, and two-valve receivers, will be installed in the *Geddington Court*, *Rossington Court*, *Tilsington Court*, *Quarrington Court*, and *Sinnington Court*.

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### U.S. WIRELESS *v.* TELEGRAPH WAR.

The Radio Corporation of America has applied to the Federal Radio Commission for permission to use sixty-seven short-wave channels and to establish a domestic wireless service in direct competition with the telegraph service by wire of the Western Union and the postal telegraph companies (says *The Times*). The Corporation intends to establish offices in thirty of the principal commercial centres of the United States. Ninety-five per cent. of its present business originates in those cities.

### THE MANCHESTER SHOW.

Daily demonstrations of the Fultograph system of picture reproduction are to be given at the Manchester Radio Exhibition to be held under the auspices of the *Evening Chronicle* in the City Hall from October 22nd to November 3rd.

Arrangements for the Exhibition are now well in hand, and it is stated that the stands will be greater in number than at any previous wireless show in Manchester. It is understood that the B.B.C. will be represented by the historical display and tableaux which were a feature at Olympia.

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### RADIO EXHIBITION IN GUILDFORD.

The Guildford and District Radio Exhibition this year will be held in St. Saviour's Halls from October 16th to October 20th inclusive. It will be open on the first day from 3 p.m. to 9.30 p.m. and on subsequent days from 2.30 p.m. to 9.30 p.m. It is expected that the Baird Television Development Company will provide television demonstrations. Local wireless firms will be well represented and a stand will be occupied by the Guildford and District Wireless Society, which is organising the exhibition.

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### SHORT WAVES FROM KENYA COLONY.

The Nairobi broadcasting station now transmits on 35 and 400 metres, and it is hoped that programmes on the former wavelength will be audible throughout the world. The times of transmission are 4 p.m. to 7 p.m. G.M.T. daily, Sundays included.

The Nairobi station, which uses the call signs 7LO, was opened in June last and has since made a name for itself among DX enthusiasts.

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### WIRELESS RELAY SERVICE FOR HULL?

The Hull Corporation Works Committee is considering an application by the Broadcast Relay Service, Ltd., for permission to erect overhead wires. The company proposes to establish a broadcast relay exchange in the city to enable subscribers, by the pressing of a switch, to be connected direct to a high power broadcast receiver at the company's exchange.

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### MARCONI MARINE DIVIDENDS.

In announcing an interim dividend of 7½ per cent. actual, less tax, upon the 1,192,726 shares of £1 each, the directors of the Marconi International Marine Communication Co. intimate that the estimated profits for the year 1928 will enable them to recommend a final dividend at the same rate, making 15 per cent. for the whole year.

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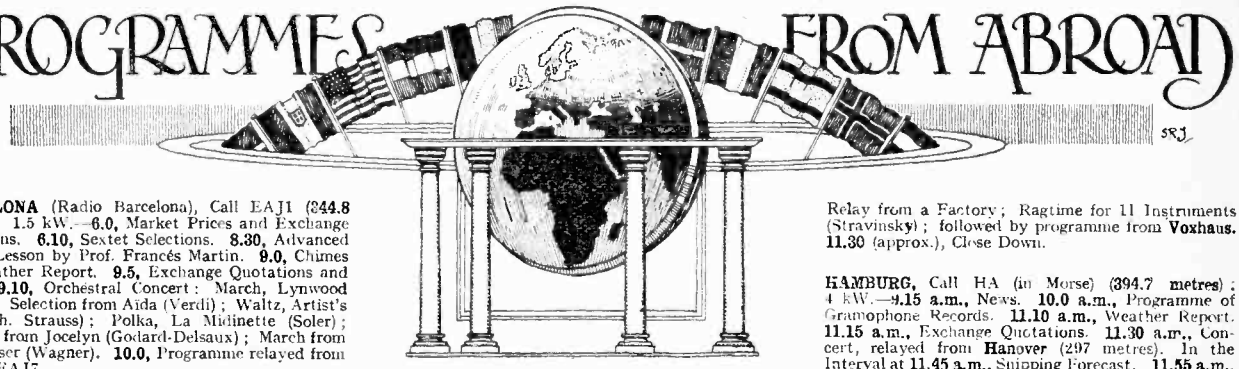
### IRISH AMATEURS TO UNITE?

It is understood that negotiations are in progress for the amalgamation of the Wireless Society of Ireland and the Irish Radio Transmitters' Society. Those who favour the step contend that Ireland is too small a country to contain more than one large wireless society with departments working on identical lines. The Wireless Society of Ireland has a flourishing transmitters' section.

# PROGRAMMES FROM ABROAD



## SATURDAY, OCTOBER 13th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**BARCELONA** (Radio Barcelona), Call EAJ1 (**244.8 metres**) ; 1.5 kW.—**6.0,** Market Prices and Exchange Quotations. **6.10,** Sextet Selections. **8.30,** Advanced French Lesson by Prof. Francés Martin. **9.0,** Chimes and Weather Report. **9.5,** Exchange Quotations and News. **9.10,** Orchestral Concert : March, Lynwood (Hume) ; Selection from Aïda (Verdi) ; Waltz, Artist's Life (Joh. Strauss) ; Polka, La Midinette (Soler) ; Berceuse from Jocelyn (Godard-Delsaux) ; March from Tannhäuser (Wagner). **10.0,** Programme relayed from **Madrid,** EAJ7.

**BERGEN** (**370.4 metres**) ; 1.5 kW.—**6.0,** Programme for Children. **6.30,** Talk for Girls. **7.0,** Orchestral Selections. **7.50,** Topical Talk. **8.0,** Recital of Ballads. **8.30,** Mrs. Maaloe, Talk : Norwegians in Denmark. **9.0,** Weather Report, News and Time Signal. **9.15,** Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) (**1,250 metres**) ; 40 kW. —**3.30,** Dr. Meynen, Talk : Civil Servants' Expenses. **4.0,** Programme from **Hamburg. 5.0,** Heinrich Bachmann, Talk : Everyday Democracy. **5.30,** Elementary Spanish Lesson. **5.55,** Herr Ohrmann, Talk : Bruckner. **6.20,** Dr. Eberhard Preussner, Talk : Modern Literature. **7.0** (approx.), Programme from **Leipzig,** followed by Programme from **Voxhaus.**

**BERLIN** (Voxhaus) (**484 metres**) ; 4 kW.—**3.0,** Dr. Paul Frank, Talk : Medical Hygiene. **3.30,** Reading by Paul Morgan. **4.0,** Concert : Overture to The Mute of Portici (Auber) ; Waltz from Die Puppenfee (Bayer) ; Erinnerung an Bayreuth (Wagner-Morena) ; Spanish Dance, No. 8 (Sarasate) ; Song, Nur wer die Sehnsucht kennt (Tchaikovsky) ; Danse Macabre (Saint-Saëns), followed by Announcements. **5.30,** Talks. **6.0,** Talk by Willy Hahn. **6.30,** Wolfgang Schwartz, Talk : The Dreams of Peace and the Reality of War. **7.0,** Concert : Overture to Fatinitza (Suppé) ; Tenor Solo from The Geisha (Jones) ; Soprano Solos from Die Puppé (Audran) ; Aus den Bergen-Waltz, Op. 292 (Joh. Strauss) ; Soprano and Tenor Duets from (a) A Waltz Dream (Oscar Straus), (b) Der Tanz ins Glück (Stolz) ; Selection from The Czarewitsch (Lehár) ; Soprano and Tenor Duets from (a) Die Herzogin von Chicago (Kálmán), (b) Liebe im Schnee (Benatzky) ; March, Prince Eugen (Joh. Strauss). **8.0,** Arthur Rimbaud Programme. **8.30,** Kurt Lubinski, Talk : Eastern Lands of the Future—The Awakening of Siberia, followed by News, Weather Report and Dance Music. **11.30** (approx.), Close Down.

**BERN** (**411 metres**) ; 1.5 kW.—**6.29,** Time Signal and Weather Report. **6.31,** Teddy Bear's English Half-hour. **7.0,** Symphony Concert, relayed from **Basle** (1,010 metres) : Symphony in F Major (Brahms) ; Symphony in G Minor (Mozart) ; Fifth Symphony in C Minor (Beethoven). **9.0** (approx.), News and Weather Report. **9.15,** Orchestral Selections. **9.35,** Dance Music. **11.0** (approx.), Close Down.

**BRESLAU** (**322.6 metres**) ; 4 kW.—**5.20,** Talk in Esperanto by Elsa Koschate. **5.30,** Talk by Rudolf Mirbt. **6.25,** Shorthand Lesson. **6.50,** Prof. Meyer, Natural Science Talk : The Shape of the World in Modern Science. **7.30,** Light Variety Concert, with Karl Schnog : L'Ile Tulipatan (Offenbach) ; Theatre Anecdotes ; Flirt sous bois (de Taye) ; Styrian Folk Songs with Lute Accompaniment ; Rhenish Blood (Hannemann) ; Humorous Selections ; Styrian Folk Songs with Lute Accompaniment ; Humoresque (Mikulicz) ; Light Satire ; March, Nobby Gobs (Frey). **9.0,** News and Dance Music. **11.0** (approx.), Close Down.

**BRÜNN** (**441.2 metres**) ; 3 kW.—**4.30,** Talk. **4.45,** German Transmission, Der Freischütz (Weber), The Cricket (Goldmark). **5.15,** Weekly Report. **6.0.** Programme from **Prague. 7.15,** Programme from **Olomouc** (See Prague). **9.0,** Programme from **Prague.**

**BRUSSELS** (**508.5 metres**) ; 1.5 kW.—**5.0,** Dance Music from the St. Sauveur Palais de Danse. **6.0,** Elementary English Lesson. **6.25,** Advanced English Lesson. **6.45,** Trio Concert : Here and Here (Chapelle) ; Hérodiade (Massenet) ; Blumen Suite (Siède). **7.0,** Gramophone Selections. **7.30,** "Radio-Chronique." **8.15,** Gala Concert. Topical Talk during the Interval. **10.15,** News and Close Down.

**BUDAPEST** (**555.6 metres**) ; 35 kW.—**6.0,** Cabaret Concert. **7.20,** Concert by a Military Band. **8.20,** Musical Humour. **8.40,** Concert followed by Time Signal, Weather Report, and Horse Racing Results and Tzigane Music from the Hotel Danube Palace.

**COLOGNE** (**283 metres**) ; 4 kW.—**11.10 a.m.,** Programme from **Langenberg. 12.5,** Orchestral Concert from the Works of Joh. Strauss : Overture to Carnival in Rome ; Waltz, Gross-Wien ; Intermezzo from A Thousand and One Nights ; Selections from Die Fledermaus ; Waltz, Delirium ; Selection from Cinderella ; Polka, Neue Pizzicato ; Waltz, Perlen der Liebe ; Egyptian March. **1.30,** Household Hints. **2.40,** Programme from **Langenberg. 3.0,** Talk and Recitation on the Occasion of the 10th Anniversary of the Death of Gerrit Engelke. **3.30,** Programme from **Königswusterhausen. 4.10,** Talk for Women. **4.45,** Orchestral Concert : Selections from Jolanthe (Tchaikovsky) ; Overture to Raymond (Thomas) ; Serenades, (a) Frühling ist's (Senig) ; (b) Küsse im Dunkeln (Micheli) ; Waltz, Faschingsfee (Kálmán) ; March, Funk Heil (Hoffmann). **5.30,** Talk : From the World of Perception to the World of Speculation. **6.15,** Programme from **Langenberg. 6.40,** Dr. Otto Förster, Talk : German Cathedrals. **7.0,** Variety Concert including "Nicht Eifersüchtig," Farce in One Act (Müller). **9.30** (approx.), News, Sports Notes, Announcements, Orchestral Selections and Dance Music. **12.0 Midnight,** Close Down.

**CRACOW** (**566 metres**) ; 1.5 kW.—**6.0,** Various Announcements. **6.50,** Talk in English. **6.55,** Agricultural Report and News. **7.30,** Operetta from **Warsaw. 9.30,** Restaurant Concert. **10.30** (approx.), Close Down.

**DUBLIN,** Call 2RN (**319.1 metres**) ; 1.5 kW.—**1.30** Weather Report and Gramophone Selections. **.0 to 6.0,** Relay from the Grafton Picture House. **7.20,** News. **7.30,** Poetry Recital by C. Ni Dhaluigh. **7.45,** Irish Lesson by Seamus O. Duirinne. **8.0,** Tenor Solos by W. F. Watt. **8.10,** The Augmented Station Orchestra. **8.30,** Gaelic Vocal Selections by Tadhg MacFirbhisigh. **8.40,** The Waverley Vocal Quartet. **8.55** Selections by the Station Celeste Orchestra. **9.0,** Tenor Solos by W. F. Watt. **9.10,** The Augmented Station Orchestra. **9.30,** Light and Shade by P. Murnaghan and Con O'Shea. **9.45,** "The Last Laugh"—Sketch by the Crofton Repertory Company. **10.15,** Selections by the Station Orchestra. **10.30,** News, Weather Report and Close Down.

**FRANKFURT** (**428.6 metres**) ; 4 kW.—**3.35,** Orchestral Concert : Overture to Le Postillon de Lonjumeau (Adam) ; Viennese Folk Music (Komzak) ; Selection from Mignon (Thomas) ; Old German Folk Song, Kommt a Vogerl geflogen ; Selection from Norma (Bellini) ; Entry March of the Boïards (Halvorsen). In the Interval, Announcements. **5.30,** Talk. **6.0,** Shorthand Lesson by Georg Kalis. **6.30,** Alfred Auerbach, Talk : The New Railway Time Table. **7.0,** Programme from Stuttgart. **8.0,** Concert of Modern Music : Chamber Music No. 2 Op. 36 (Hindemith) ; "Die neue Zeit"—Dialogue ; Two Poems ; Selection from "Newspaper Cuttings" (Cross) ; Talk : "If I Were . . ." ; Orchestral Interlude (Martini) ; Relay from a Factory ; Ragtime for 11 Instruments (Stravinsky) ; followed by programme from **Voxhaus. 11.30** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse) (**394.7 metres**) ; 4 kW.—**9.15 a.m.,** News. **10.0 a.m.,** Programme of Gramophone Records. **11.10 a.m.,** Weather Report. **11.15 a.m.,** Exchange Quotations. **11.30 a.m.,** Concert, relayed from **Hanover** (297 metres). In the Interval at **11.45 a.m.,** Shipping Forecast. **11.55 a.m.,** Time Signal. **12.10,** News. **1.40,** Exchange Quotations. **2.30,** Review of Books. **3.0,** Labour Exchange Report. **3.15,** Chinese Stories, by Robert Walter. **4.0,** Concert of Viennese Operetta Music : Overture to The Gipsy Baron (Joh. Strauss) ; Potpourri from Gasparone (Millöcker) ; Eva Waltz (Lehár) ; Potpourri from Der Obersteiger (Zeller) ; Overture to Banditenstreiche (Suppé) ; Song from Der lachende Ehemann (Kysler) ; Potpourri of Paganini (Lehár) ; Quadrille from Die Fledermaus (Joh. Strauss). **6.0,** Talk from **Kiel** (254.2 metres), on Neumünster, by Herr Schmidt, relayed from the Town Hall, **Neumünster. 6.25,** Talk by Helmut Jaro Jaretzki. **6.55,** Weather Report. **7.0,** "The Munich October Festival," Topical Satire. **8.0,** "First Norag Autumn Ball." In the Intervals, Weather Report, News and Sports Notes.

**HILVERSUM** (**1,071 metres**) ; 5 kW.—**11.40 a.m.,** Police Announcements. **12.10,** Concert of Trio Music. **1.40,** Concert from the Tuschinski Cinema, **Amsterdam. 3.10,** Talk and Italian Lesson. **5.40,** Time Signal. **5.42,** Concert : Overture to Jean de Paris (Boieldieu) ; Ballet Suite (Popy) ; Pensée d'automne (Leoncavallo) ; Baritone Solo from A Masked Ball (Verdi) ; Selection from Le Tribut de Zamora (Gounod) ; Baritone Solos, (a) Air from Mireille (Gounod), (b) Mattinata (Leoncavallo) ; Serenade Italien (Schebek) ; Rêverie viennoise (Maduro) ; Russian Scenes (Petras) ; Selection from Herbstmanöver (Kálmán). **7.25,** Police Announcements. **7.40,** Concert and Talk, arranged by the Workers' Radio Society. **10.10,** Concert from the Royal Cinema, **Amsterdam. 11.15** (approx.), Close Down.

**HUIZEN** (**340.9 metres**) ; 4 kW.—Transmits on 1,870 metres from **5.40 p.m. 12.10,** Concert of Trio Music. **2.40,** Programme for Children. **5.10,** Gramophone Selections. **6.40,** English Lesson. **7.10,** Lesson in Dress-making. **7.40,** Talk by M. v. Haastert. **8.0,** Concert of Soprano, 'Cello and Violin Selections.

**JUAN-LES-PINS** (Radio L.I.) (**244 metres**) ; 1.5 kW. —**1.0,** Concert. **9.0,** News, Weather Report, Talk for Women, by Mme. la Comtesse de Tremeuge and Concert. **10.0,** Dance Music. **10.30,** (approx.), Close Down.

**KALUNDBORG** (**1,680 metres**) ; 7 kW.—Programme also for **Copenhagen** (337 metres).—**6.30 a.m.,** Morning Gymnastics. **10.0 a.m.,** Weather Report. **12.15,** Educational Talk. **2.0,** Orchestral Concert. In the Interval, Recitation by Christen Möller. **5.20,** English Lesson. **5.50,** Weather Report. **6.0,** News, Exchange Quotations and Time Signal. **6.30,** Axel Holch, Talk : The History of Social Thought, Robert Malthus. **7.0,** Chimes from the Town Hall. **7.2,** Emil Aarestrup Programme, Talk and Songs. **8.0.** News and Balalaika Concert : The Nightingale (Alabieff) ; Romance (Glinka) ; Gopak (Dobrochotoff) ; Russian Folk Dance, The Red Sarafan (Warlamoff) ; Humoresque (Dobrochotoff) ; Song of the Volga Boatman ; Russian Folk Dance, Trepak (Dobrochotoff). **8.45,** Old Dance Music : Arch-Duke Albrecht's March (Komzak) ; Laura Waltz (Millöcker) ; Swedish Country Mazurka (Translateur) ; Pepita Polka (Lumbye) ; Old North Jutland Dances, (a) Rheinländer Polka, (b) Old-Time Waltz, (c) Sekstur, (d) Waltz ; Quadrille from The Gipsy Baron (Strauss) ; Susanne Mazurka (Möller) ; Annen Polka (Strauss) ; Bacchus Gallop (Lumbye). **9.45,** Dance Music from the Industri Restaurant. **11.0.** Chimes from the Town Hall. **11.15** (approx.), Close Down.

**KATTOWITZ** (**422 metres**) ; 10 kW.—**6.55,** Agricultural Report. **7.5,** Talk by Mr. K. Zienkiewicz **7.30,** Programme from **Warsaw. 9.0,** Time Signal, Weather Report and News. **9.30,** Dance Music.

## Programmes from Abroad.—

**KAUNAS (2,000 metres)**; 7 kW.—**4.0,** Concert: Waltz, Dananusagen (Fucik); Erotica (Grieg); Selections from Das Pensionat (Suppé); Serenade, Küsse im Dunkel (Micheli); Melodienkranz (Manfred); Goodbye (Tosti); Tango, Vidalita (Sentis); Intermezzo, La Veeda (Alden). **4.45,** Talk. **5.30,** Announcements. **6.0,** Weather Report and News. **6.30,** Programme from the National Theatre.

**LAHTI (1,522.8 metres)**; 35 kW.—**4.0,** Orchestral Concert: March, Porin Marssi (Merikanto); Valse lente (Kuula); Lampaan Polska (arr. Tiger); Finnish Melodies (Järnefelt); Berceuse (Sibelius); Valse Chevaleresque (Finlandia). **5.15,** Programme of Talks. **6.0,** A Short Play. **6.40,** Bassoon and Vocal Music, followed by Orchestral Selections: Melodies (Brahms); Overture to Rosamunde (Schubert). **7.45,** News in Finnish and Swedish. **8.15,** Dance Music. **9.0** (approx.), Close Down.

**LANGENBERG (468.8 metres)**; 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**11.10 a.m.,** Gramophone Selections. **12.5,** Programme from **Cologne. 1.30,** Household Hints. **2.40,** Technical Wireless Talk by Artur Wurbs, relayed from **Elberfeld. 3.0,** Programme from **Cologne. 3.30,** Programme from **Königswusterhausen. 4.10 to 5.55,** Programme from **Cologne. 6.15,** Talk for Workers by Dr. Karl Würzburger, from **Dortmund. 6.40 to 12.0 Midnight,** Programme from **Cologne.**

**LEIPZIG (365.8 metres)**; 4 kW.—**6.0,** Talk on Wurzburger. **7.0,** Programme from the Works of Schubert. **8.15,** Cabaret Concert. **9.15,** News, Announcements and Sports Notes. **9.30,** Programme from **Voxhaus.**

**LILLE,** Call PTT **(264 metres)**; 0.5 kW.—**7.0,** Market Prices. **7.10,** Concert arranged by Le Journal l'Echo du Nord. **8.20,** Variety Selections. **8.45,** Concert organised by the Wireless Association of Northern France, followed by News.

**MADRID** (Union Radio), Call EAJ7 **(375 metres)**; 3 kW.—**7.0,** Sextet Selections: Andante from the Suite romantica (Villar); Intermezzo. Naila (Delibes); Recuerdos de Andalucia (Ocón); Barcarolle, Mallorca (Albéniz); Entr'acte from Don César de Bazán (Massenet); Czardas, Ultimo amor (Gungl); Interlude by Luis Medina. **8.0,** Dance Music. **9.45,** Weekly Market Report. **10.0,** Chimes and Musical Comedy Selection: "Pepe Conde" (Vives), followed by News. **12.30 a.m.** (approx.) (Sunday), Close Down.

**MILAN,** Call 1MI **(549 metres)**; 7 kW.—**7.35,** Time Signal and Talk, The History and Appreciation of Music. **7.45,** News and Concert: Overture to Ruy Blas (Mendelssohn); Mezzo-Soprano Solos, (a) Autumn (Fauré), (b) Le Voyageur, (c) Après une rêve; Pianoforte Solos, Toccata and Fugue in A Minor (Frescobaldi); Baritone Solos, (a) Air from I Puritani (Bellini), (b) Prologue to I Pagliacci (Leoncavallo); Reading; Impromptu in C Sharp Minor (Chopin); Prelude for Pianoforte (Ravasenga); Vizione Veneziana (Brogi); O Fior di campo (Billi); Orchestral Selections, (a) Siegfried Idyll (Wagner), (b) Danza dei fiore e dell' amore (Parelli), (c) Le Maschere Symphony (Mascagni), Followed by News. **10.0,** Dance Music from the Hotel Majestic Diana. **10.45** (approx.), Close Down.

**MOTALA (1,380 metres)**; 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres), **Sundsvall** (545.6 metres).—**5.30,** Cabaret Programme. **6.30,** Talk on Careers. **6.45,** Pianoforte Recital: Fantasia Op. 12 (Schumann). **7.0,** Concert of Romances and Chamber Music from the Works of Eyvind Alnaes: Songs, (a) Der de gjekk fyre, (b) Siste Reis, (c) So skal jenta hav a det, (d) Little Friend, (e) Poems, (f) February Morning by the Gulf, (g) Spring Longings; Suite for Two Violins and Pianoforte; Songs (a) An Old-new Melody, (b) May Song, (c) Et vackert gammalt mönster, (d) A Summer Melody, (e) Skogrsrän, (f) The Happiness of Two, (g) En liten lät om varen. **8.0,** Topical Talk. **8.15,** News and Weather. **8.45,** Dance Music. **12.30 a.m.** (approx.) (Sunday), Close Down.

**NAPLES,** Call 1NA **(333.3 metres)**; 1.5 kW.—**7.40,** Time Signal and News, followed by Harbour Notes. **7.50,** Concert: Overture to The Marriage of Figaro (Mozart); Tenor Solo from Mignon (Thomas); Shadow Song from Dinorah (Meyerbeer); Prelude No. 9 for Orchestra (Chopin); Soprano and Tenor Duet from La Sonnambula (Bellini); "The Lost Letter," One-Act Comedy (Niccodemi); "Peace in the Family," One-Act Comedy (Courteline); Selection from La Dubarry (Camussi); Soprano Solo from The Elixir of Love (Donizetti); Tenor Solo from Faust (Gounod); Nocturne, Op. 15, No. 1, for Orchestra (Chopin); Duet from Rigoletto (Verdi); Overture to Oberon (Weber). **9.50,** News, followed by Calendar and Programme Announcements. **10.30** (approx.), Close Down.

# Saturday, October 13th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**OSLO (461.5 metres)**; 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), and **Rjukan** (448 metres).—**6.15,** Weather Report, News and Agricultural Report. **6.30,** Talk: The Reception of Knut Hamsun in Germany. **7.0,** Time Signal. **7.30,** Orchestral Concert: Marche Matador (Siède); Wiener Blut (Strauss); The Negro's Dream (Myddleton); Styltelöpern (Murzilli); Rêve du Bal (Translateur); Tango (Schüttauf); Waltz, Gold and Silver (Lehár); La Poupée Aveugle (Leopold); March (Johansen). **8.0,** Concerto in G Minor for Violin (Max Bruch). **8.30,** Weather Report and News. **9.0,** Topical Talk, followed by Dance Music from the Hotel Bristol, Oslo. **11.30** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT **(458 metres)**; 0.5 kW.—**6.30,** "Radio Journal de France." **8.0,** Sports Notes and Review. **8.30,** Relay of Speeches under the Presidency of M. le Maréchal Lyautey, from the Grand Amphithéâtre of the Sorbonne, followed by News, Time Signal, Weather Report and Dance Music from the Coliseum de Paris.

**PARIS** (Eiffel Tower), Call FL **(2,650 metres)**; 5 kW.—**6.45,** "Le Journal Parlé." **7.10,** Weather Report. **7.30,** Concert: Arabian Dances (Grunbach); 'Cello Solos; Nuages (Georges); Le Chant du Souvenir (Filipucci); Aubade Sentimentale (Fourdrain); Les Danses de Chez Nous (Jacquet).

**PARIS** (Petit Parisien) **(340.9 metres)**; 0.5 kW.—**8.45,** Gramophone Selections, Talk, News and Announcements. **9.0,** Orchestral Concert: Penelope Prelude (Fauré); Selections from Gillette de Narbonne (Audran); First Movement from the Symphony in G Minor, No. 40 (Mozart); Concerto Grosso, No. 6 (Handel); Ballet from The Bartered Bride (Smetana); Sérénade Florentine (Godard); Marche des Girondine (Le Borne); News in the Intervals.

**PARIS** (Radio-Paris), Call CFR **(1,750 metres)**; 6 kW.—**12.30,** Concert of Gramophone Selections: Fox-Trot, Get out and get under the Moon, by Paul Whiteman and his Orchestra; One-Step, Constantinople, by Paul Whiteman and his Orchestra; Some of These Days, by Sophie Tucker; The New St. Louis Blues, by Ted Lewis and Band; Fox-Trot, If You See Sally, by Ted Lewis and Band; Together, by Layton and Johnston; Old Song, Le Bossu (Rameau); Harpsichord Solo, Tambourin (Rameau); Song of the Toreador from Carmen (Bizet); Jewel Song from Faust (Gounod); Selections from Siegfried (Wagner), (a) Forest Murmurs, (b) Prelude to the Third Act, (c) Fire Music; Second Symphony in D (Beethoven), by the London Symphony Orchestra, under the direction of Sir Thomas Beecham; News in the Interval. **3.30,** Market Prices and Religious News. **3.45,** Dance Music; News in the Intervals. **8.0,** Agricultural Report. **8.15,** Talk, Market Prices, News and Announcements. **8.30,** Vocal and Orchestral Concert; News in the Intervals.

**PITTSBURGH,** Call KDKA **(63 and 27 metres)**; 25 kW.—**11.30,** Concert from the William Penn Hotel. **12.0 Midnight,** Telechron Time Signal and Address from the University of Pittsburgh. **12.15 a.m.** (Sunday), Concert (continued). **12.30 a.m.,** Home Radio Club. **12.45 a.m.,** Literary Selections. **1.0 to 3.0 a.m.,** Relay from WJZ, **New York. 1.0 a.m.,** "The Philco Hour." **2.0 a.m.,** Republican Speaker. **2.30 a.m.,** Accordion Quartet Music. **3.0 a.m.,** Longine Time Signal and Weather Report. **4.0 a.m.,** Special Antarctic Broadcast.

**POSEN (344.8 metres)**; 1.5 kW.—**6.0,** Talk: Impressions of a Journey through Norway. **6.30,** Talk from **Warsaw. 7.0,** Finance Report. **7.30,** "The Heroes," Operetta (Oscar Straus), from **Warsaw. 9.0,** Time Signal, News and Weather Report. **9.30,** Various Announcements. **9.40,** Dance Music from the Carlton Restaurant. **11.0,** Concert, arranged by the Philipps Maison. **1.0 a.m.** (approx.) (Sunday), Close Down.

**PRAGUE (348.9 metres)**; 5 kW.—**4.30,** Talks. **4.50,** Agricultural Report. **5.0,** German Transmission. **6.0,** Operetta (Offenbach). **7.15,** Relay from **Olomouc,** Concert by the Moravian Teachers' Choral Society. **9.0,** Time Signal and News. **9.20,** Selections of Popular Music.

**ROME,** Call 1RO **(447.8 metres)**; 3 kW.—**7.30,** Sports Notes, News, Exchange Quotations and Weather Report. **7.47,** Topical Talk and Time Signal. **8.0,** "La Baronessa di Carini," Lyrical Drama in One Act (Mulè); Art and Literature Review; Acts I and II of "Mephistopheles," Opera (Boito), with Topical Talk in the Interval. **10.5,** News and Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF **(21.96 and 31.4 metres)**; 30 kW.—**11.55,** Baseball Announcements. **12.0 Midnight,** Statler's Pennsylvanians, directed by Johnny Johnson, from **New York. 12.30 a.m.** (Sunday), Concert from the Hotel Sagamore, **Rochester. 1.0 to 4.0 a.m., New York** Relay. **1.0 a.m.,** Musical Programme. **1.30 a.m.,** "The Park Bench." **2.0 a.m.,** "Variety Hour." **3.0 a.m.,** American Tobacco (Lucky Strike) Programme. **4.0 a.m.,** Dance Music from the Hotel De Witt Clinton. **5.0 a.m.** (approx.), Close Down.

**STAMBOUL (1,200 metres)**; 5 kW.—**7.30,** Weather Report and Time Signal. **7.40,** Concert: Overture to Das Nachtlager in Granada (Kreutzer); Italian Caprice (Tchaikovsky); Song, Romance (Schumann); Marche Militaire (Saint-Saëns). **9.0,** News and Close Down.

**STUTTGART (379.7 metres)**; 4 kW.—**2.45,** Orchestral Concert: Polonaise in A Major (Chopin); Kol Nidrei (Bruch); Two Minuets (Haydn); Slavonic Suite (Frederiksen). **3.35,** Dance Music, relayed from **Frankfurt. 5.5,** Time Signal and Weather Report. **5.15,** Talk, relayed from **Freiburg** (577 metres). **5.45,** Book-keeping Lesson. **6.15,** Dr. Schwäbsch, Talk: Patents. **6.45,** Time Signal, Weather Report and Sports Notes. **7.15,** Concert of Slavonic Music: Dumky Trio, Op. 90 (Dvorak); Trio, Op. 15 (Smetana). **8.15,** Programme from **Frankfurt. 9.15,** Concert of Marches and Waltzes: Carmen March (Fétras); Waltz, The Skaters (Waldteufel); March, Hail, Heidecksburg! (Herzer); Moonlight on the Alster (Fétras); Hoch und Deutschmeister March (Ertl); Tales of the Vienna Woods (Strauss); Florentine March (Fucik); followed by Dance Music from the Pavilion Excelsior and **Experimental Relay of American Stations.**

**TOULOUSE** (Radiophonie du Midi) **(391 metres)**; 3 kW.—**12.45,** Concert. **8.0,** Exchange Quotations and News. **8.30,** Concert: Selections from (a) Scènes Alsaciennes, (b) Thaïs (Massenet), (c) L'Arlésienne (Bizet); Marouf (Rabaud). **9.40,** Selection by Balalaika Orchestra: Toreador and Andalouse (Rubinstein). **9.46,** Selections from the Works of Ganne: Extase; Selection from Ilans the Flute Player; Lorraine March; Le Père la Victoire; Overture to The Mountebanks. **10.5,** Dance Music: Mon Paris; Nanette; La Caravane; On ne peut pas quitter Paris; Valencia; Parisette. **10.15,** North African News.

**VIENNA (577 and 517.2 metres)**; 1.5 and 15 kW.—**10.0 a.m.,** Concert of Quartet Music. **4.30,** Programme for Children. **5.0,** Reading from A Thousand and One Nights, by Gustav Hermann. **5.45,** Zither Recital by Fanni and Otto Slezak. **6.20,** concert of Chamber Music, by the Weiss Quartet; Doric Quartet (Respighi); String Quartet, Op. 105 (Dvorák). **7.10,** "Mamsell Nitouche," Operetta in Three Acts (Hervé.)

**VILNA (435 metres)**; 1.5 kW.—**6.5,** M. Charkeiwicz, Talk: The Decay of the Orthodox Greek Church. **6.30,** Programme from **Warsaw. 6.55,** News, followed by Gramophone Selections. **7.30,** Programme from **Warsaw. 10.30** (approx.), Close Down.

**WARSAW (1,111 metres)**; 10 kW.—**11.0 a.m.,** Time Signal and Fanfare from **Cracow.** General News Bulletin. **2.0,** Weather Report. **3.0,** Light Music. **4.10,** Talk. **4.35,** Talk. **6.30,** "La Radio Chronique," by Dr. Stepowski. **7.5,** News. **7.30,** "The Heroes," Operetta (Oscar Straus); in the Interval: News in French. **9.0,** Time Signal, Aviation Notes and Weather Report. **9.5,** News, Police Announcements and Sports Notes. **9.30,** Dance Music. **10.30** (approx.), Close Down.

**ZURICH (588 metres)**; 1 kW.—**11.30 a.m.,** Time Signal and Weather Report. **11.32 a.m.,** Gramophone Records. **11.50 a.m.,** Weather Report and News Bulletin. **12 noon,** Gramophone Selections continued. **12.35,** Stock Exchange Quotations. **2.0,** Bert Herzog, Talk on New Books. **3.0,** Concert from the Carlton Elite Hotel. Selections by the Castellano Orchestra. **4.15** Concert by the Edelweiss Club. **6.0,** Chimes relayed from the Zurich Churches. **6.30,** Time Signal and Weather Report. **6.16,** Concert. **7.0,** Symphony Concert, relayed from **Basle** (1,010 metres). **9.0,** Weather Report and News. **9.15** (approx.), Close Down.

# SUNDAY, OCTOBER 14th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

## Programmes from Abroad.—

**BARCELONA** (Radio Barcelona), Call EAJ1 (**344.8 metres**); 1.5 kW.—**1.30**, Concert by the Iberia Trio, and Gramophone Records. **2.45** to **6.0**, No Transmission. **6.0**, Market Prices. **6.10**, Concert by the Station Orchestra with Soloists. **8.40**, Sports News. **9.0** (approx.), Close Down.

**BASLE** (**1,010 metres**); 1.5 kW.—Programme relayed from **Bern**. **6.30**, Dr. Brüschweiler, of Thun, Talk: Baptismal Customs in Switzerland—The Christening. **7.0**, Concert. **8.45**, Sports Notes, General News Bulletin and Weather Report. **9.0** (approx.), Close Down.

**BERGEN** (**370.4 metres**); 1.5 kW.—**9.30 a.m.**, Relay of Morning Service and Sermon. **11.30 a.m.**, Weather Forecast and General News Bulletin. **7.0**, Orchestral Selections, followed by Topical Talk. **8.30**, Concert by the Choral Society of the Bergen Handicrafts and Industries Association, Conductor: Kr. Svenkerud. **9.0**, Weather Report, Late News Bulletin and Time Signal. **9.15**, Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) (**1,250 metres**); 40 kW.—**7.55 a.m.**, Garrison Church Chimes from Potsdam. **8.0 a.m.**, Concert relayed from **Voxhaus**, followed by the Cathedral Chimes. **10.15 a.m.** (approx.), Musical Programme, relayed from **Voxhaus**. **2.30** to **3.45**, Three Talks on Agricultural Topics, from **Voxhaus**. **4.0**, Concert relayed from **Voxhaus**. **5.30**, Talks, followed by relay of Programme from another German Station. **9.15**, News from the Press. **9.30**, Dance Music. **11.30** (approx.), Close Down.

**BERLIN** (Voxhaus) (**484 metres**); 4 kW.—**7.55 a.m.**, Chimes relayed from the Garrison Church, Potsdam, **8.0 a.m.**, Recital of Music, followed by Berlin Cathedral Chimes. **10.15 a.m.**, Orchestral Concert. **2.30**, Agricultural Talks on Practical Advice in Farming and the Week's Markets. **4.0** to **5.0**, Relay of Orchestral Concert, followed by Advertisements and Talks. **7.15** (approx.), Concert of Orchestral Selections. **9.10** (approx.), Weather Report, Time Signal, Sports Notes, News and Announcements. **9.30**, Relay of Dance Music. **11.30** (approx.), Close Down.

**BERN** (**411 metres**); 1.5 kW.—**9.30 a.m.** to **10.30 a.m.**, Religious Address. **12.0 Noon**, Time Signal and Weather Report. **12.5**, Orchestral Selections. **7.0**, Bernese Popular Evening with the collaboration of local societies. Musical Items and Play in Bernese dialect. The Edelweiss Yodler Club, the Belp Orchestra, and the Zytglogge Dramatic Society. **8.45**, Sports News, Weather Report and General News Bulletin. **9.0**, Orchestral Concert. **9.35** (approx.), Close Down.

**BRATISLAVA** (**300 metres**); 1 kW.—**8.0 a.m.**, Morning Recital of Sacred Music. **10.0 a.m.**, Programme relayed from **Prague**. **4.30** (approx.), Concert. **9.20**, Orchestral Music.

**BRESLAU** (**322.6 metres**); 4 kW.—Programme relayed by **Gleiwitz** (329.7 metres).—**7.45 a.m.**, Chimes from Christ Church, Breslau. **10.0 a.m.**, Evangelical Recital, with Address and Instrumental Items. **11.0 a.m.**, Instrumental Concert. **1.0**, Ten Minutes for the Amateur Gardener. **1.10**, Talk. **1.35**, Interesting Points for Chess Players. **2.0**, Stories for Children. **2.30**, Talk for Farmers, followed by Talk and Music. **7.30**, Programme of Variety Items, with the collaboration of Ludwig Manfred Lommel. **9.0**, News Bulletin and probable outside relay. **11.0** (approx.), Close Down.

**BRÜNN** (**441.2 metres**); 3 kW.—**8.0 a.m.**, Morning Recital. **9.0 a.m.**, Agricultural Report and Talk for Farmers. **10.0 a.m.**, Orchestral Concert. **5.0**, German Programme. **6.15** (approx.), Popular Concert. **9.0**, General News Bulletin, relayed from **Prague**, followed by Musical Programme.

**BRUSSELS** (**508.5 metres**); 1.5 kW.—**5.0**, Programme of Dance Music by the Orchestra of the St. Sauveur Palais de Danse, Brussels. **6.0**, Half-Hour for Children. **6.30**, Music by the Radio-Belgique Trio. **7.30**, La Radio-Chronique. **8.15**, The Station Orchestra, under the direction of M. René Tellier. **10.15**, Press News. **10.30** (approx.), Close Down.

**BUDAPEST** (**555.6 metres**); 35 kW.—**8.0 a.m.**, Press Review, followed by Talk for Women. **9.0 a.m.**, Relay of Morning Service and Sermon. **11.15 a.m.** (approx.), Orchestral Selections. **2.30**, Talk, arranged by the Ministry of Agriculture, followed by Children's Corner. **4.15**, Concert. **6.0**, Talk. **7.30**, (approx.), Concert or Play. **9.20**, Relay of Orchestral Programme. **10.30** (approx.), Close Down.

**COLOGNE** (**283 metres**); 4 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Langenberg** (468.8 metres) and **Münster** (250 metres).—**7.15 a.m.**, Music Recital. **7.35 a.m.** to **7.55 a.m.**, Esperanto Talk. **8.5 a.m.**, Evangelical Choral and Instrumental Recital with Address. **10.0 a.m.**, Talk: The German Language, its worth and honour. **10.35 a.m.**, Agricultural Talk. **10.55 a.m.**, Talk on Music with illustrations. **12.0 Noon**, Orchestral Concert, followed by Literary Talk, and Hints for Chess Players. **3.30**, Concert. **5.50**, (approx.), Transmission for Workers, Kurt Klaber. Introductory Talk: Georg Schwarz. **7.0**, Concert by the Cologne Station Orchestra followed by Late News Bulletin, Sports Notes and programme of Light Music. **11.0** (approx.), Close Down.

**CORK**, Call 6CK (**400 metres**); 1.5 kW.—**8.30**, Concert of Vocal and Instrumental Music, including Tenor Solos by Mr. W. F. Watt. **11.0**, Weather Report and National Anthem. **11.15** (approx.), Close Down.

**CRACOW** (**566 metres**); 1.5 kW.—**9.15 a.m.** to **10.45 a.m.**, Relay of Cathedral Service. **11.0 a.m.** to **11.10 a.m.**, Relay of Fanfare from Notre Dame, Cracow. **11.5 a.m.**, Time Signal and Weather Forecast. **3.40**, Dr. St. Wasniewski, "La Chronique Agricole." **7.0**, Relay of Fanfare from Notre Dame. **7.15**, Sports News. **7.30**, Orchestral Concert: Two arias from "The Marriage of Figaro" (Mozart) sung by Mademoiselle Félicie Günther. **9.0**, Relay from **Warsaw**. **9.30**, Concert relayed from a Restaurant. **10.30** (approx.), Close Down.

**DUBLIN**, Call 2RN (**319.1 metres**); 1.5 kW.—**8.30** to **11.15** (approx.), Programme relayed from **Cork**, Concert by the Station Sextet with vocalists. Tenor Solos by Mr. Leslie Williams. **11.0**, Weather Forecast and National Anthem. **11.15** (approx.), Close Down.

**FRANKFURT** (**428.6 metres**); 4 kW.—Programme relayed by **Cassel** (252.1 metres).—**7.30 a.m.** (approx.), Recital of Music. **10.0 a.m.**, Talk for Parents. **11.0 a.m.**, Concert by the Station Orchestra. **12.0 Noon**, Ten minutes of Agricultural Topics. **4.0** (approx.), Concert. **7.30**, Musical or Literary Programme. **9.30**, (approx.), Dance Music relayed from **Berlin**. **11.30** (approx.), Close Down.

**HAMBURG**, Call HA (in Morse) (**394.7 metres**); 4 kW.—Programme relayed by **Bremen** (272.7 metres), **Hanover** (297 metres) and **Kiel** (254.2 metres).—**7.25 a.m.**, Time Signal. **7.30 a.m.**, Weather Forecast and General News Bulletin. **8.0 a.m.**, Law Report. **8.15 a.m.**, Morning Recital of Music. **9.55 a.m.** (for **Kiel** only), Relay of Morning Service. **11.55 a.m.**, Time Signal relayed from **Nauen**. **12.5** (for **Hamburg** and **Kiel**), Concert. **12.5** (for **Bremen**), Musical Programme. **12.5** (for **Hanover**), Gramophone Records. **1.0**, Programme for Children arranged by Hans Bodenstedt. **2.0**, Concert. **4.15** (approx.), Orchestral Concert. **6.30**, Talk arranged by the Hamburg Physical Training School. **6.40**, Sports News. **6.55**, Weather Report. **7.0** (approx.), Concert or Play. **8.30** (approx.), General News Bulletin and North Sea and Baltic Weather Report followed by programme of music. **10.0** (approx.), Close Down.

**HILVERSUM** (**1,071 metres**); 5 kW.—**12.40** to **2.10**, Orchestral Music by the Radio Trio. **2.10** (approx.), Military Band Concert. **7.40**, Weather Report and General News Bulletin. **7.50**, Concert relayed from the "Concertgebouw" (Concert Hall) at **Amsterdam**. The Orchestra conducted by Cornelius Dopper. **9.55**, Programme of Music. **11.0** (approx.), Close Down.

**HUIZEN** (**340.9 metres**); 4 kW.—Transmits on 1,870 metres from 5.40. **8.10 a.m.** to **9.10 a.m.**, Morning Service and Address. **9.30 a.m.** (approx.), Relay of Divine Service. **12.10**, Trio Selections. **5.30** (approx.), Relay of Evening Service. **8.0**, Orchestral Concert. **10.25**, Epilogue by the Choir. **10.40** (approx.), Close Down.

**JUAN-LES-PINS** (Radio L.L.) (**244 metres**); 1.5 kW.—**1.0** to **2.0**, Musical Selections and Talk for Children by "Radiolo." **9.0**, Late News Bulletin, Weather Report and Sports Notes. **9.15**, Concert of Orchestral Selections. **10.0**, Dance Music by the Municipal Casino Orchestra. **10.30** (approx.), Close Down.

**KALUNDBORG** (**1,680 metres**), 7 kW.—Programme also for **Copenhagen** (337 metres).—**9.0 a.m.**, Morning Church Service, relayed from **Copenhagen**. **10.30 a.m.** to **10.40 a.m.** (**Kalundborg** only), Weather Report from the Meteorological Institute. **4.0**, Evening Service relayed from **Copenhagen**. **5.20**, Children's Corner. **5.50** (**Kalundborg** only), Weather Report from the Meteorological Institute. **6.0**, News from the Press. **6.15**, Time Signal. **6.30**, Talk. **7.0**, Chimes relayed from the Town Hall, **Copenhagen**. **7.5**, "Danish History in Poetry and Music" Orchestral and Vocal Concert with introductory talk by Axel Garde. **8.30**, General News Bulletin. **8.45**, Concert by the Station Orchestra. **9.45**, Popular Dance Music; in the interval at **11.0**, Chimes from the **Copenhagen** Town Hall. **11.30** (approx.), Close Down.

**KATTOWITZ** (**422 metres**); 10 kW.—**9.15 a.m.**, Relay of Morning Service. **11.0 a.m.**, Time Signal and Weather Report. **6.45**, Weekly Press Review. **7.30**, Vocal and Instrumental Concert relayed from **Warsaw**. Soprano Songs by Tola Mankiewicz; Bass Solos by S. Mossocxy; Recitations by J. Sliwicki and Professor L. Urstein at the piano. **9.0**, Time Signal, Weather Forecast, Press and Sports News. **9.30**, Dance Music. **10.30** (approx.), Close Down.

**KAUNAS** (**2,000 metres**); 7 kW.—**10.15 a.m.**, Morning Recital. **11.0 a.m.**, Weather Forecast. **11.30 a.m.**, Orchestral Concert. **12.0 Noon**, Programme for Children. **12.30**, Physical Training. **2.30**, Half-hour for Young People. **3.0**, Literary Talk. **3.30**, Hygiene Talk. **4.0**, Talk. **6.0**, Weather Report. **6.5**, Notes on Politics. **6.15**, Accordion Selections. A Potpourri of Lithuanian Songs. **6.30**, Concert of Orchestral Selections. **9.30** (approx.), Close Down.

**KÖNIGSBERG** (**303 metres**); 4 kW.—Programme relayed by **Danzig** (272.7 metres).—**8.0 a.m.**, Recital of Instrumental Music and Address. **10.0 a.m.** (**Königsberg** only), Weather Forecast. **10.5 a.m.**, Orchestral Concert, with Songs. **11.55 a.m.**, Time Signal, relayed from **Nauen**, followed by Weather Report. **1.50**, Notes for Chess Players, by P. S. Leonhardt. **2.20**, Elementary Spanish Lesson by Kurt Metze, Lecturer in Spanish at the **Königsberg** Technical Institute. **3.0** (approx.), Concert by the Station Orchestra, followed by Talks. **7.0**, "Die geschiedene Frau," operetta in Three Acts by Victor Léon, Music by Leo Fall; the Orchestra under the direction of Erich Seidler. **9.15**, General News Bulletin and Sports Notes. **9.30** (approx.), Relay of Dance Music. **11.30** (approx.), Close Down.

**LAHTI** (**1,522.8 metres**); 35 kW.—Programme also for **Helsingfors** (375 metres).—**8.0 a.m.** (approx.), Relay of Church Service. **9.50 a.m.**, General News Bulletin. **10.5 a.m.**, Concert. **10.50 a.m.**, Weather Report and Time Signal. **11.0 a.m.**, Sacred Service in Swedish. **3.0**, Orchestral Concert. **4.0**, Talk. **4.25**, Concert by the Station Orchestra, conducted by Erkki Linko. **4.57**, Time Signal and Weather Report. **5.10**, History Talk. **5.40**, Talk. **6.0**, Concert. **7.45**, Late News Bulletin given in Finnish and Swedish. **9.0** (approx.), Close Down.

**LANGENBERG** (**468.8 metres**); 20 kW.—Programme also for **Aix-le-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**7.15 a.m.**, Light Music, relayed from **Cologne**. **7.35 a.m.**, Talk in Esperanto, relayed from **Cologne**. **8.5 a.m.** (approx.), Morning Recital of Music with Choral Items and Address from **Cologne**. **10.0 a.m.**, Talk on the German Language. **10.35 a.m.**, Two Talks from **Cologne**. **12.0 Noon**, Concert of Popular Selections, followed by Talks. **3.30**, Orchestral Concert. **6.20**, Tales by Hermann Hesse, read by Lisa Tetzner. **7.0**, Relay of Concert from **Cologne**, followed by News Bulletin, Sports Notes and Dance Music. **11.0** (approx.), Close Down.

**LEIPZIG** (**365.8 metres**); 4 kW.—Programme relayed by **Dresden** (275.2 metres).—**7.30 a.m.**, Organ Recital of Sacred Music. **8.0 a.m.**, Morning Concert of Vocal and Instrumental Music. **10.0 a.m.**, Concert. **12.0 Noon**, Two Talks. **1.0**, Foreign Press Review. **1.20**, Talk arranged by the German Speaking Union. **1.30**, Musical Selections. **5.30**, Talk. **6.0**, Talk. **6.30**, Concert of Chamber Music by the Zilcher Trio: Dr. Hermann Zilcher (Pianoforte); Professor Adolf Schiering (Violin); and Professor Ernest Cahnbley ('Cello): Sonata for Violin and Pianoforte, Op. 16 in D Major (Zilcher). **9.0**, Sports Notes. **9.30**, Dance Music, relayed from **Berlin**. **11.30** (approx.), Close Down.

**LILLE**, Call PTT (**264 metres**); 0.5 kW.—**12.30**, Concert arranged by the Wireless Association of Northern France. **1.35**, Prices of Motor Oils. **8.30**, Instrumental Concert, followed by Late News Bulletin.

**LYONS** (Radio Lyon) (**291 metres**); 1.5 kW.—**7.45**, The Radio Lyon "Journal Parlé," with Press Review and Sports News. **8.0**, Vocal and Instrumental Concert: Artistes, Madame Ducharne (Pianist), and Monsieur Camand (Violinist) of the Lyons Conservatoire; and Monsieur Testanière ('Cellist). **9.0** (approx.), Close Down.

## Programmes from Abroad.—

**MADRID** (Union Radio), Call EAJ7 (**375 metres**); 3 kW.—Programme relayed by **Salamanca,** EAJ22 (405 metres). **2.0,** Chimes and Time Signal. **2.10,** Popular Selections by the Union Radio Orchestra and Luis Medina. **3.30 to 7.0,** No Transmission. **7.0,** Music and Stories for Children; the Station Sextet, "Phaëton," Symphonic Poem, by Saint-Saëns. **8.30 to 10.0,** No Transmission. **10.0,** Chimes and Time Signal. **10.5,** Orchestral Concert. **12.0 Midnight,** Relay of Dance Music Programme by the "Palermo en Rosales" Orchestra. **12.30 a.m.** (approx.) (Monday), Close Down.

**MILAN,** 1MI (**549 metres**); 7 kW.—**9.30 a.m. to 10.0 a.m.,** Recital of Vocal and Instrumental Sacred Music. **11.30 a.m.,** Time Signal and Concert by the Radio Quartet. **12.30 to 3.0,** No Transmission. **3.0,** Opening Signal and Vocal and Instrumental Programme with Selections by the Station Quintet. **4.25,** Agricultural Talk. **4.30,** Concert of Light Music; Selections by the Tzigane Orchestra of the Fiaschetteria Toscana at Rome. **5.0 to 7.25,** No Transmission. **7.25,** Opening Signal and General News Bulletin. **7.35,** Time Signal. **7.45,** Sports News. **7.50,** Relay of an Opera with Late News Bulletin and Sports Notes at the end of the Second Act. **10.45** (approx.), Close Down.

**MOTALA** (**1,380 metres**); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres) and **Sundsvall** (545.6 metres).—**10.0 a.m.,** Relay of Morning Service. **11.35 a.m.,** Weather Report. **11.45 a.m.,** Exchange Quotations. **11.55 a.m.,** Time Signal. **4.55,** Carillon, relayed from the **Stockholm** Town Hall. **5.0,** Relay of Evening Service. **7.15,** Programme by the Band of the Royal Life Guards. **8.15,** General News Bulletin. **8.30,** Weather Report. **8.40,** Concert. **10.0** (approx.), Close Down.

**MUNICH** (**535.7 metres**); 4 kW.—Programme relayed by **Augsberg** (566 metres), **Kaiserslautern** (277.8 metres) and **Nuremburg** (241.9 metres).—**12.0 Noon,** Time Signal, Weather Report and Notes on Forthcoming Programmes. **2.15,** Concert of Light Music. **4.30,** Concert. **5.30,** Orchestral Music. **7.0,** Grand Concert by the Munich Wireless Orchestra. **9.5,** General News Bulletin. **9.30,** Relay of a Concert Programme. **10.45** (approx.), Close Down.

**NAPLES,** Call 1NA (**333.3 metres**); 1.5 kW.—**9.0 a.m.,** Sacred Morning Recital. **3.45,** Children's Corner. **4.0,** Concert: Orchestral Music with Songs by Signora Carla Spinelli. **4.30,** Time Signal. **7.20,** Current Topics. **7.40,** Time Signal. **7.48,** Naples Harbour Authorities' Report. **7.50,** Vocal and Instrumental Concert: "Prontalo son," from "Don Pasquale," by Donizetti, Duet for Soprano and Baritone, sung by J. Lugaro and R. Aulicino, accompanied by the Station Orchestra. **9.0,** Sports Notes. **9.55,** Calendar and Programme Announcements. **10.0** (approx.), Close Down.

**OSLO** (**461.5 metres**); 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—**9.50 a.m.,** Chimes. **10.0 a.m.,** Morning Service, relayed from St. Saviour's Church. **6.15,** Weather Report and News from the Press, followed by Musical Selections or Talk. **7.0,** Time Signal. **8.30,** Weather Report and Press News. **8.45,** Talk on Current Events. **9.0,** Dance Music by the Orchestra at the Hotel Bristol. **10.45** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT (**458 metres**); 0.5 kW.—Programme relayed at Intervals by the following Stations: **Bordeaux,** PTT (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille,** PTT (264 metres), **Limoges** (285 metres), **Lyons,** PTT (476 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse,** PTT (260 metres).—**8.0 a.m.,** General News Bulletin and Time Signal. **10.25 a.m.,** International Time Signal and Weather Forecast. **12.0 Noon,** Concert. **1.0,** Economic Report. **1.30,** Orchestral Concert: "The Italian Girl in Algiers" (Rossini). **2.30,** Symphony Concert, arranged by "Le Journal." **6.30,** "Le Radio Journal de France." **8.0,** Talk, arranged by the General Union of French Associations. **8.30,** Concert of Instrumental and Vocal Music, organised by the French Wireless Listeners' Association, followed by Late News Bulletin, Time Signal and Weather Report. **10.30** (approx.), Relay of Dance Music from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL (**2,650 metres**); 5 kW.—**7.56 a.m.,** Time Signal on 32.5 metres. **9.26 a.m.,** Time Signal on 2,650 metres. **5.45,** "Le Journal Parlé par T.S.F.," including Talks by Regular Contributors on Health and Sports Topics. **7.10 to 7.20,** Weather Report. **7.30 to 9.0,** Mario Cazes and his Orchestra. **7.56,** Time Signal on 32.5 metres. **10.26,** Time Signal on 2,650 metres. **11.15** (approx.), Close Down.

# Sunday, October 14th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**PARIS** (Petit Parisien) (**340.9 metres**); 0.5 kW.—**8.45,** Gramophone Selections, followed by Talk and Press News. **9.0,** Orchestral Concert. **9.25,** General News Bulletin. **9.30,** Symphony Concert: The First Movement from the Fourth Symphony in B Flat (Beethoven). **10.0,** Late News Bulletin. **10.15,** Concert of Instrumental Selections. **11.0** (approx.), Close Down.

**PARIS** (Radio LL) (**370 and 60 metres**); 1 kW.—**12.30,** Transmission, arranged by "Radio-Liberté," News Bulletin, Talk on Current Topics, followed by Concert of Vocal and Instrumental Music. Songs by Madame Hérault-Harlé. **1.0,** Carillon de Fontenay. **3.0,** Programme of Dance Music.

**PARIS** (Radio-Paris), Call CFR (**1,750 metres**); 6 kW.—**8.0 a.m.,** News Bulletin and Press Review. **12.0 Noon,** Address and Choral Recital of Sacred Music arranged by "La Vie Catholique." **12.30,** News from the Press. **12.45,** Concert by the Albert Locatelli Orchestra. **4.30,** Dance Music by the Grand Vatel Orchestra. Press News in the Interval. **8.0,** Agricultural Report and News from the Press. **8.45.** Symphony Concert devoted to the Works of Danish Composers, Press Review and General News Bulletin in the intervals.

**PITTSBURGH.** Call KDKA (**63 and 27 metres**); 25 kW.—**3.45,** Telechron Time. **4.0,** Church Service. **7.0,** Roxy's Stroll Programme from WJZ, **New York.** **9.45,** Church Service. **11.0,** Time Signal and Baseball Scores. **11.30,** Relay of Concert from WJZ. **12.0 Midnight,** Time Signal and Baseball Scores, followed by Orchestral Selections. **1.0 a.m.** (Monday), Programme relayed from WJZ, **New York.** **1.15 a.m.,** Collier's Radio Hour from WJZ. **2.15 a.m.,** Programme from WJZ. **3.0 a.m.,** Time Signal. **3.5 a.m.,** The Continentals programme continued. **3.15 a.m.,** Baseball Scores and Telechron Time. **3.30 a.m.** (approx.), Close Down.

**POSEN** (**344.8 metres**); 1.5 kW.—**9.15 a.m. to 10.45 a.m.,** Relay of Cathedral Service. **11.0 a.m.,** Time Signal. **11.5 a.m. to 11.55 a.m.,** Two Talks for Farmers. **6.20 to 7.10,** Two Talks relayed from **Warsaw.** **7.30,** Instrumental Concert. **8.0,** Recital of Songs by Mr. Sigismond Jablonowski, of Berlin; Vocal Selections from the Works of Beethoven and Brahms. **9.0,** Time Signal, Weather Report and Sports Notes. **9.20,** Twenty Minutes of Variety. **10.0,** Relay of Dance Music by the Orchestra at the "Palais Royal." **11.0** (approx.), Close Down.

**PRAGUE** (**348.9 metres**); 5 kW.—**8.0 a.m.,** Recital of Sacred Music. **9.0 a.m.** (approx.), Agricultural Notes. **10.0 a.m.,** Programme of Music. **12.5,** Industrial News. **12.20,** Notes on Current Events. **5.0,** Programme for German Listeners. **6.15** (approx.), Popular Concert. **9.0,** Time Signal and General News Bulletin, followed by Orchestral Concert.

**RABAT,** Call PTT (**416 metres**); 2 kW.—**12.30,** Concert by the Station Orchestra. **8.30,** Popular Concert. **10.30,** The Cinema Orchestra at the Jardin d'Eté. **11.0** (approx.), Close Down.

**RIGA** (**526.3 metres**); 4 kW.—**9.15 a.m.,** Relay of Sacred Service from the Mara Church; Songs, Stories and Music for Children. **3.0,** Concert by the Station Orchestra conducted by Arved Parups. **4.0 to 6.0,** Four Talks. **6.0,** Instrumental Music. **8.0,** Weather Report and General News Bulletin. **8.30,** Concert by the Orchestra at the Café de l'Opéra. **10.0** (approx.), Close Down.

**ROME,** Call 1RO (**447.8 metres**); 3 kW.—**9.15 a.m. to 10.0 a.m.,** Opening Signal and Recital of Songs and Instrumental Items. **10.0 a.m. to 12 Noon,** No Transmission. **12.0 Noon, to 1.0,** Concert by the Station Trio. **1.0 to 4.0,** No Transmission. **4.0,** Opening Signal. **4.5,** Orchestral Concert. **5.0 to 7.0,** No Transmission. **7.0,** Opening Signal and Current Topics. **7.20,** Agricultural Talk. **7.30,** Sports News and General News Bulletin. **7.46,** Topical Talk. **7.59,** Time Signal. **8.0,** Concert by the Grand Symphony Orchestra: Dvorak's "New World" Symphony (No. 5 in E Minor), (a) Adagio e allegro molto, (b) Largo, (c) Finale; Talk in the Interval. **10.5,** Late News Bulletin. **10.15** (approx.), Close Down.

**SAN SEBASTIAN** (Union Radio), Call EAJ8 (**335 metres**); 0.5 kW.—**10.0,** Orchestral Concert relayed from the San Sebastian Casino. **12.0 Midnight** (approx.), Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF (**21.96 and 31.4 metres**); 30 kW.—**3.30,** Relay of Church Service and Sermon. **6.30 to 7.0,** Half Hour of the United Radio Corporation, relayed from **New York.** **9.30,** Organ Recital from the Union College Memorial Chapel at Schenectady, Organist: Elmer Tidmarsh. **10.30,** Programme from **New York.** **11.0,** Stetson Parade Hour, relayed from **Boston, Mass.** **12.0 Midnight,** Lehigh Programme, relayed from **New York.** **12.30 a.m.** (Monday), Transmission from the Capitol Theatre, **New York.** **2.0 a.m.,** Address on "Our Government," relayed from **Washington, D.C.** **2.15 a.m.,** Atwater Kent Programme from **New York.** **2.45 a.m.,** Time Signal. **3.15 a.m.,** Television Signals, Experimental Transmission. **3.30 a.m.** (approx.), Close Down.

**STAMBOUL** (**1,200 metres**); 5 kW.—**3.30,** Concert of Popular Selections. **4.30,** Prices of Cereals. **5.15,** Turkish Music. **7.30,** Weather Report and Time Signal. **7.40,** Orchestral Programme. **9.0,** Late News Bulletin. **9.30** (approx.), Close Down.

**STUTTGART** (**379.7 metres**); 4 kW.—Programme relayed by **Freiburg** (577 metres).—**10.10 a.m.** (approx.), Morning Recital of Choral and Instrumental Music with Address. **11.0 a.m.,** Musical Selections followed by Gramophone Records. **7.15** (approx.), Concert. **9.0** (approx.), Light Music followed by General News Bulletin and Sports Notes.

**TALLINN** (**408 metres**); 2.2 kW.—**1.0,** Concert of Orchestral and Vocal Music. **7.0,** Agricultural Talk. **7.30,** Late News Bulletin.

**TOULOUSE** (Radiophonie du Midi) (**391 metres**); 3 kW.—**12.30,** Weather Forecast and Local Market Quotations. **12.45,** Popular Concert. **1.0,** Time Signal. **1.45,** News from "Le Télégramme," "L'Express" and "Le Midi Socialiste." **8.0,** Exchange Quotations and News Bulletin. **8.15,** News from the Press. **8.30,** Instrumental Music. **9.0,** Carillon. **9.5,** Concert of Popular Items, Selections from the Works of Charpentier including the orchestral suite "Impressions d'Italie." **10.15,** North African Notes and Late News Bulletin. **10.30** (approx.), Close Down.

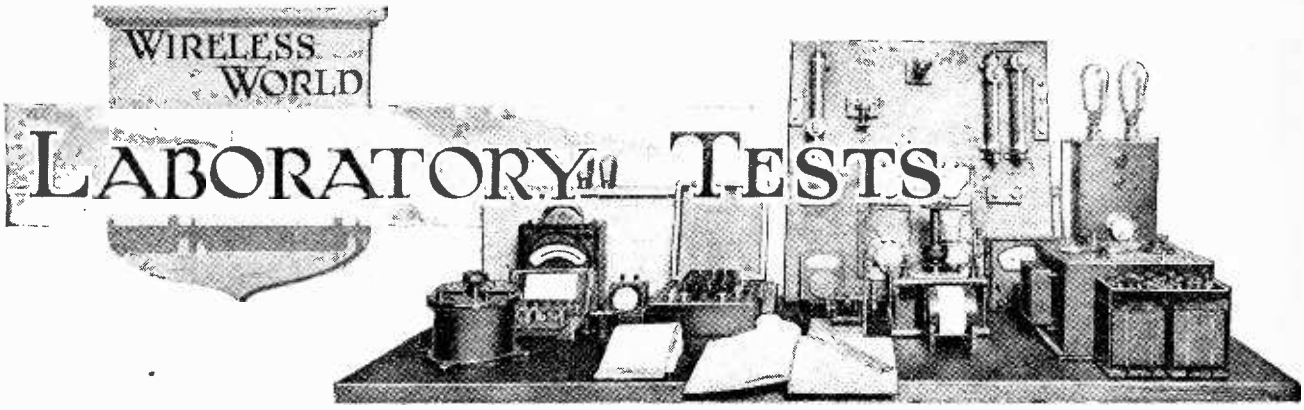
**VIENNA** (**577 and 517.2 metres**); 1.5 and 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres), and **Linz** (254.2 metres).—**9.30 a.m.,** Organ Recital. **10.0 a.m.,** The Vienna Symphony Orchestra in a Concert from Works of Classical Composers. **3.0,** Orchestral Concert. **6.0,** Concert with Soloists. **7.5,** "The Curse of Moisasur," Magical Play in Two Acts by Ferdinand Raimund, Produced by Victor Kutschera, followed by Light Musical Selections. **10.0** (approx.), Close Down.

**VILNA** (**435 metres**); 1.5 kW.—**9.15 a.m.,** Relay of Cathedral Service. **11.0 a.m. to 11.10 a.m.,** Time Signal and News Bulletin relayed from **Warsaw.** **6.20,** Programme from **Warsaw.** **6.45** (approx.), Talk. **7.10,** General News Bulletin. **7.30,** Relay of Concert from **Warsaw.** Concert devoted to the Works of Moniuszko. The Polskie Radio Orchestra conducted by J. Oziminski. The Male Choir of the "La Harpe" Society, under the direction of W. Lachman. **9.0,** Time Signal, Aviation Route Report, Weather Report and Late News Bulletin, followed by Sports and Police News relayed from **Warsaw.** **9.30,** Dance Music. **10.30** (approx.), Close Down.

**WARSAW** (**1.111 metres**); 10 kW.—**9.15 a.m. to 10.45 a.m.,** Relay of Morning Cathedral Service. **11.0 a.m.,** Time Signal and Relay of the Fanfare from the Tower of Notre Dame Church in **Cracow.** **11.5 a.m.,** Report on Aviation Route Conditions and Weather Forecast. **11.10 a.m. to 1.0,** Concert of Symphony Music relayed from the Philharmonic Hall in Warsaw. Selections from the works of Paderewski. The Philharmonic Orchestra conducted by J. Oziminski. **6.45,** Talk. **7.10,** General News Bulletin. **7.30,** Concert with Vocal and Instrumental Solos. **9.0,** Time Signal, Aviation Route Conditions and Weather Report. **9.5,** Late News Bulletin. **9.20,** Police Communications and Sports News. **9.30,** Music relayed from the Oaza Restaurant in Warsaw. **10.30** (approx.), Close Down.

**ZAGREB** (**309.2 metres**); 0.7 kW.—**10.30 a.m.,** Orchestral Concert. **4.0,** Dance Music relayed from the "Club-Bar." **6.45,** Wireless Notes. **7.0,** Opera relayed from the Zagreb National Theatre, News Bulletin and Weather Report in the Interval.

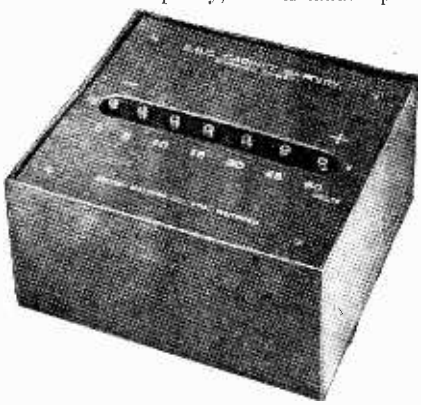
**ZURICH** (**588 metres**); 1 kW.—**10.0 a.m.,** Orchestral Concert. **11.29 a.m.,** Weather Report. **11.30 a.m.,** Concert by the Station Orchestra. **3.0,** Selections by the Castellano Orchestra at the Carlton Elite Hotel. **6.30,** Time Signal. **6.33,** Religious Address. **7.0,** Concert by the Station Orchestra. **9.0,** Late News Bulletin. **9.15,** Concert by a Military Band under the direction of Herr Brändli. **10.15** (approx.), Close Down.




## A Review of Manufacturers' Recent Products.

### B.B.C. "CABINET" BATTERY.

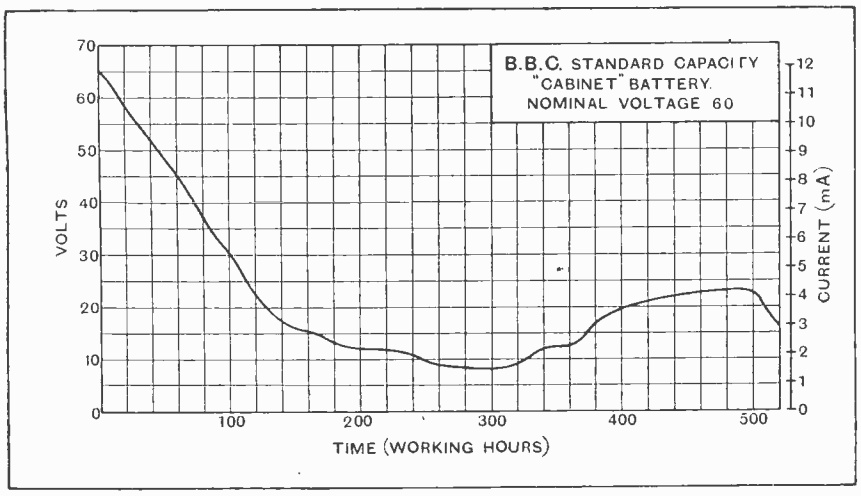
The new type "Cabinet" battery made by the British Battery Co., Ltd., Clarendon Road, Watford, Herts, is of "standard" capacity, and is made up in



B.B.C. Standard capacity "Cabinet" H.T. battery.

an attractive grained brown cardboard container. The battery tested had a nominal voltage of 60, but the actual terminal voltage *on load* at the commencement of the test was 65. The initial current of 11.8 mA. may seem a little high for a small capacity battery of this type, but it is necessary to start fairly high if the normal current of 6 or 7 mA. is to be obtained after the first rapid drop. Unfortunately, the steady state was not reached until the battery had been running for 150 hours, when the current settled down to about 2 mA. for a further 200 hours. In the circumstances it would have been better to have started the discharge at a lower current (i.e., with a higher fixed resistance in circuit), when the form of the curve would undoubtedly have been improved.

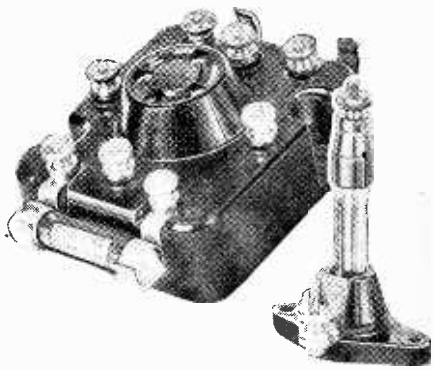
A special feature claimed for the B.B.C. battery is the power of recuperation, and this is clearly substantiated by the curve, which rises from 2 mA. at 300 hours to 4.2 mA. at 500 hours. The test was continued to 800 hours, and showed that after 500 hours the fall of current is rapid. It is difficult to assign a definite life in working hours, owing to the drop between 150 and 300 hours, but, under the conditions of the test, the activity of the cells ceased for all intents and purposes at 500 hours.




Discharge curve of the B.B.C. H.T. battery.

### TWO NEW DUBILIER COMPONENTS.

The vertical holder for "Dumetohm" resistances comprises a moulded bakelite base with side spring and terminal and a split metal terminal cap. Not only does this form of mounting occupy less space on the baseboard, but the self-capacity and possible leakage of an ordinary holder is eliminated. The price is **1s.**



Dubilier vertical "Dumetohm" holder and combined R.C. coupling unit and valve holder.

The combined R.C. coupling unit and valve holder is another move in the direction of space economy. The unit is essentially the same as the ordinary Dubilier R.C. unit, and incorporates a fixed condenser and clips for the anode resistance and grid leaks. The valve holder sockets are provided with separate terminals, so that the coupling resistances and condenser can be joined up either to precede or follow the valve on the unit. The price complete with "Dumetohms" is 8s. 6d.

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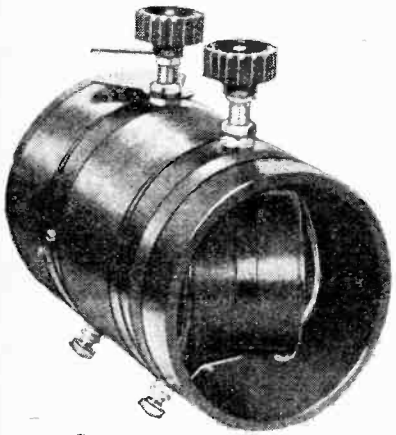
### REDFERN'S "EBONART."

In addition to the standard polished finish, Messrs. Redfern's Rubber Works, Ltd., Hyde, Cheshire, are now producing ebonite panels with a moiré watered-silk surface design. Apart from its pleasing appearance, this surface has the advantage that it is practically scratch proof, and retains its appearance much better than a polished surface.

## "ALL-WAVE" TUNER.

Made by Messrs. S. W. Scott, 67a, Lothian Road, London, S.W.9, this unit has a range of 180-2,000 metres when used with a 0.0005 mfd. variable condenser.



Scott "All-wave" tuner.

The aerial coil is tapped and fitted with an internal six-point switch. The reaction coil rotates inside one end of the aerial coil and is remarkably smooth in action, there being no flexible lead connections.

The price is 15s., and the overall dimensions are $4\frac{3}{4}$in. × $3\frac{1}{4}$in. diameter.

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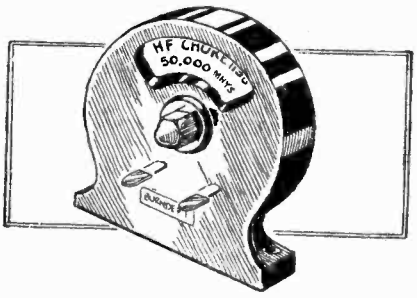
## BURNDEPT H.F. CHOKE.

The type No. 1196 Burndept choke consists of a single-slot former random-wound with silk-covered wire having a total D.C. resistance of 480 ohms. The coil is built into a neat moulding with holes for baseboard mounting and a panel showing the inductance of the choke, which is given as 50,000 micro-henrys. In the original design soldering tag connections were fitted, but terminals are now provided, the price remaining at 3s. 6d.

When connected in a circuit which puts a capacity of 8 micro-mfds. across the winding, resonance occurs at 1,900 metres, so that self-oscillation will not occur on the Daventry 5XX wavelength. At 50 metres the effective impedance is 3,500 ohms, at 500 metres 23,000 ohms, and at resonance 280,000 ohms.




Burndept H.F. choke type No. 1196.

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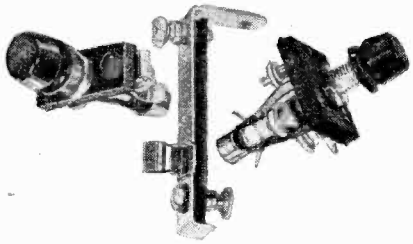
## JENNENS COMPONENTS.

The Jennens vertical baseboard resistor is one of the neatest pre-set filament resistances on the market, the low price of 1s. being not the least attractive feature. Designed primarily for use in portable sets, it is built up on a plated brass angle piece, the vertical arm of which carries the sliding contact. This takes the form of a simple flat spring; the contact is firm and smooth, and there is a complete absence of jamming, which is a common fault in resistors of this type.



Jennens vertical baseboard resistor and push-pull switches.

The push-pull switches are of conventional design and are made with two-pole and three-pole contacts. With the latter switch it is possible to open-circuit the H.T. as well as the L.T. circuit. The price of the two-pole switch is 1s. 3d., and the three-pole 1s. 6d., and the maker is J. R. Jennens, Jennens Row, Birmingham.

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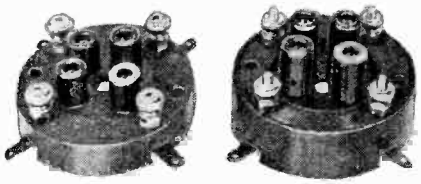
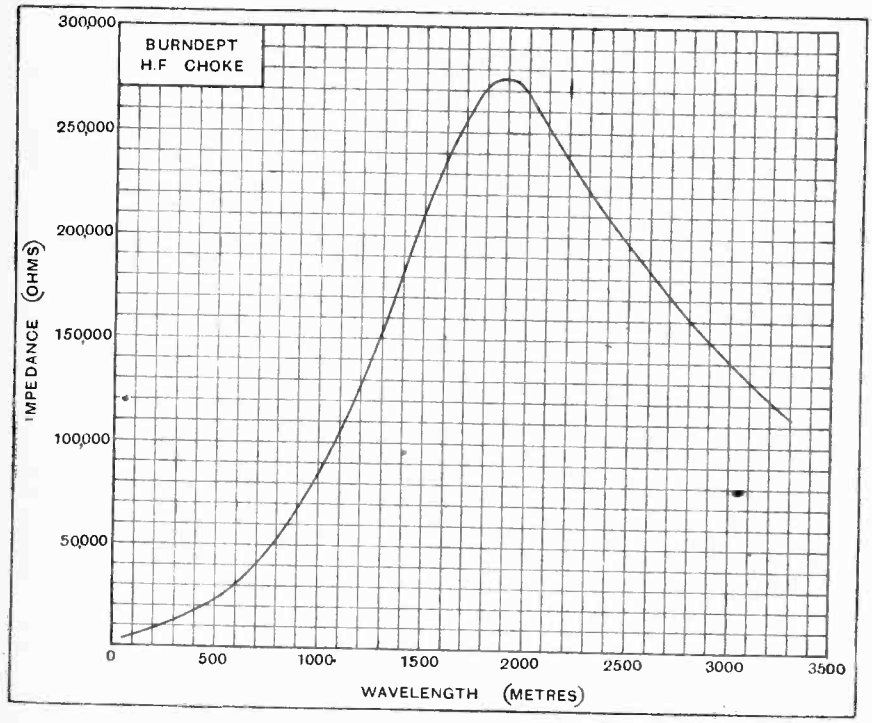
## CASON VALVE HOLDERS.

The valve holders made by Messrs. Cason Mouldings, Chiswick Road, Lower Edmonton, London, N.9, are of two types, the "Anti-Capacity" rigid holder (at 10d.) and the "Anti-Microphonic" (at 1s. 6d.).



Cason "Anti-Capacity" and "Anti-Microphonic" valve holders.

Both types are fitted with phosphor bronze coil sockets, enclosed in hollow columns moulded to the base. The springs are soldered to tinned soldering tags to ensure continuity, and terminals are standard fittings in both types. In the "Anti-Microphonic" type the sockets are mounted on a separate body, which floats on four coil springs inside the outer shell. The movement is limited both upwards and downwards by suitable stops. In both types the anode socket is distinguished by a red ring, and all four terminals are lettered on the base.




Impedance curve of Burndept H.F. choke.

## CATALOGUES RECEIVED.

H. Clarke & Co. (M/c.), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.—Illustrated brochure No. 32, dealing with "Atlas" battery eliminators; this publication supersedes the No. 31 leaflet referred to in the September 5th issue.

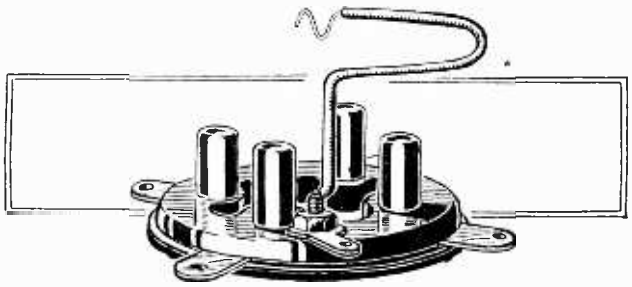
Gent and Co., Ltd., Faraday Works, Leicester.—Illustrated leaflet (Section 10. Book 8) dealing with "Tangent" A.C. mains transformers for power amplifiers and moving-coil loud speakers.

# THE TREND OF PROGRESS.

## New Components—Battery Eliminators and Loud Speakers.

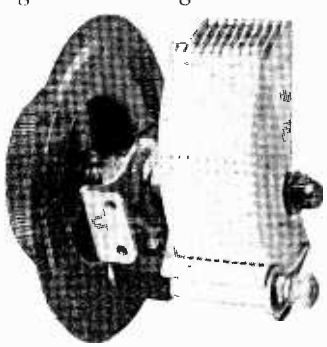
(*Concluded from page 467 of last week's issue.*)

THE only really new components are those which have been called into being by the screened grid and pentode valves. For instance, special astatic coils for coupling screened grid H.F. valves are to be found among the components made by several firms. In this connection it is interesting to note that the coils used in the successful Marconiphone Type 61 receiver are available as separate units. The pentode has brought into being special valve holders with provision for a fifth contact to the screen grid terminal, notably the Bowyer-Lowe and the Pye.



**Valve holder with additional contact for the pentode valve (Pye).**

The variable condenser manufacturers have shown considerable activity, and the quality is even better than last year. There were many low-priced condensers in the Show, but none of the "cheap" articles so plentiful a year or two ago. Drum control condensers, which were the novelty of last year's Show, have firmly established themselves during the year, and all makers exhibit one or more types as alternatives to their standard slow-motion dials. Nearly all the drum control condensers are now fitted with slow-motion devices in place of the direct drives shown last year, and there is no lack of variety in methods adopted to obtain fine control. Most firms have merely fitted special brackets to their standard condensers for parallel-to-panel mounting together with large diameter knurled drums on the existing main and vernier spindles. As exceptions to this rule the following, selected at random, are worth noting: The Igranic vernier drum control with worm drive and translucent scale for internal illumination and the new Utility drum with inside drive. Messrs. Williams and Moffat fit a neat ivorine dust cover to the fixed vanes of one of their condensers, while another interesting feature is the two-speed dial giving ratios of 15 : 1 and 160 : 1 respectively.

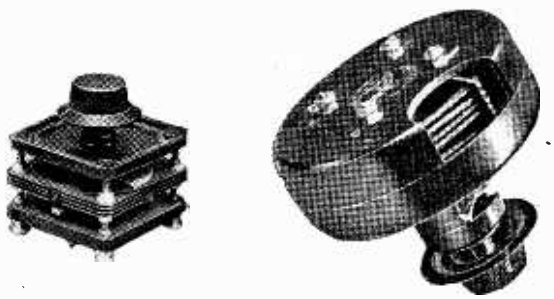


**New type Simplicon condenser with dust cover.**

### Miniature and Reaction Condensers.

New condensers designed for special purposes include the Igranic screened condenser with spindle of insulating material for use in circuits in which both plates are at H.F. potential, and the Pye differential condenser. This is intended for use in the combined Reinartz-Schnell circuit, in which one side supplies capacity reaction and the other acts as a by-pass condenser. The three sets of vanes are so arranged that the by-pass or "throttle" condenser is decreased as the reaction condenser is increased, but the chief feature of the arrangement lies in the fact that the capacity across the impedance in the anode circuit is always constant. It will be appreciated that if a low-frequency transformer is designed to give a straight line frequency characteristic with the net capacity of the differential condenser connected across its primary, the characteristic will remain unaltered by variation of the reaction control condenser.

An increase in the number of miniature variable condensers for use in portables and for capacity-controlled reaction circuits was also observed.

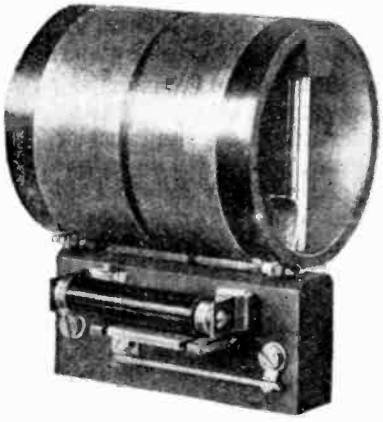


**Pye three element reaction condenser and the dual range tuner unit.**

Fewer plug-in coils are seen, their place being taken by complete tuner units in the case of reacting detector circuits and built-in coils and transformers in the case of receivers with H.F. stages. The Pye dual-range tuner unit with built-in change-over switch is particularly neat, and it is interesting to note that the coils are designed in accordance with Butterworth's classical formulæ. Plug-in type coils still maintain their popularity for short-wave work, and good designs were shown by the Marconiphone Co., Ltd., and D.X. Coils, Ltd. Many of these coils, however, will be found on closer examination to consist of complete tuner units with aerial grid and reaction winding, such as the Lewcos 6-pin unit in which the grid coil is wound with blue silk-covered strip.

**The Trend of Progress.—**

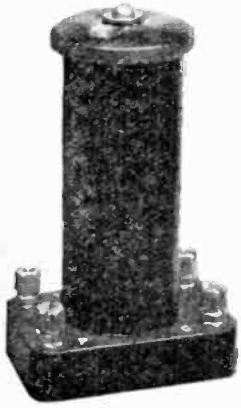
As an accessory to the aerial tuning circuit the Met-Vick Elastic Aerial Unit is something new and original. It may be connected in front of any receiver and produces an electrical effect equivalent to shortening the effective length of the aerial. It is well known that a short aerial improves the ratio of signal strength of a foreign station to the pick-up from the local station, and the Met-Vick unit enables the equivalent of the optimum length to be found electrically. The unit is a genuine advance in design, and is really a form of high-



Marconiphone H.F. Intervalve coupling unit.

frequency potential divider which enables any desired fraction of the total H.F. voltage pick-up on the aerial to be applied to the aerial tuning circuit.

Although the pentode has altered the output arrangements of L.F. circuits the components used for coupling to preceding valves have undergone little change. An interesting detail improvement in R.C.C. units is to be found among the new Igranic components. It is well known that the A.C. resistance of a detector valve depends on whether it is operating as a leaky grid or anode-bend rectifier, and that the anode resistance should be changed if the best results are to be obtained in a set designed for alternative methods of rectification. The Igranic dual-resistance coupling unit contains two alternative anode resistances, either of which may be selected by rotating a milled switch disc at the top of the unit.



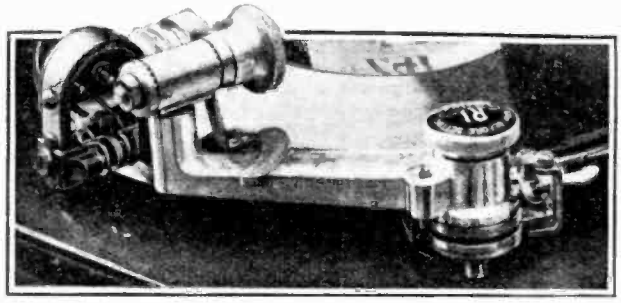
Igranic dual range resistance coupling unit.

Logarithmically - tapped wire wound anode resistances for purposes of volume control are to be found among the 1929 products of several firms, including Igranic and Messrs. A. W. Stapleton.

Low-frequency transformers remain much as before, but it is interesting to note that the Igranic Company now publish curves for their transformers which take into account the load on the secondary under working conditions, *i.e.*, with an output valve loaded by a loud speaker. Miniature transformers for use in portables are now made by all the leading firms.

**For the Electric Gramophone.**

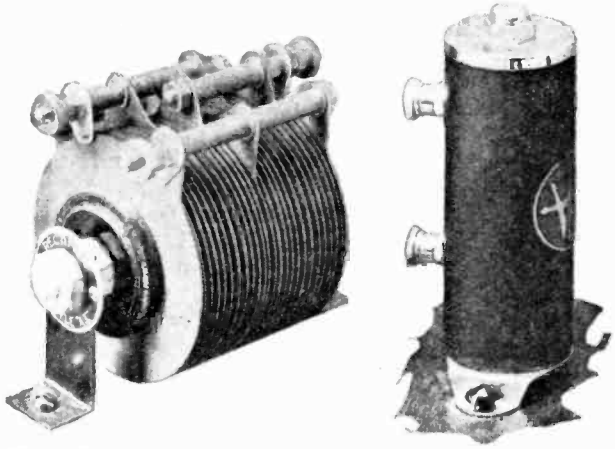
Accessories for the electric gramophone have reached a higher state of development than was evident at the last Show. The pick-ups are quieter mechanically, and most of them have greater freedom of movement so that record wear should be even less than with an ordinary gramophone sound box. The pick-up arms which are all new this year range from the simple but effective Edison Bell arm at 3s., to the elaborate R. I. Varley automatic pick-up arm at 35s. The latter is a work of art, and incorporates every conceivable refinement. The needle angle may be varied and the needle pressure adjusted between wide limits by means of an internal spiral spring tensioning device. By an ingenious link motion the needle track alignment is kept tangential at all parts of the record from the outside



By an automatic swivelling of the pick-up the needle track alignment is kept tangential to the groove in the new R.I. pick-up arm.

to the centre, and at the end of the record the turntable is automatically stopped.

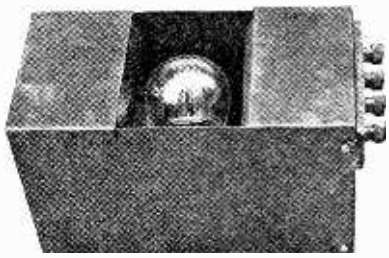
Although it is less than a year since the Westinghouse metal rectifier entered the radio field, the Exhibition has revealed the most significant fact that eliminators and battery chargers using this form of rectifier completely outnumber the sum total of all other types. On



Westinghouse rectifying units. The A3 is a new battery charging unit giving a heavier current than the popular ½ ampere model. The grid biasing rectifier is on the right.

**The Trend of Progress.—**

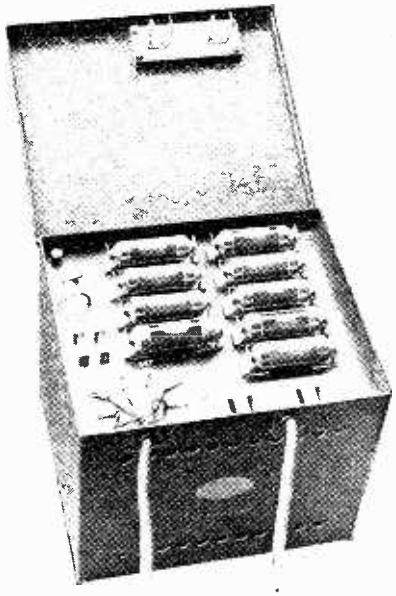
the one side are arranged the arc and valve rectifiers for L.T. and H.T. supply respectively against various Westinghouse units differing only in dimensions for several output currents and voltages. A census compiled from a visit to all the stands revealed that fourteen manufacturers of A.C. mains gear exhibited, in housings of their own design, the Westinghouse form of rectifier.



New model Atlas valve rectifier.

Supporters of the valve form of rectifier numbered five, including those firms who are themselves makers of valves. It is doubtful if any conclusion based on technical merit can be gleaned from these figures, each form of rectification proving itself to be trustworthy by the amount of support it receiyes.

Based on long experience, arc and valve rectifiers, while being strongly favoured by many users of A.C. mains, are, of course, not indestructible, and although the rectifying valve may have a life of a year or more when in continuous use, it must be regarded as a renewable part of this class of rectifier. One cannot overlook, on the other hand, that owing to the lack of



Ferranti battery eliminator. On opening the metal box the supply circuit is broken.

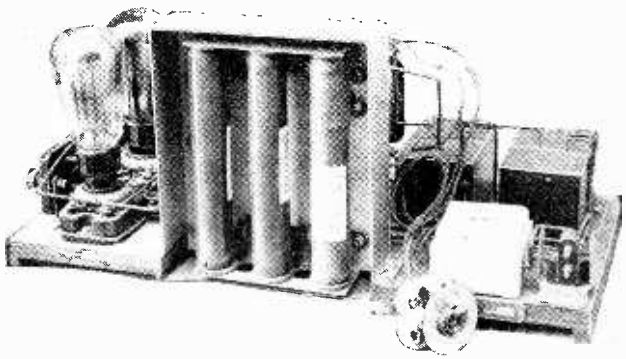
knowledge concerning the Westinghouse metal rectifier that the durability of this type is regarded, in some quarters, with suspicion. Its almost universal adoption, however, must dispel any lack of confidence, and one learned at the Westinghouse stand that metal rectifying units carry a twelve months' guarantee. If high efficiency is a consideration in the design of small eliminators and battery chargers then metal rectifiers must be adjudged the best. Effective cooling appears to be an important requirement of the metal rectifier, and careful provision was to be found in many of the rectifiers for the purpose of dispersing the heat.

Complete battery eliminators supplying H.T., L.T., and grid bias made their first appearance this year on several of the stands. The H.T. circuits require no description. L.T. was produced by two distinct methods, one a rectifier, followed by chokes and elec-

Gambrell complete battery eliminator giving H.T., L.T. and grid biasing potentials.

trolytic condenser, and the other making use of a switch so that a trickle-charged L.T. battery is taken off charge and connected to the set as required. Obviously, the first method is equivalent to using a battery of high internal resistance, so that if one valve of a multi-valve receiver should be removed an increased voltage will be applied to the remainder. It is the electrolytic condenser that has made this form of battery substitute feasible, and used in conjunction with a voltmeter and rectifier of liberal output the method may be quite workable, though one cannot think it will be long-lived in this precise form.

What is often referred to as " free grid bias " is the



B.T.H. valve rectifier specially designed for use with the output stage of the R.K. moving coil loud speaker amplifier.

**The Trend of Progress.—**

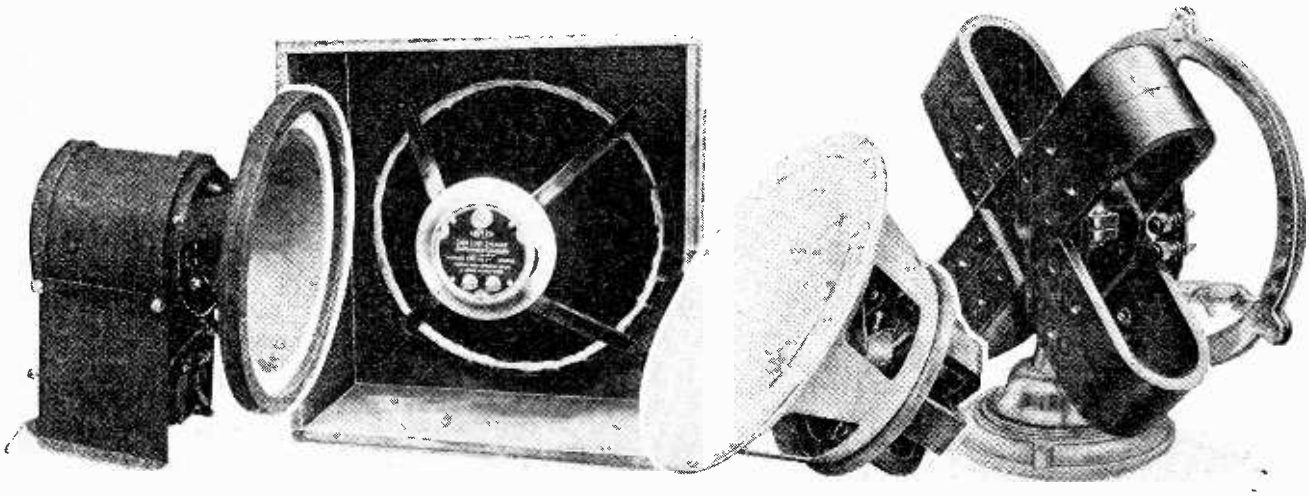
arrangement that has been adopted in several eliminators. It consists of a resistance connected between the minus terminal of the H.T. rectifier and the filament current supply, so that it is traversed by the anode current and biasing potentials created. Carefully worked out and incorporated in a batteryless receiver such an arrangement may be permissible, yet it is regarded with suspicion in view of the present knowledge and the dangers of undesirable battery couplings.

**Rectifier of Grid Bias.**

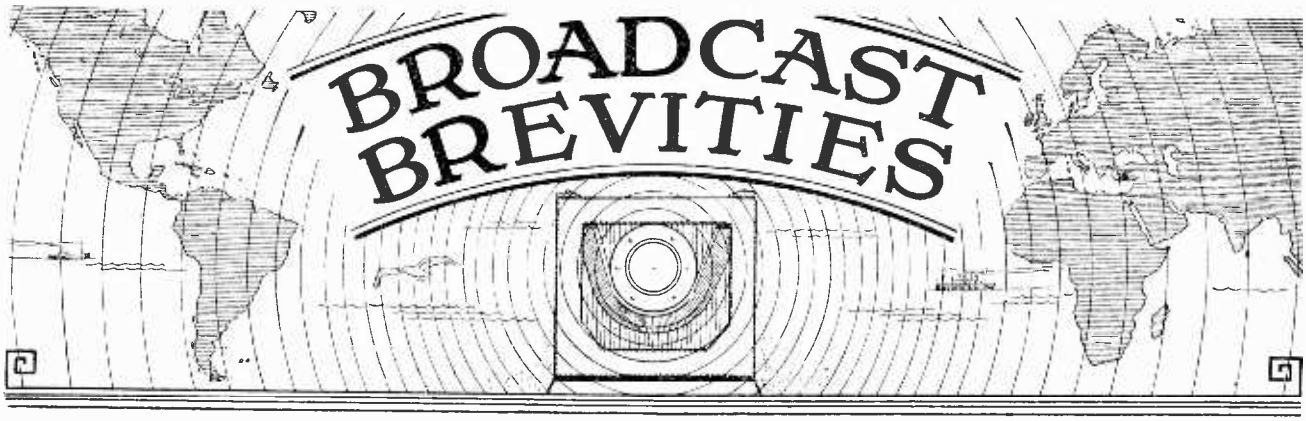
Most interesting of all is the Westinghouse rectifying unit, scarcely larger than a small grip cell, which has been introduced for supplying grid biasing potentials. Unlike metal rectifiers for other purposes its rectifying cells are not bridge connected, and it merely comprises a number of small series connected sections forming a half-wave rectifier. It is used with a smoothing circuit of its own, and its output must be slightly loaded with a resistance which, incidentally, will form the potential divider.

The problem of filament operation from D.C. is yet to be solved. Series connected filaments demand the complete rewiring of a receiver and a careful selection of valves, so this year one finds that at least one eliminator—the Marconiphone unit—provides for passing a comparatively heavy current through a resistance lamp, so that the valve filaments may be parallel connected and modification of the receiver for use with D.C. supply thus avoided.

Since the last Exhibition the moving coil loud speaker has come into common use to such an enormous extent and so advanced the standard of broadcast reception that the loud speaker market has become uncertain. Moving coil loud speakers are produced by manufacturers who, until recently, had little or nothing to do with the radio industry; while, on the other side, it has been rendered all the more difficult to produce a loud speaker not of the moving coil type that will produce tolerable results in comparison with the moving coil instruments. While setting a new standard, the field current demands of the coil-driven loud speaker are a deterrent to its general adoption. The permanent magnet models of Baker, Zampa, and S. G. Brown provide a solution, but must necessarily be arranged with an exceedingly small gap width if the flux density is to be high and the instrument sensitive. One could not help noticing the large crowds which regularly gathered around the stands exhibiting moving coil loud speakers and parts. Of the reed-driven types, there has been an increase in the number of those employing a balanced armature in view of the claims of greater gap width and increased amplitudes, more constant field strengths, and absence of adjustment. A definite advance in loud speaker design has been made in the Lion loud speaker. In brief its merit is a liberal permissible displacement of the reed without loss of sensitivity. The design of the reed, its mounting and method of adjustment, produce an effect which compensates for the undue increase in magnetic pull when the current in the magnet winding is of moderate value. The claims made are exceptional sensitivity together with ability of handling high power and producing purity of tone, because the design of the reed creates a movement normally proportional to the current at every instant. This compensated form of reed design allows a full bass volume without rattle. Reference is also made in an explanatory pamphlet issued by Graham Amplion to that musical property known as "attack." In this connection it is necessary that the displacement of the diaphragm shall be made just as spontaneously as the movement of the strings or other sound creating device which the loud speaker is called upon to reproduce. It is generally appreciated that there is a lag coupled with a slow building up to the required displacement when a diaphragm is reed driven. It is claimed that by means of a delay effect a spontaneous and rapid displacement of the diaphragm is achieved, though it occurs at a brief interval after the current rise has taken place in the coil windings.



Loud speakers of interest. Left to right: Zampa permanent magnet model, Amplion Lion, Brown permanent magnet type, permanent magnet model by Baker Selhurst.




*By Our Special Correspondent.*

***"Broadcasting House."—Longer Life for 2BD and 5NO.—Captain Eckersley Challenged.—The Clapham Conservatory.—Sir Henry Wood.—Debaters are Too Friendly!***

**"Broadcasting House": A Chance for Young Architects?**

The Portland Place site has passed definitely into the hands of the B.B.C., to be made beautiful, commonplace, or ugly, according to the sort of building which it pleases the Corporation to erect. What a responsibility! What an opportunity!

Bearing in mind that "Broadcasting House" will probably be known all over the world as a symbol of British broadcasting, much as St. Paul's conjures up London in the mind of the outsider, it would be distressing if the B.B.C. failed to draw upon the highest architectural talent at its command.

The best plan would surely be to hold an open competition, which would at least give our younger architects a chance to display their ideas. This was done quite recently in the case of the Shakespeare Memorial Theatre at Stratford-on-Avon, the design ultimately chosen being the work of a young woman.

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**A Miniature Theatre.**

There seems little doubt that the B.B.C. will lavish a tremendous amount of care on the interior of the building. Apart from the introduction of small halls or "double-deckers" instead of the cramped studios at Savoy Hill, it is likely that the plans will include a miniature theatre and a concert hall.

Some of the staff would like to splash out with a swimming bath, which could, of course, be provided by listeners' money on the grounds that the effects department could use the splashes for sea effects in radio plays.

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**Newcastle and Aberdeen as Permanent Transmitters.**

Major Gladstone Murray, of the B.B.C., has announced that it is almost a certainty that 5GB will remain as the permanent Midland transmitter independently of the regional scheme. I now learn that two other important transmitters—Newcastle and Aberdeen—are also unlikely to be affected when the majority of the present transmitters close down.

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**The Last of the Mohicans.**

After November 1st the station directors of Aberdeen and Newcastle will be the sole surviving members of their tribe. From that date the chief executive officers attached to the various transmitters will be known as Regional Directors for the Scottish, Northern, Western, Midland, and Northern Ireland areas respectively.

London has managed without a station director for two years now. His place is filled by the "London Executive."

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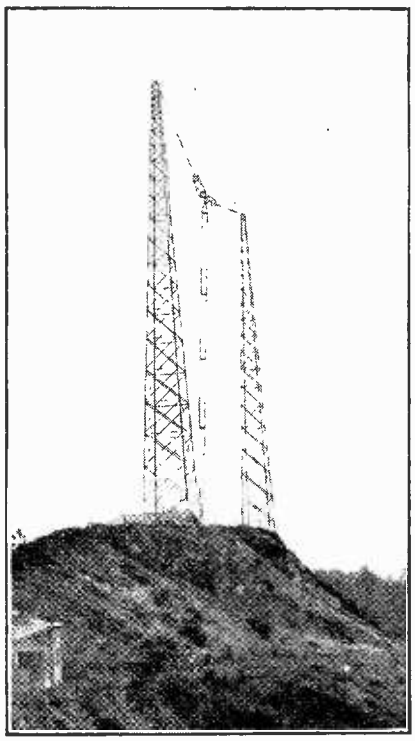

**"ATENCION! AQUI RADIO EAJ 8!" A picturesque view of the masts of the San Sebastian broadcasting station which overlooks the Bay of Biscay from Mount Igueldo. San Sebastian can be heard on 335 metres.**

**Picture Transmission Time-table.**

According to present arrangements, the experimental picture transmissions from Daventry with the Fultograph will observe the following schedule:—

Sundays and Mondays, 2-2.15 p.m.
Mondays and other weekdays, 12 midnight to 12.15 a.m.

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**Captain Eckersley Declines a Duel.**

Savoy Hill still has its thrills. Here is a copy of a letter received last Wednesday:—

"I, A.E.D. . . . , of - - - - - - , challenge Captain Eckersley of the B.B.C. to a duel on any set you like to bring either sidedly from a crystal set to an 8-valve Etrodine on any kind of aerial indoor or out, on any earth, whether close together, or miles apart, or two earth wires, two aerials, none at all, I have got everything ready in my kitchen, in fact you need not come next to me, and I'll bet I will beat you everyway at any trick at wireless. Hows that for a docker?

(Signed) A.E.D. . . . . .
(Countersigned) W.J.Y.
friend of the above."

Captain Eckersley is progressing as satisfactorily as can be expected, but he has declined the duel.

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**Forbidden Fruit?**

It must be rather disconcerting to have to carry out wireless research amid the seductive temptations of a grape vine, especially when the grapes are big and black and "asking to be picked." The engineers at the Clapham research department are finding it very trying.

As readers know, the Clapham laboratory occupies a private mansion on the Common. Most of the available space is in use, including the conservatory, and it is in this little Eden that the fruit

clusters. There is a charging board here, with ledge upon ledge of H.T. and L.T. accumulators. And every time someone wants to see how the juice is going he stands a chance of getting grape juice down his neck.

The difficulty is that they are semi-Government grapes, and no one likes to be the first to pick.

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### Sets for the Critics.

Most of these accumulators, by the way, are especially for the use of the critics and others whose sets are permanently maintained by the B.B.C. From time to time the engineers tour the dwelling places of the mighty ones to restore the grid batteries and carry out other little adjustments. Who wouldn't be a critic!

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### Sir Henry Wood.

It is reassuring to hear Sir Henry Wood refuting rumours by declaring that he has never felt better in his life.

Whatever may happen as regards the constitution of the Queen's Hall Orchestra (and slight changes are probable before next season's "Proms"), it is practically certain that Sir Henry Wood will stay. Indeed, it is doubtful if the B.B.C. would handle the Promenade Concerts at all without him.

At the same time, other tasks can be found for the "new Richard" who has entered the field with a sense of humour so keen that he can decry broadcasting on the eve of his *rapprochement* with Savoy Hill!

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### Women Performers.

It is stated authoritatively that there has been no difference between the B.B.C. and Sir Henry Wood on the question of women performers in the orchestra. The sole criterion for eligibility is talent.

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### Hallé Concerts Again.

The first Hallé broadcast of the season will take place on October 18th, when the Hallé Concerts Society opens its seventy-first season at the Free Trade Hall, Manchester.

The concert will be relayed to all stations. It opens with the stupendous Symphony No. 7 in C major by Schubert, a work which was beyond even the powers of the famous Vienna orchestra of the composer's day.

During the interval there is to be a short recital of German Lieder and old French folk-songs by Helen Henschel. The second half of the Hallé concert is devoted to Wagner, and includes the Faust Overture and the Tannhäuser Overture.

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### A Shilling a Second.

A revue sketch, "Give Me New York," described as "a Transatlantic transmission at a shilling a second," will be broadcast from 2LO on October 26th. Holt Marvell has written the lyrics, while the music is the joint work of Roger Eckersley, Dick Cecil, and L. Stanton Jefferies.

### The King to Broadcast.

The speech by the King and a running commentary on the ceremony at the opening of the new Tyne bridge will be broadcast to Tyneside listeners to-day (Wednesday) at 10.50 a.m.

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### Railway Plays.

Two plays of the iron road will be heard by 5GB listeners on October 15th. The first, "In the Tunnel," is a dramatic thrill by Rupert Croft-Cooke, and the action takes place in a compartment of an express train passing through a tunnel which some time previously was the scene of a tragedy. To lighten the tension which this play creates, it will be followed by "What a Nerve," a farcical adventure by Stuart Ready.

**FUTURE FEATURES.**

**London and Daventry (5XX).**

OCTOBER 17TH.—"The Grand Cham's Diamond," a play by Alan Monkhouse.

OCTOBER 20TH.—An Old Folks' Programme.

**Daventry Experimental (5GB).**

OCTOBER 15TH.—"In the Tunnel," by Rupert Croft-Cooke, and "What a Nerve," by Stuart Ready, two plays of the Iron Road.

OCTOBER 17TH.—Act III. of "Faust," by the Carl Rosa Opera Company, from Cardiff.

OCTOBER 19TH.—A programme of selections from the Popular Operas.

**Cardiff.**

OCTOBER 14TH.—"The Golden Legend," by Arthur Sullivan.

OCTOBER 16TH.—"Henry VIII. of England," by "L. du G.," of "Punch."

OCTOBER 18TH.—A Descriptive Recital on "The Music of Spain," by Michael Mulliner (pianoforte).

**Manchester.**

OCTOBER 15TH.—"Tall Chimneys," a drama by James Lansdale Hodson.

**Newcastle.**

OCTOBER 20TH.—A Border Programme.

**Glasgow.**

OCTOBER 15TH.—"The Jazz Business," or "Controversy Confounded," by Edwin Lewis.

**Aberdeen.**

OCTOBER 19TH.—A Humorous Programme.

**Belfast.**

OCTOBER 19TH.—The Opening Concert of the Belfast Philharmonic Society.

### Debaters are Too Friendly!

If broadcast debates are to be given in any quantity this winter they should be a little more vivacious than some which we have had recently. The "armchair and a cigar" idea can be overdone; too often it engenders a feeling of *bonhomie* and magnanimity which is fatal to good polemics and keeps the sparks from flying as they should.

Let us have some really fiery exchanges on burning topics. I see that on October 24th a variety broadcast is to be introduced with a general smashing of china in the studio. Debates should start this way.

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### Sir James Barrie.

It seems likely that Sir James Barrie will, after all, be heard by London and Daventry listeners on Monday next, October 15th, when he is presented with the freedom of Jedburgh. The original arrangement whereby the speech was to be relayed only from the Scottish stations did not please the army of Barrieolators in the south.

I hear that Sir James had a mild shock when the broadcasting project was mentioned, but, like the majority of celebrities, he finally yielded to the claims of the microphone. The important personages who have not yet been captured must now be very few.

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### A Bright Brace.

What sort of programme should we get if the B.B.C. relied upon the "criticism" appearing in the correspondence columns of the Press?

These are extracts from letters appearing last week:—

". . . too much talking, opera, promenade concerts, etc. This an ordinary listener-in does not understand. What they want up North is something with a Kick in it."

"When are we going to get some really jolly B.B.C. programmes? I am weary of symphony concerts and talks on cats."

How many talks have we had on cats? Fifty, a hundred, two hundred? At the moment I can recall only one—that excellent little chat by Mr. Compton Mackenzie a few nights ago. And what is "something with a Kick in it"?

Certain people deserve "something with a kick in it."

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### Hydroplaning Round Britain.

Colonel the Master of Sempill is to give the sports talk from 2LO and 5XX on October 27th, his subject being "Round Britain in a Light Hydroplane."

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### A Glasgow Item.

Listeners who have become familiar with the B.B.C.'s "Foundations of Music" series may expect something rather on the same lines when they read the item, "Foundations of Drama," in Glasgow's programme for October 12th. They need hardly expect anything quite so serious, however. Modern drama had other foundations as well as the miracle and morality plays which the text-books tell us about, and it is one of these rather out-of-the-way "foundations" which will be illustrated in this programme.

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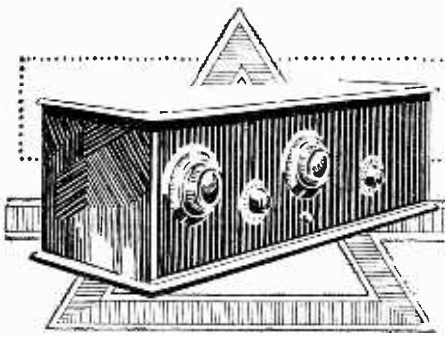
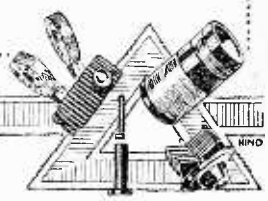
### "Studio" on the Platform.

Pursuing their policy of broadcasting from various provincial centres, the B.B.C. in Scotland will relay a concert from the City Hall, Perth, to all Scottish stations on October 24th. This concert has been arranged in co-operation with the local Rotary Club, who are running it on behalf of local charities. The Perth City Hall is one of the finest concert halls in Scotland, and promises to make an exceptionally good broadcasting "Studio." An attempt will be made to carry through the programme in exactly the same way as concerts are usually given in the studio, with announcements being made from the platform, so that the audience may see a programme as it is presented for them night after night.



# REACTION

## Its Uses and Abuses



By N. P. VINCER-MINTER.

THE problem of smooth reaction control is one which never fails to arouse interest and in some cases heated argument whenever the question arises. It cannot be out of place, therefore, at this season of the year, when there are so many newcomers to wireless, to discuss the principal types of reaction units in use and to indicate the particular merits and demerits of each.

In Fig. 1 (*a*) we see the conventional "swinging coil" method of reaction. It is still the best type for long-wave work, but on the B.B.C. wavelengths is none too good unless a really good coil holder with slow-motion drive can be obtained. In Fig. 1 (*b*) we see exactly the same circuit arranged for control by means of a condenser. It is, therefore, a capacitatively controlled magnetic reaction circuit, and is not a "capacity reaction" circuit as so many people seem to think. The reaction condenser $C_5$ must never be of such a capacity range that, in conjunction with $C_4$, it can bring the H.F. choke circuit into resonance with the $L_1$, $C_1$ circuit. $C_1$ is merely a blocking condenser to prevent discharge of the H.T. battery through the telephones and H.F. choke in the event of a short circuit developing in $C_5$. $C_3$, shown in dotted lines, represents the normal position of the anode circuit condenser used to by-pass H.F. energy. It will not be required if $C_5$ is never adjusted so that its capacity is less than the normal value of $C_3$ in Fig. 1 (*a*). This means that a small reaction coil should be used in order to avoid the necessity of the reaction condenser ever being set at minimum.

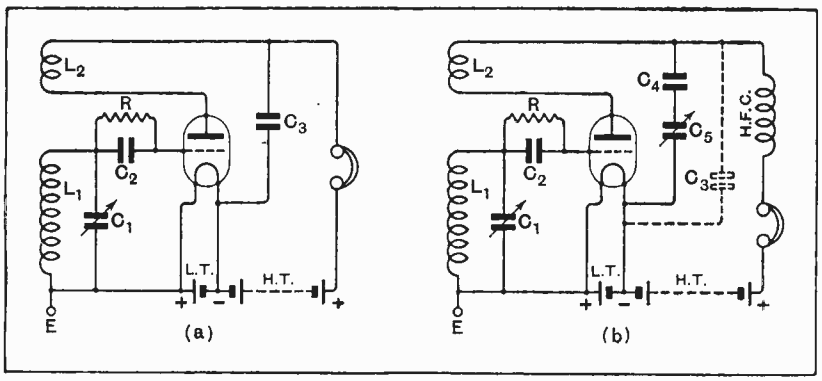



Fig. 1.—(a) The swinging coil method of reaction. (b) The throttle controlled system.

In Fig. 2 (*a*) we have one of the innumerable variations of the Reinartz system of reaction often loosely referred to as the Reinartz circuit. This particular type is the Weagant circuit. The functions and values of reaction coil and condenser and of the blocking condenser will not differ from that of Fig. 1 (*b*) already discussed. In particular, it should be noted that the question of the presence or absence of $C_3$ is governed by the same factor as in the case of Fig. 1 (*b*). This may not be so apparent in the case of Fig. 2 (*a*), but careful thought will reveal that $C_3$ is in parallel with $C_4$ and $C_5$ in both circuits. In Fig. 2 (*b*) the reaction condenser is used to alter what may permissibly be called the "choking effect" of the H.F.C. choke. This is true also of Fig. 1 (*b*), but not of Fig. 2 (*a*), where $C_5$ varies the H.F. energy in the circuit comprised by the reaction coil and the reaction condenser. $C_3$ is in parallel with $C_4$ and $C_5$ in both circuits.

In Fig. 2 (*b*) we have what is usually known as the throttle control reaction system, which has the peculiarity (the reason for which is obvious to those possessing even small technical knowledge) that

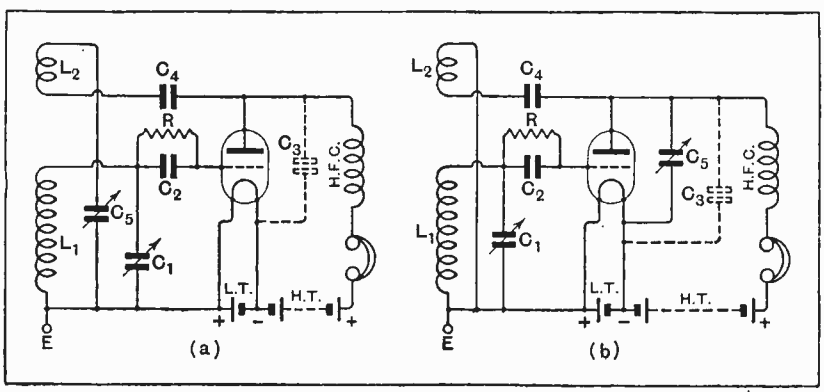



Fig. 2.—(a) The Reinartz system. (b) A throttle controlled Reinartz circuit.

**Reaction.**—

the reaction effect increases as the capacity effect increases, unlike the case of Fig. 1 (*b*) and Fig. 2 (*a*). The absolute necessity of the blocking condenser $C_4$ in the position shown is obvious, whilst an additional blocking condenser in series with $C_5$ is optional. The question of $C_3$ has already been discussed in conjunction with previous circuits. All the circuits which we have mentioned so far, with the single exception of the first, may be said to be in the Reinartz group, whilst all the ensuing ones, with the exception of the last, are in the Hartley group.

A study of Fig. 3 (*a*) will reveal that we have got rid of the reaction coil, it being incorporated as an integral part of the tuning inductance. A centre tapped coil is used, and in order to help the novice the same symbols, $L_1$ and $L_2$, are used for the tuning and reaction coils as before. $L_2$ is therefore, we see, merely a portion of $L_1$, and is not separate. The fact of a centre tapped coil being used renders this circuit peculiarly suitable for frame aerial work, as a centre tapped frame is used in place of the coil, and one need not go to the trouble of adding reaction turns on to an existing tapped frame. The reaction condenser in this circuit, of course, need only consist of a neutralising condenser of a type which has a smooth movement. The usual blocking condenser is present to prevent trouble should $C_5$ unexpectedly develop a short circuit, a fault rather too common with certain of these devices.

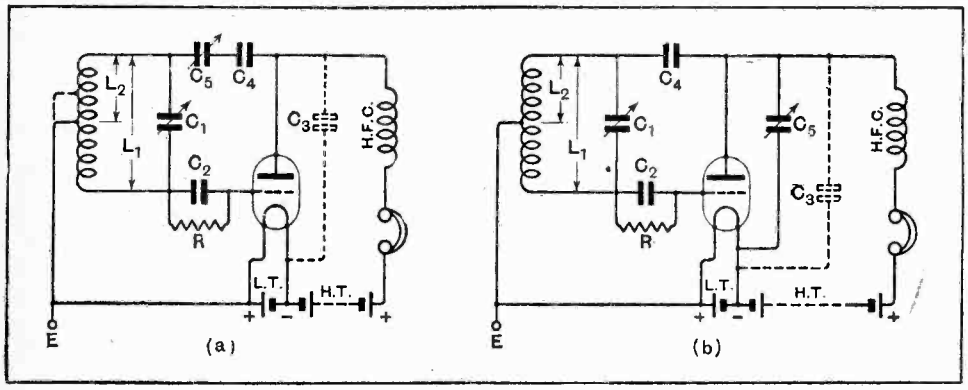



Fig. 3.—(a) The Hartley circuit. (b) The Schnell circuit.

Fig. 3 (*b*) is commonly known as the Schnell circuit, but, of course, belongs to the Hartley group. To appease anybody who is using a Schnell circuit, which is somewhat different to the one illustrated, it would perhaps be better to call it one of the Schnell variations of the Hartley circuit. There may be, and probably is, an independent Schnell circuit which knows not Hartley. This circuit gets rid of one of the great drawbacks of the Hartley circuit proper, namely, the disadvantage that both rotor and stator of the reaction control are at H.F. potential, with consequent hand-capacity effects when using reaction. It still leaves us up in the air, however, with regard to the tuning condenser, neither side of which is at earth potential. We can, however, dodge even this problem and obtain a really sound, stable, and sensitive circuit by passing on to the circuit shown in Fig. 4 (*a*), which the writer does not remember ever having seen in print before. As will be seen, the problem is solved by the use of a dual condenser, or, alternatively, a double-gang condenser. Dual condensers are, however, usually cheaper.

The final circuit indicates the tuned plate system of reaction, which never had a great following in this country. It is dependent for its action upon the plate circuit being brought into resonance with the grid circuit when oscillation will take place, provided the grid circuit is not heavily damped; the energy is fed back through the electrostatic capacity of the valve.

Reaction may be readily added to a receiver containing an H.F. stage in such a manner that, although the carrier waves of distant stations can be heterodyned, the radiation from the aerial is negligible.

It must be borne in mind that in all the foregoing circuits special attention must be given to obtaining smooth reaction control; otherwise all our well-meaning efforts to avoid oscillating will prove fruitless. The receiver should glide almost imperceptibly into and out of oscillation at the bidding of the reaction control. If it "plops" in and out of oscillation and, moreover, does not cease oscillating at the same adjustment of the reaction control as it commenced, various troubles are indicated, such as a faulty valve, too large a reaction coil, or an incorrect value of grid leak. This state of affairs is known as electrical backlash, and in the majority of cases it is safe to accuse the grid leak, be it of the fixed or hand-controlled variable type. Take advantage, however, of the writer's experience and only use leaks of known reputation.

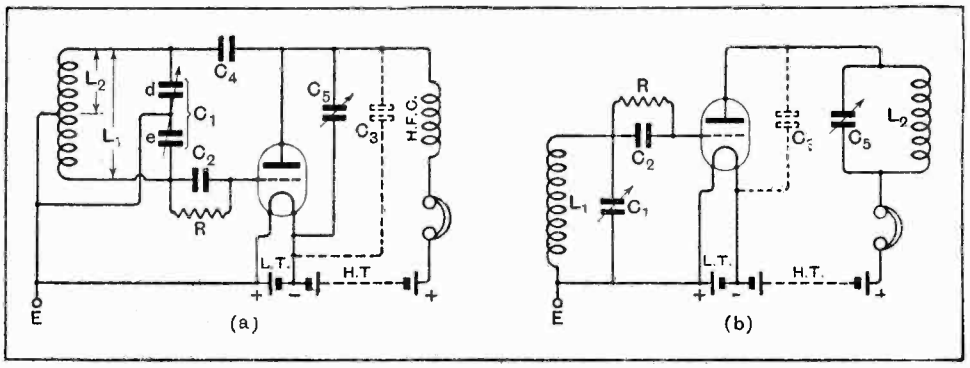



Fig. 4.—(a) An improved Hartley circuit. (b) The tuned plate system.

# 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, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

### CAPTAIN ROUND ON "ATTACK."

Sir,—In connection with a new type of loud speaker, a claim is made that it represents more exactly the "attack" than is given by the R.K. type loud speaker.

The arguments are based on the fact that the R.K. is mass controlled, and that, owing to the slow rise of velocity of a mass under a suddenly applied force, such a transient as is represented by this suddenly applied force cannot be faithfully represented. I believe this is an incorrect notion due to a wrong choice of the co-ordinates concerned. The ideal small diaphragm source situated in a baffle radiates sound proportional to its acceleration. Diaphragm acceleration is proportional to the force applied if there is mass control. Consequently, the force curve is fairly represented in the radiation, and any incorrect representation of transients must be due to a divergence from this ideal law. This, of course, happens in practice, for first of all we do not use a point source—then our diaphragm is not infinitely stiff—our force curve is not straight, and so on, which troubles are common to any and every open diaphragm loud speaker driven by iron or copper. Differences in accuracy of reproduction are purely due to the cleverness of the designers in keeping these faults well restrained.

Those who have imagined that the transient cannot be represented by the R.K. due to the mass control have drawn their conclusions from the velocity curve, and radiation is only proportional to velocity with horn loading, and, of course, in that case the force acts on a pure mechanical resistance.

Marconi House, W.C.2. H. J. ROUND.
September 29th, 1928.

### B.B.C. CONTROL ROOM.

Sir,—I would like to associate myself with the views expressed by your correspondent, Mr. E. C. Hughes, with reference to the excessive volume control indulged in by the B.B.C. I also have a record of some of the Wagner music recently broadcast, and entirely agree with Mr. Hughes that the radio version was not up to the gramophone because of this.

Surely this is a rather lamentable state of affairs!

Could not the B.B.C. convince us of the necessity of the volume controller by one night dispensing with him and showing us the result? I would not be surprised to find that the occasional slight overloading and very weak passages would be more than discounted by the vastly improved rendering.

Incidentally, I consider that no useful purpose is done by strengthening up the weak passages, since the "mush" is also amplified, and becomes worse than any needle scratch on the gramophone.

I have often wondered what famous soloists would think when they realised that, when broadcasting, their carefully modulated diminuendos and crescendos were for the most part being set at nought by an over-zealous volume controller. Surely the tonal range of a soloist should be within the capacity of the modulator valve! GEORGE R. PALMER

Stanmore.
September 21st, 1928.

### REALISTIC REPRODUCTION.

Sir,—May I trespass again into your correspondence columns in order to reply to the comments of the Rev. Bonavia-Hunt regarding the matter of realistic broadcast reproduction?

First, I am conscious of having caused him some misconception of my point of view by the use of the phrase "acoustic attenuation."

Acoustic "characterisation" would perhaps have been a more correct description of the actual phenomenon I had in mind.

I did not wish it to be supposed that the sound waves emanating from the loud speaker suffer physical modification at the hands of the local atmosphere. What I intended to convey was that the human mind, although focused on the sound from the loud speaker, is conscious also of sound generated locally, the intensity of which might be surprisingly large, even in a "quiet" room. These two sources of sound must be correlated by the human mind as belonging to one another if a sense of realism is to be experienced, and this is possible only where their respective acoustical characteristics are alike, or where the intensity of the local atmosphere is negligible compared with the reproduced distant atmosphere.

It is, indeed, my belief that all attempts at realism are foredoomed unless steps be taken to circumvent the "psychological effect," which effect I define as "reluctance of the human mind to digest reproduced sounds in a false atmosphere."

I previously outlined a method whereby sense of realism can be attained. Where powerful high quality loud speaker reproduction is available (say, a moving coil), a somewhat similar effect is obtainable by sitting in close proximity to the loud speaker and covering the ears with the hands. By this means the effect of the local atmosphere is diminished. The volume of sound from the loud speaker must be adjusted to compensate fully for loss of hearing caused by covering the ears.

Unfortunately, covering the ears in this manner emphasises head noises which tend to spoil the effect.

Shepherd's Bush. GEORGE E. POHU.
September 30th, 1928.

### "WIRELESS WORLD" ABACS.

Sir,—Many of your readers appreciate the series of Useful Data Charts or "Abacs" you are publishing from time to time—myself very much included.

May I suggest to readers that a strip of (say) 10 mm. transparent celluloid, 10in. long and ¾in. wide, having a straight hair-line lengthways, would make an ideal cursor for use with these charts? Its cost is negligible. F. S. L. WESTON.

Stoke-on-Trent.
September 29th, 1928.

### THE "DIODE" DETECTOR.

Sir,—Having recently converted the second detector in my superhet to the above system, the results convince me that there is nothing to approach it, and if those of your readers who belong to the "Moving Coil and L.S.5 Brigade" would give it a trial I think they would get those last few degrees of perfection which seem so elusive, in spite of a perfect amplifier. In most cases the slight distortion which results when using a moving-coil speaker, even with a good amplifier, can be traced to the detector, and the popular and over-rated "anode bend" can be guilty of quite an appreciable amount of distortion. Being normally followed by one resistance-coupled stage and one transformer, the amplification is often not quite sufficient to give the really good volume which is essential with a moving-coil speaker if natural reproduction is required, and the reaction or H.F. is accordingly pushed to bring the volume up, until a slight overloading of the detector occurs, and completely ruins the quality. The "diode" cannot be overloaded, and, moreover, it can be followed by a high ratio transformer stage instead of a resistance-capacity stage, the greater amplification of which will in some degree make up for the weaker output of the "diode" as compared with an anode-bend detector. Transformer coupling is also more

reliable than resistance coupling and not so "finicking." The "diode" is rarely mentioned in your columns and always passed over as being too insensitive, so that I was extremely sceptical of getting anywhere but the local station when I switched on after making the necessary alterations to my set. Imagine my surprise and pleasure when 5GB at 100 miles or so came through at excellent volume, followed by Langenburg, Stuttgart, and Hamburg at very nearly the same strength. The local and 2ZY require the use of the volume control, and there is no distortion whatever—a marvellous improvement on the anode bend and resistance stage in use before. The set comprises detector, oscillator, and two intermediate stages before the "diode," and no doubt there is plenty of H.F. amplification, which is essential with the "diode," but it is not an unusual amount, and, in fact, one usually finds three intermediate stages in most superhets, so that there is still room for further H.F. if required, although it hardly seems necessary. The L.F. side consists of two transformer stages with parallel B11 valves in the output stage. The "diode" seems, furthermore, to remove all trace of the background and mush usually associated with the superhet, and on this score alone is a considerable advantage. It is now possible to move the potentiometer almost up to the point when oscillation of the intermediate amplifier occurs without the tenfold increase of background which was inevitable before conversion to the "diode."

Those of your readers who have equipped themselves with moving-coil speakers and 400 volts H.T. should not object to the trouble and additional expense of the extra H.F. amplification required with the "diode," and two stages should be ample with an outside aerial—provided one does not require "forty stations on the loud speaker." After all, how many stations can one get even on a straightforward set to do justice to a moving-coil speaker?

It would be interesting to have the views of other experimenters who have given the "diode" a trial.

Liverpool. H. W. STACEY.

September 26th, 1928.

# Club News.

### Picture Broadcasting Demonstrated.

For the demonstration of picture broadcasting by Mr. F. H. Haynes, assistant editor of *The Wireless World*, on Friday next, October 12th, the Wembley Wireless Society is extending an invitation to all enthusiasts in the district, whether members or not. The meeting will be held at 8 o'clock at Park Lane School, and it is hoped that there will be a large attendance to witness what will undoubtedly be one of the most interesting and instructive demonstrations of the season.

Full information concerning the Society's activities may be had on application to the Hon. Secretary, Mr. H. E. Comben, B.Sc., 24, Park Lane, Wembley.

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### Does the Amateur need "Maths."?

A stimulating debate on "The Amateur's Mathematical Equipment" marked the opening winter session of the Radio Experimental Society of Manchester on Friday, September 28th. The chair was taken by Mr. Bentley, of the College of Technology, who opened the discussion. The general conclusion arrived at was that no seriously minded amateur could afford to neglect a certain amount of pure and applied mathematics. Some valuable suggestions were made regarding suitable arrangements whereby members could polish up their "maths." The evening closed with a lively discussion on "The Shock-absorber," a wave-trap newly designed by Mr. R. M. Kay.

Joint Hon. Secretaries: Mr. J. Levy, 19, Lansdowne Road, West Didsbury; Mr. R. M. Kay, 82, Daisy Bank Road, Victoria Park, Manchester.

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### Newcastle Society's Long Syllabus.

The Newcastle-upon-Tyne Radio Society, which opened its winter session with the Annual General Meeting on Monday last, October 8th, has prepared an attractive programme covering the entire session up to April 29th, 1929. Among some interesting features will be a debate (on Monday next) on "Anode Bend v. Grid Rectification"; a film of the annual Field Day; a lecture by Mr. E. Mewse, M.Sc., on "Messages from the Stars," and a lecture with the engaging title "Radio and Common Sense," by Mr. S. Burns.

Hon. Secretary: Mr. William W. Pope, 7, Kimberley Gardens, Jesmond, Newcastle-on-Tyne.

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### Coil-driven Loud Speakers Compared.

Two types of B.T.H. moving-coil loud speaker were demonstrated by Mr. F. N. G. Leevers at the Muswell Hill and District Radio Society's first winter meeting on September 26th. The two types of speaker shown belonged to the permanent magnet and electro-magnet types respectively. The receiver was a 1-v-1 arrangement, the last stage consisting of a bank of four small power valves in parallel, with their filaments run in series from the mains. Excellent reproduction was obtained on the permanent magnet loud speaker, which appeared to be as sensitive as the electro-magnetic model. A demonstration was also given of the B.T.H. pick-up and improved carrier.

Hon. Secretary: Mr. Gerald S. Sessions, 20, Grasmere Road, N.10.

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### Q.R.P. Transmitters' Society.

The Q.R.P. Transmitters' Society will hold the annual general meeting on Thursday, October 11th. The principal subject of discussion among members at the present time is the new licensing conditions regarding the use of crystal control

Hon. Secretary, Mr. C. D. Abbott, G6TA, 120, Cavendish Road, Balham, S.W.12.

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### Dry Batteries or Accumulators?

The problem of H.T. supply was well ventilated at a discussion on the subject at the last meeting of the North Middlesex Radio Society. The respective merits of dry batteries and of accumulators were eagerly put forward; testimony showed that while the former had constantly to be renewed, ownership of the latter was by no means carefree, the charging being expensive, while in unreliable hands the accumulators were easily damaged. The use of electric light supply was keenly discussed, the various systems coming under review. Favourable comment was made upon the dry-contact rectifiers now obtainable.

All wireless enthusiasts in the district are specially invited to attend the Society's meeting this evening (Wednesday), when a lecture and demonstration on transformer amplification will be given by Mr. Garside, of Messrs. Ferranti, Ltd. The meeting will be held at 8.15 p.m. at St. Paul's Institute, Station Road, Winchmore Hill.

Hon. Secretary, Mr. E. H. Laister, "Endcliffe," Station Road, N.21.

## FORTHCOMING EVENTS.

**WEONESDAY, OCTOBER 10th.**

*Tottenham Wireless Society.—At 8 p.m. At 10, Bruce Grove, N.17. Lecture: "The Output Stage," by Mr. F. E. R. Neale.*

*Muswell Hill and District Radio Society.—At 8 p.m. Demonstration of Resistance-coupled Amplifiers by Mr. Edmund H. McCormack (at lecturer's private address).*

**THURSDAY, OCTOBER 11th.**

*Slade Radio (Birmingham).—At 8, Victoria Road, Erdington. Members' Night. Talk on "Electricity as Applied to Wireless."*

**FRIDAY, OCTOBER 12th.**

*Radio Experimental Society of Manchester.—At 7.30 p.m. At Clegg's Café, Blackfriars Street. Lecturettes by Members.*

**MONDAY, OCTOBER 15th.**

*Hackney Radio and Physical Society.—At 8 p.m. At Hackney Electricity Hall, Lower Clapton Road. Disposal of Spare Apparatus.*

*Newcastle-upon-Tyne Radio Society.—At 7.30 p.m. At 11, Savile Row. Debate: "Anode Bend v. Grid Rectification."*

**WEDNESDAY, OCTOBER 17th.**

*Wigan Technical College Radio Society.—Lecture: "Modern Wireless Batteries and their Operation," by Mr. C. P. Lockton, M.Sc., of Messrs. Chloride Electrical Storage Co., Ltd.*

### Lesser Known Uses of Electricity.

The increasing use of electricity in most departments of human existence was dealt with in an interesting lecture given before the Tottenham Wireless Society by Mr. R. F. G. Holness on Wednesday September 19th. As an instance of how existing electrical instruments can be adapted to new purposes, the lecturer mentioned that the ordinary transformer so common in radio receivers was now used for melting steel. In this case the ordinary iron core and primary winding remain, but the secondary winding is composed of the steel to be melted. Variations of this type of furnace, said the lecturer, were used in valve manufacture to heat the metal elements when enclosed in the glass during the last stages of exhaustion. The lecturer referred to several little-known uses to which electricity is put, and mentioned the Lodge Cotrell system of electrostatic precipitation designed to prevent air pollution.

Hon. Secretary, Mr. F. E. R. Neale, 10, Bruce Grove, Tottenham, N.17.

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### Society's Ultra Short-wave Work.

A prize scheme for obtaining new members has just been inaugurated by the Stretford (near Manchester) and District Radio Society. Anyone interested is asked to communicate with the Hon. Secretary.

A new 45-metre receiver has been built, and a transmitter for this band is under construction. The Society's 8-metre apparatus is being redesigned. Of special interest to non-transmitting members during the coming session will be experiments in L.F. amplification and its application to wireless and the gramophone. Morse classes will be held as usual on Monday nights.

Hon. Secretary, Mr. W. Hardingham, 21, Burleigh Road, Stretford, Manchester.

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### Wigan Wireless Show.

The success of the wireless exhibition held at Wigan on September 15th, 17th, and 18th, under the auspices of the Wigan and District Technical College Radio Society, may be gauged from the fact that nearly 4,000 visitors attended, although the exhibition was open for only four hours each evening.

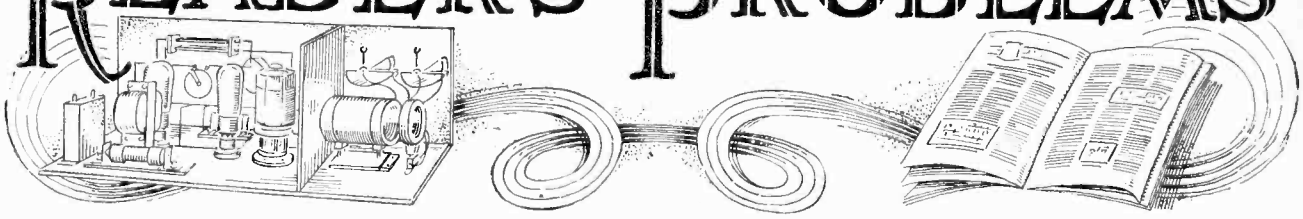
Amongst the members' exhibits were to be seen some fine examples of ingenious mechanism and craftsmanlike finish. Dr. N. S. Walls exhibited a two-valve short-wave receiver, a duplex telephonic set for two-way conversation using a single aerial, an automatic switch for switching on a set at required intervals, controlled by a clock and a low-power transmitter. Mr. W. G. Langshaw was represented by an exponential horn 5ft. in length. Mr. O. B. Kellett, a keen member from Southport, showed a seven-valve short- and long-wave receiver with a range of from 10 to 2,000 metres, an ultra short-wave receiver for 2 to 2.7 metres, a special Mullard transmitting valve, and a home-made moving-coil loud speaker.

The Department of Physics contributed a valve generator of high-frequency currents for use in alternating current bridge measurements, a set of accessory precision instruments for H.F. measurements, and a number of selenium and photo-electric cells.

The principal radio manufacturers were well represented.

Hon. Secretary: Mr. M. M. Das, B.Sc., Library Street, Wigan.

# READERS' PROBLEMS



"The Wireless World" Supplies a Free Service of Technical Information.

*The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.*

### The "Empire" Set on 150 Metres.

*The local broadcasting station (Nairobi) is at present experimenting on 90 and 150 metres. How can I raise the wavelength range of the "Empire Short Wave Receiver" so that these transmissions may be received?*

R. B.

You will find it necessary to wind new grid and reaction coils. These may have, respectively, 18 and 10 turns. The present chokes will probably be found to resonate on the waveband you are to cover, so they should be replaced by others of higher inductance.

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### Picture Reception.

*It is stated that the wireless transmission of pictures is to be started in this country at an early date. As I should like to be ready for this innovation, can you refer me to any article giving constructional details of suitable apparatus?*—C. A.

Until the precise arrangement of the transmitter is made public, it is not possible for you to prepare your receiving apparatus, because in any system of picture transmission the receiver must be synchronised. We think, however, that you will glean some useful information from an article which appeared in *The Wireless World* for August 24th, 1927, in which a practical receiver is described, with full constructional details. Needless to say, the pages of this journal will keep you well posted as to future development.

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### A Seasonable Conversion.

*My "Everyman Portable" has stood me in good stead during the summer, and as its sensitivity seems to be of a high order for a detector-L.F. combination, I am thinking of building a similar set for use on a full-sized open aerial. Can you give me any hints as to modifications which will be necessary?* S. D.

The circuit of the "Everyman Portable" would be quite suitable for a fixed receiver, and we give in Fig. 1 a skeleton diagram showing the detector portion of the set modified for use in this way. Of course, the frame aerial will be replaced by a coil, the winding of which must be broken at the centre point. We suggest that this coil might have a total of sixty turns of No. 26 D.C.C. on a 3in. former. The two halves of this coil shown at $L_1$ and $L_2$ in the diagram will therefore have thirty turns each. The loading coil $L_3$ may be a commercial inductance with some 200 turns.

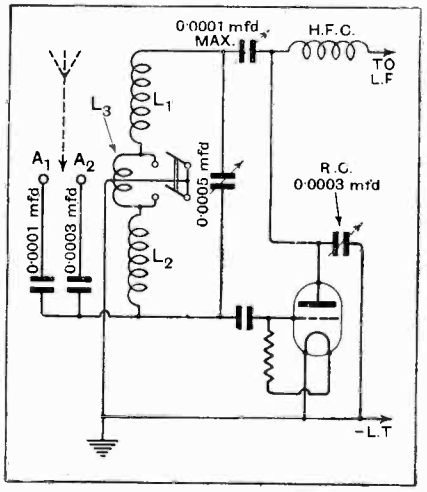


**Fig. 1.—An effective detector circuit with throttle-controlled reaction and waveband switching.**

*RULES.*

(1.) *Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."*

(2.) *Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.*

(3.) *Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.*

(4.) *Practical wiring plans cannot be supplied or considered.*

(5.) *Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.*

(6.) *Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.*

*Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.*

### Spurious Fading.

*I have lately been troubled with fading of the signals from my local station, which is only some four miles away. This does not set in until after 8 p.m., so I presume it is due to the effect of darkness. However, it occurs to me that it is just possible that the excessive use of reaction by one of my neighbours may be responsible. In either case, is there a remedy?*

L. G. R.

It is inconceivable that true fading of sufficient intensity to be noticeable could take place at your short distance from the transmitter, and we think it much more likely that interaction between your aerial and others in the vicinity is responsible for the variation in signal strength which you have noticed. It is by no means certain, however, that your neighbours are using reaction to excess; if the interfering aerial is sufficiently close, it may under certain conditions absorb energy from your own, with the result that signal strength will vary as tuning adjustments are made to the other receiver.

We suggest that you should arrange mutually with your neighbours not to vary the tuning of any of the receivers as far as the local station is concerned, and also we recommend you to move your aerial, if possible, so that it is at right angles to those which are adjacent.

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### A Leaky Grid Condenser.

*The anode current consumed by my first stage L.F. amplifier is considerably in excess of that shown by the maker's curves, and to reduce it to a reasonable figure I find that I have to double the normal grid bias. Adjusted in this way the quality is good, but I am by no means satisfied that all is well, and would welcome your comments.* C. W. L.

You do not give particulars of your circuit, but assuming the first L.F. amplifier to be coupled to the detector by means of a resistance (or choke) and a condenser, we consider it probable that this condenser is leaking. If it is, a certain positive voltage from the H.T. battery will be impressed on its grid, but may be offset by an increase in bias voltage. You are recommended carefully to test the coupling condenser.

### Incorrect De-coupling.

*Will you please criticise my diagram of a four-valve receiver? You will observe that series feed resistances have been inserted in each anode circuit, and that there is a single H.T. supply voltage.* S. M. S.

We have nothing but favourable comment to offer regarding the receiver itself, which comprises a fairly conventional arrangement of H.F. amplifier, anode-bend detector, and two L.F. stages. There is, however, a small point with respect to the connections of the anode by-pass condensers which is open to criticism: your sketch shows that these are all joined together and to a common point on the L.T. negative bus-bar, as shown in dotted lines in Fig. 2. By doing this you are not taking the fullest possible advantage of the scheme, and we suggest that the low-potential sides of each of the by-pass condensers should be connected direct to the negative filament of the associated valve, as shown in "dot-and-dash" lines.

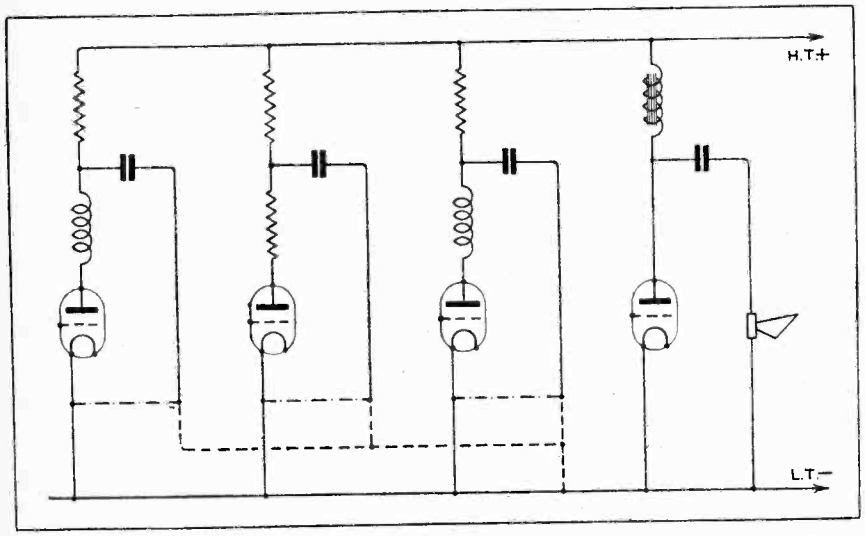


**Fig. 2.—By-pass condensers used in a "de-coupling" scheme should be joined to the negative filament terminal of the associated valve, and not to a common point.**

This is possibly a small point, and it is quite likely, if your set does not tend towards instability, that there will be no appreciable difference, whichever form of connection is adopted. However, as you apparently wish to take all possible precautions against instability, it is as well to carry out the wiring in a manner to which no exception can be taken on theoretical grounds.

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### H.F. and L.F. Chokes.

*In certain H.T. eliminator designs I notice that H.F. chokes are connection in series with the L.F. chokes. Why is it considered necessary to make this addition; surely the L.F. components, which are of comparatively high inductance, exert a sufficiently high choking effect on currents of radio frequency?* C. B.

Admittedly L.F. chokes have a high inductive value, but as they are not designed to "stop" high-frequency currents, their self-capacity is comparatively high, and it is for this reason that they are sometimes inadequate.

o o o o

### Louder Signals.

*I should like to increase the volume obtainable from my moving-coil loud speaker without going to the expense of obtaining a last-stage valve with a greater output. The field winding of the instrument is fed from the D.C. mains, and I am wondering whether I should attain the desired object by arranging to supply it with more current. If so, how can this be done?* C. P.

The sensitivity of your moving-coil loud speaker will be greater if you increase the flux density across the gap. Assuming that the field winding is connected directly across the mains without any series resistance, the only way for you to do this is to fit a new magnet winding designed to give a greater number of ampere-turns.

### Transformer Construction.

*Should the various windings of H.F. transformers be wound in a clockwise or anti-clockwise direction? I ask this question because I have so far been unable to neutralise correctly the H.F. amplifier of my set.* M. B. R.

It is immaterial whether the windings are clockwise or anti-clockwise, provided that they are in the correct relative direction. As far as the great majority of couplings described in this journal are concerned, all windings must be in the same directions.

o o o o

### Insufficient Voltage.

*I have an L.T. trickle charger which gives an output of slightly over one amp. Is it practicable to modify it for use as an H.T. eliminator with a three-valve set?* T. T.

In all probability your charger gives an output of certainly not more than some 20 volts on open circuit; therefore it cannot be easily adapted to the purpose you require.

o o o o

### Too Many Conversions.

*With a view to modifying my gramophone for electrical reproduction, I propose fitting a microphone, and to follow this by a two-stage L.F. amplifier. Is this system satisfactory?* H. C. D.

We would strongly dissuade you from adopting this plan; even with the best type of microphone ordinarily available, you will run greater chances of introducing distortion by converting sound waves into electrical energy and then back into sound waves through an amplifier and loud speaker than by using a pick-up in the conventional manner.

o o o o

### Choosing a Circuit.

*I have decided on a three-valve receiver, but cannot make up my mind as to whether the valves should be arranged as* (1) *detector and two L.F. amplifiers, or* (2) *H.F.-detector-L.F. Which arrangement do you favour?* —T. H.

We fear that this is a question which cannot be discussed adequately in a letter. Very briefly, however, the detector-L.F. combination will give much louder signals when the input from the transmitter is reasonably strong, but its range will not be so great as that of a good H.F.-det.-L.F. set, which, if well designed, will in addition be very much more selective. In your situation we think that this quality will be almost essential, so the latter circuit would appear to be the better of the two for you.

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### An Extra H.F. Stage.

*As my local conditions are particularly unfavourable for wireless reception, I should like to add another screened-grid H.F. amplifying stage to the "Megavox Three." Can this be done?* F. R. A.

It is of course possible to add another H.F. valve, but the alterations involved would be very extensive, and it would be more correct to describe the result as the detector-L.F. part of the "Megavox" with a two-stage H.F. amplifier.

If high efficiency is aimed at in each stage, it will be necessary to include almost complete screening.

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### Changing Over.

*Would it be possible to use a screened-grid valve in the H.F. stage of my existing receiver in place of a triode which is coupled to the detector by means of a neutralised H.F. transformer?* L. W. S.

It will be necessary for you to make considerable alterations to your set, as in all probability the H.F. transformer will be totally unsuited to follow a high-impedance screened valve. Probably the easiest way out of the difficulty is to use its existing secondary winding as a tuned-anode coil.

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(16th Year of Publication)

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Assistant Editor: F. H. HAYNES.

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CONTENTS OF THIS ISSUE.



## NO MONOPOLY.

WE have already pointed out to our readers the circumstances under which the original broadcasting organisation in this country was established, the Postmaster-General insisting that there should be nothing in the nature of a monopoly in the manufacture and supply of wireless receivers, but that all those who wished to manufacture should be free to do so on reasonable terms. It was this stipulation on the part of the Postmaster-General which obliged the Marconi Company to issue a General Licence under its patents on what, at the time, was considered to be reasonable terms to those who wished to produce receivers.

### Picture Broadcasting.

New developments in connection with broadcasting require, in our opinion, that the same attitude should be adopted by the Postmaster-General. In the case of picture broadcasting, which the B.B.C. has undertaken to commence very shortly, it would, we believe, be unsatisfactory if the manufacture and sale of apparatus for receiving these pictures became a monopoly. On the other hand, of course, we recognise, just as we did in the case of the Marconi Company, that the owners of patents are entitled to a full reward by way of royalties from those who benefit by participating in the industry which such patents bring into existence.

We feel very strongly that before the actual transmissions from the B.B.C. of still-life pictures begin the Postmaster-General should be satisfied that general freedom to manufacture and sell receiving apparatus on reasonable terms has been established.

### Television.

Later on (we do not know yet at what date) we may see the same situation arising in connection with television. When that time comes the same attitude should, we consider, be adopted by the Postmaster-General, the inventors again deriving benefit from their patents, but being prevented from establishing a monopoly.

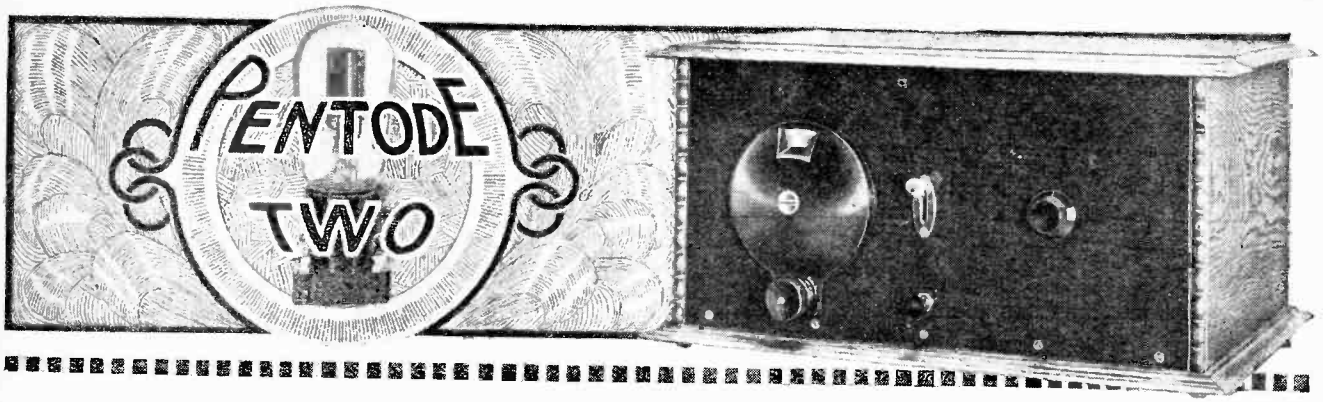
### Wired Wireless.

We cannot at the moment foresee in what other directions broadcasting may develop where it may be desirable that the same procedure should be adopted, but it is highly likely that if wired wireless reaches a stage where it can be applied usefully as a means of broadcasting or an adjunct to broadcasting, it will be found that methods of receiving by this system are covered by patents controlled by a limited number of firms or individuals, and here, too, the same attitude could be adopted in this country in view of the fact that broadcasting itself is under single control supervised by the Government.

oooo

## THE B.B.C. CONTROL ROOM.

The feeling is very strong that something is amiss in the B.B.C. Control Room, and we submit that it is quite time that the B.B.C. either produced evidence to refute the allegations of unsatisfactory control or else admitted that there was something in the complaints and set about to effect a remedy. Circumstantial evidence seems to be against the B.B.C. in this matter, for it would appear from observation that bad control commences quite definitely at certain times in the programmes, and may cease as abruptly during the same evening, suggesting the possibility that not all the individuals who act as controllers in the B.B.C. Control Room are equally qualified. The B.B.C. is always ready to listen, particularly where its own interests are involved. We hope that these complaints will be investigated.




# Everyman's Two-valve Loud Speaker Receiver with Wave-change Switch.

By W. I. G. PAGE, B.Sc.

THERE are probably a number of readers who would welcome a really cheap receiver which could be constructed for three or four pounds (without valves) and which would give considerable loud speaker strength on four or five stations. No apologies are proffered for describing a detector-L.F. set, the limitations of which as regards selectivity and range are well known to the amateur; suffice it to say that with this receiver connected to a mediocre aerial 1½ miles from 2LO, by careful adjustment of reaction, 5GB could be received on the loud speaker without any interference whatsoever.

*The receiver described in the accompanying article incorporates only two valves, and is capable of giving remarkable volume and quality. The change from short to long waves is effected by a simple switch. The small number of components required effects a great economy in first cost, which will undoubtedly appeal to those who desire a very inexpensive set.*

The set when tested ten miles S.E. of London received a considerable number of stations on the loud speaker, but conditions change so markedly in different districts that a conservative estimate of performance is preferred. The volume and quality of the local station were quite remarkable; in fact, with a commercial cabinet-type moving-coil loud speaker adequately loud signals could be obtained to fill a hall of moderate size, whilst the signal strength from cone and horn speakers was entirely satisfactory.

That a two-valve set with a conventional straight circuit should give such a large overall amplification is due to the advent of new valves. The detector (P.M. 4DX) employed has pronounced rectification properties and a steep, straight portion to its anode characteristic giving a mutual conductance of two. The pentode (P.M.24) used in the output position has a mutual conductance of over two and, together with its inter-valve coupling, is equivalent to *more* than two ordinary stages of L.F. amplification where triodes are used. It can safely be claimed that this receiver gives a greater output than a similar three-valve receiver with detector and two L.F. stages.

The circuit diagram is given in Fig. 1, from which it will be seen that provision is made by the anti-capacity switch $S_1$ for a rapid change-over from short to long waves. The short-wave coil, $L_1$ $L_2$, consists of 58 turns of No. 26 D.C.C. wire wound on a 3in. paxolin former. This coil is actually wound in two halves, with a small gap in the centre from which leads are brought out to the long-wave coil and to the wave-change switch. The long-wave coil is centre-tapped and contains 200 turns of No. 32 D.S.C. wire, also wound on a 3in. paxolin former placed with its axis at right angles to the other coil. When the switch $S_1$ is closed, the long-wave coil $L_3$ is short-circuited and the tuning condenser $C_2$ (value 0.0005 mfd.) is in parallel with the short-wave coil, $L_1$ $L_2$. When the switch is open the tuning condenser is in parallel with the two halves of the short-wave coil and the long-wave coil, all three of which are in series; the

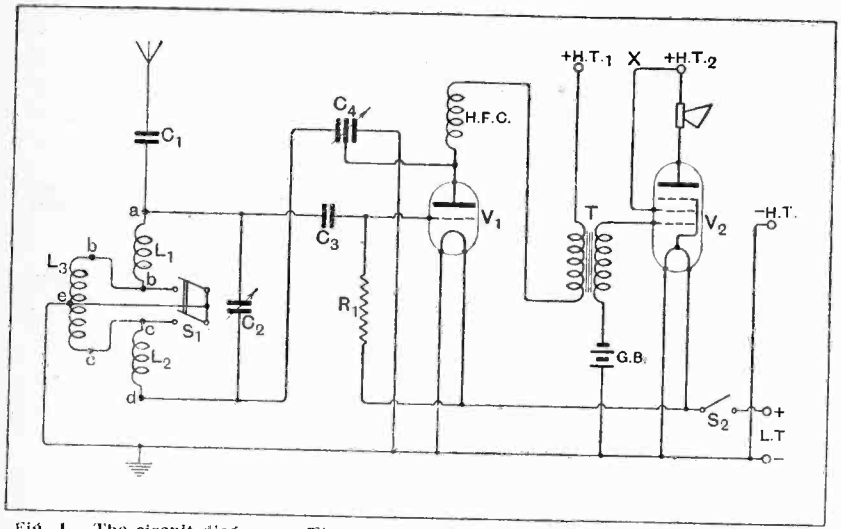



Fig. 1.—The circuit diagram. The values of the components are as follows: $L_1$, $L_2$, short-wave coil; $L_3$, Long-wave coil; H.F.C., high-frequency choke; $C_1$, 0·0001 mfd.; $C_2$, 0·0005 mfd.; $C_3$, 0·0003 mfd.; $C_4$, 0·00016 mfd. differential; $R_1$, 2 megohms; $S_1$, wave-change switch; $S_2$, L.T. switch; T, 3:1 L.F. transformer; H.T. + 1 max. 70 volts; H.T. + 2 max. 150 volts; $V_1$, P.M. 4DX (detector); $V_2$, P.M.24 (pentode).

**Pentode Two.—**

inductances have been so chosen in value that the usual medium and long wavelengths are covered. The switch has contacts for a double-pole double-throw action, but as only a single-throw is used two contacts remain idle.

The effect of the short-circuited long-wave coil when listening to the short waves is negligible. Coil-winding data are given in Fig. 2. The tuning condenser $C_2$ is controlled by a slow-motion dial in which the scale moves

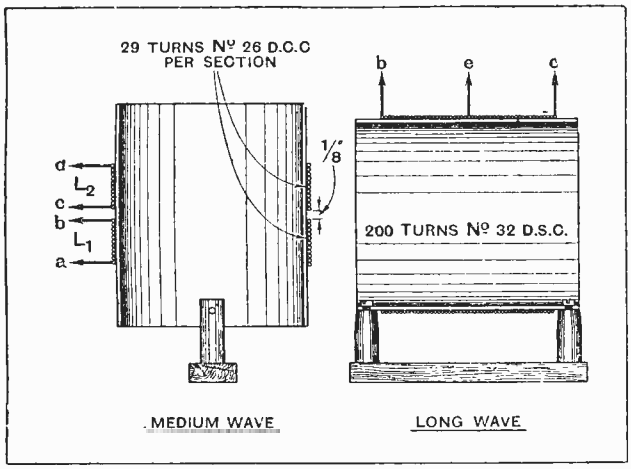



Fig. 2.—Coil winding data. The coils are permanently fixed to the baseboard by small ebonite legs.

in the same direction as the control knob—a refinement which is undoubtedly desirable. Aerial damping is reduced and selectivity enhanced by the series condenser $C_1$, the value of which should be about 0.0001 mfd. for the medium wave-band. The clip-in type of condenser has been chosen as alteration to slightly higher values can be readily made if this is found necessary for the longer wavelengths.

The reaction scheme employed is of the Hartley variety, where the aerial coil is centre-tapped and high-frequency energy is diverted to it from the plate of the detector valve by means of a H.F. choke (H.F.C.). A new type differential three—electrode variable condenser of 160 micromicrofarads ($C_4$) is used to control reaction. The rotor of this condenser is connected to the anode of the detector valve and it is so designed that an increase in capacity to provide more reaction is accompanied by an equal decrease in capacity to earth. Thus, however much capacity is required for reaction, there is a constant capacity across the primary of the L.F. transformer which should assist in giving an even frequency response for all degrees of angular displacement of the reaction condenser. The fact that the differential condenser always provides a certain amount of capacity virtually across the H.F. choke tends to increase the wavelength at which choke resonance may occur, so that stability is assured up to the highest wavelength to which the set can be tuned.

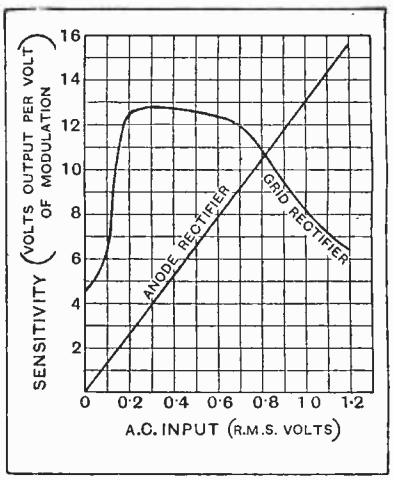
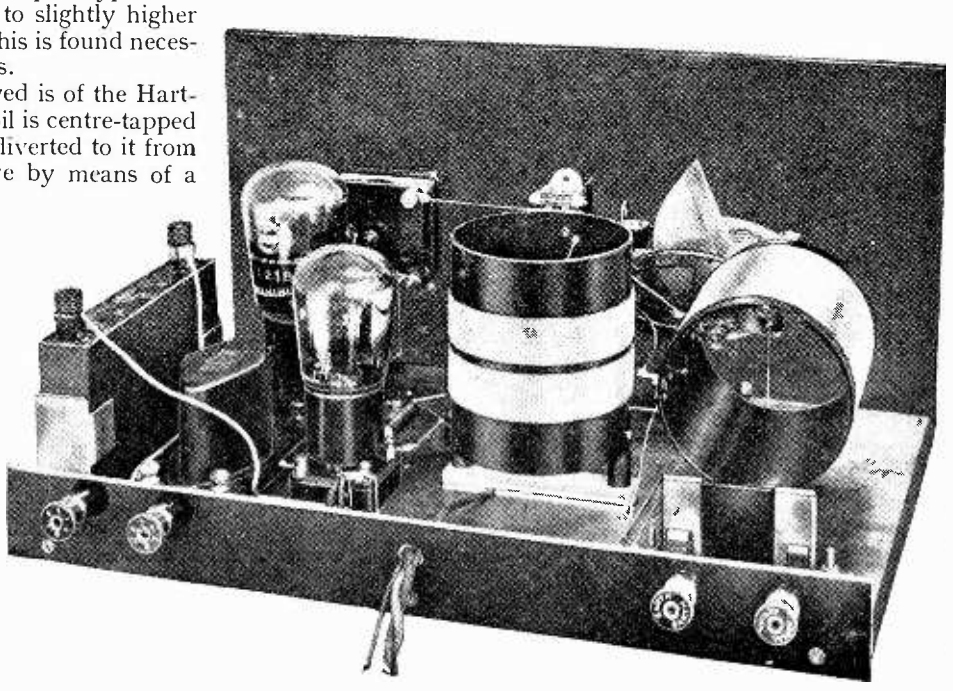



Fig. 3.—The relative sensitivities of anode and grid rectification measured as their response to the modulation of a carrier wave. Above 0·7 volts R.M.S. the sensitivity of leaky grid rectification falls off rapidly.

Detection is by the leaky grid method, the grid condenser ($C_3$) being 0.0003 mfd. and the leak (R.1) two megohms. The latter has connecting wires integral with the resistance caps and is suspended in the wiring of the receiver. Care must be taken when soldering the leak not to apply too much heat to the leads. Leaky grid detection is used not only for the obvious reason that it gives much greater sensitivity on distant stations when no H.F. amplification is used, and provides a much better reaction control, but because with a pentode preceded by a transformer anode bend detection would be almost certain to be underloaded, even when the pentode was receiving its maximum permissible grid swing. If the single-stage pentode L.F. amplifier becomes popular it is quite likely that leaky grid



Rear view of the receiver.

Pentode Two.

detection with reaction may come into its own again, as will be shown by an examination of the amplitude of grid swings applied to each valve. An investigation of the anode volts—anode current curve of the pentode—reveals that the anode volts swing may make an excursion beyond the linear portion of the characteristic, thus restricting us to about nine volts (peak) input grid swing at 150 volts H.T. A glance at the grid volts—anode current characteristic — may suggest a larger signal input as permissible, but distortion will result if this be attempted.

From the foregoing it will be evident that nine volts (peak) is the maximum signal input that the pentode can handle, and, being preceded by a three to one transformer, the voltage developed across its primary winding (connected to the detector output) must not be more than three volts (peak). The amplification due to the detector valve can be considered roughly as the amplification factor of the valve divided by the percentage modulation of the carrier wave, which is accepted as 20 per cent.

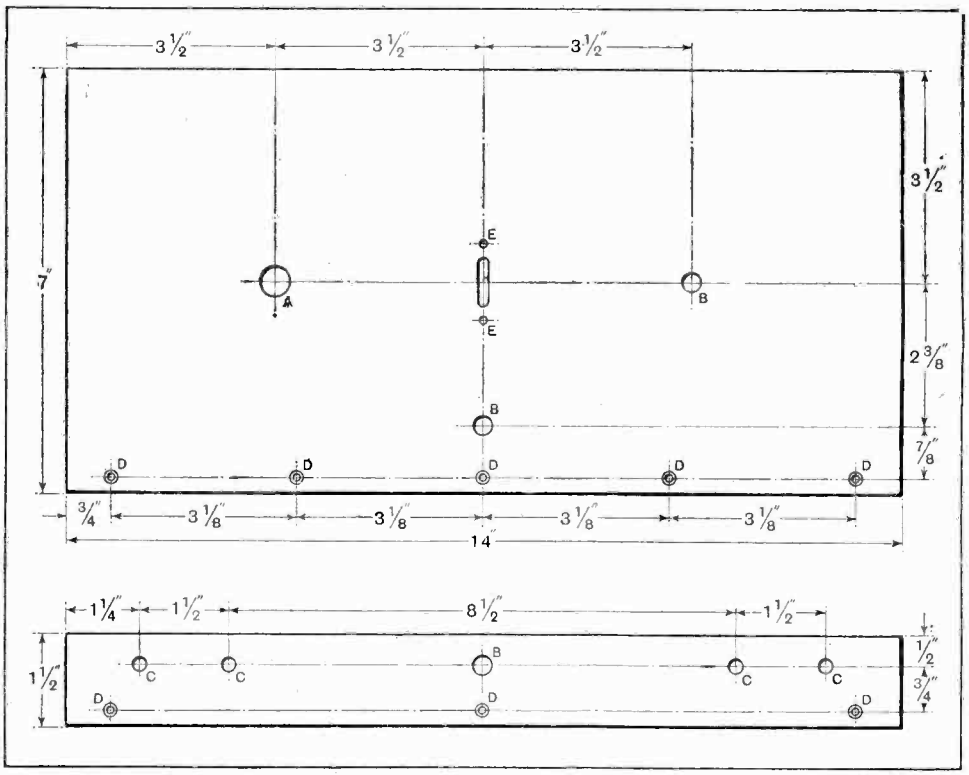



Fig. 4.—Dimensions and drilling data for the panel and terminal strip. A = ¼" diameter; B = 5/16" diameter; C = 7/32" diameter; D = ⅛" diameter countersunk for No. 4 wood screws; E = ⅛" diameter.

Using a P.M.4DX[1] valve this becomes 15/5=3, therefore the signal applied to the detector grid should not exceed one volt (peak) *i.e.*, 0.7 volt R.M.S. Referring to Fig. 3, which has been reproduced from an article[2] entitled "Anode and Grid Rectification," by A. L. M. Sowerby, and examining the relative sensitivities of the two forms of detection for a typical detector valve, it will be seen that from the weakest signal up to one of 0.7 volts R.M.S. leaky grid detection will give a much greater output than anode bend. With such a limited input using anode bend the modulated portion of the carrier would be partially applied to the non-linear portion of

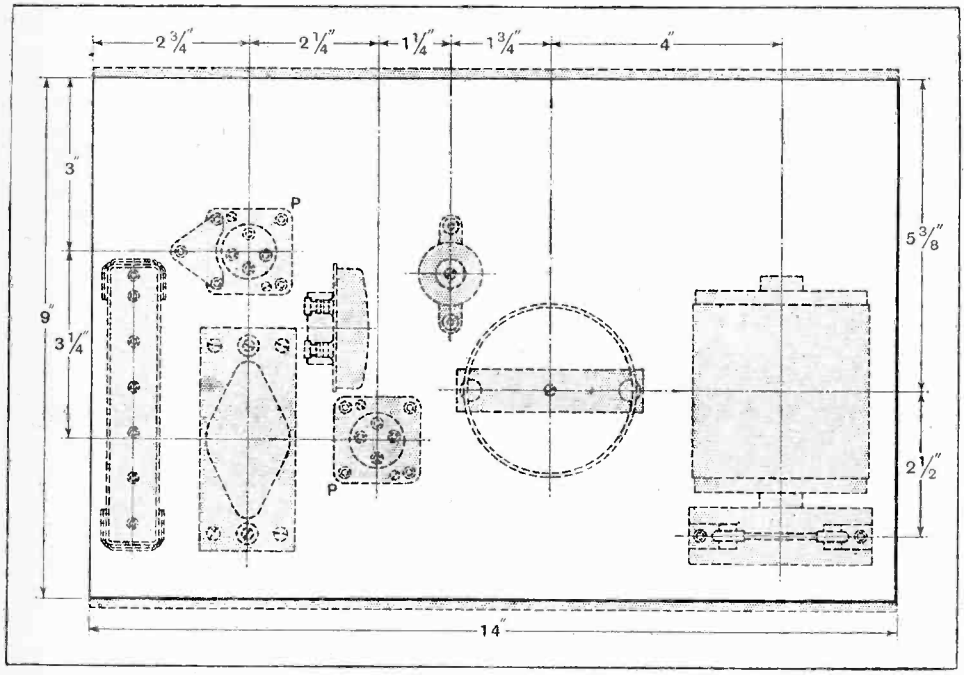



Fig. 5.—The baseboard layout. The special pentode valve holder with a fifth contact can be seen close to the grid bias battery.

[1] The P.M.4DX valve with a magnification factor of 15 now replaces the P.M.4D valve.

[2] *The Wireless World*, March 21st, 1928.

LIST OF PARTS.

1 0.0005 mfd. variable condenser (Lissen).
1 Slow motion dial (Lissen).
1 Differential condenser, 0.00016 mfd. (No. 923, Pye).
1 Double-pole double-throw new type anti-capacity switch ("Utility," W.19012, Wilkins & Wright).
1 Fixed condenser, 0.0001 mfd. clip-in type and holder (McMichael).
1 Valve holder ("Whiteline," Bowyer Lowe).
1 Pentode valve holder ("Whiteline" Bowyer Lowe).
1 L.F. transformer ("Permacore," Mullard).
1 H.F. choke (Igranic).
1 Fixed condenser, 0.0003 mfd. (C. D. Melhuish).
1 Grid leak, 2 megohms (Pye).
1 9-Volt grid battery, tapped 1½ volts (Ripaults).
1 Pair grid-battery clips (Bulgin).
1 On-and-off switch ("P.3," Pioneer Manufacturing Co., Cromwell House, Fulwood Place, W.C.1).
1 Cabinet, 14×7×9in. deep (F. Digby, 9, The Oval, Hackney Road, E.2).
2 Wander plugs; one red, one black ("Springmore," Igranic).
1 Paxolin panel, mahogany finish, 14×7×$\frac{3}{16}$in. (Wright & Weaire)
1 Baseboard, 14×9×½in.
1 Paxolin terminal strip, 14×1½×$\frac{3}{16}$in. (Wright & Weaire).
4 Terminals: aerial, earth, L.S.+ and L.S.— (Eastick).
2 Paxolin formers, 3in. dia.×3½in. length (Wright & Weaire).
1 oz. 26 gauge D.C.C. wire.
2 ozs. 32 gauge D.S.C. wire.
1 P.M.4 DX valve (Detector).
1 P.M.24 valve (Pentode).

*Approximate cost (excluding cabinet and the two valves), £3 17s. 6d.*

In the "List of Parts" included in the descriptions of THE WIRELESS WORLD receivers are detailed the components actually used by the designer, and illustrated in the photographs of the instrument. Where the designer considers it necessary that particular components should be used in preference to others, these components are mentioned in the article itself. In all other cases the constructor can use his discretion as to the choice of components, provided they are of equal quality to those listed and that he takes into consideration in the dimensions and layout of the set any variations in the size of alternative components he may use.

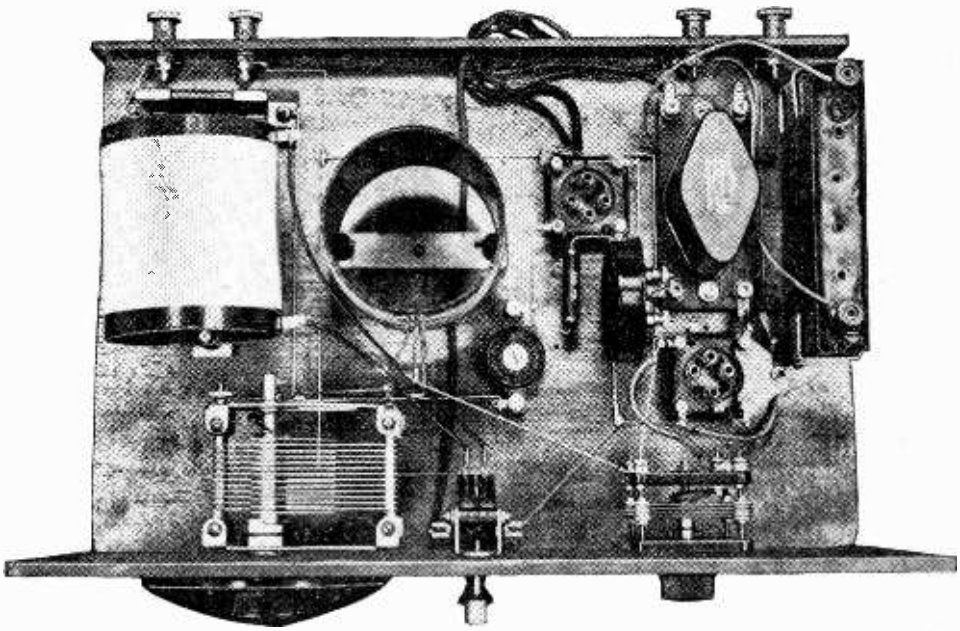
the characteristic, thus introducing undesirable harmonics.

In the case where a detector valve of approximately 20 $\mu$ is coupled direct to a pentode output valve by the resistance capacity method, then the input to the grid of the detector would need to be of the order of two volts R.M.S. before overloading of the pentode would take place. Such a circuit arrangement calls for the use of anode bend rectification to avoid distortion.

A "Permacore" three to one transformer couples the detector to the pentode, and, as already explained, a constant capacity of 160 micromicrofarads is shunted across its primary. The latter is wound with silver, and the secondary with nickel wire, which it is claimed gives a frequency response curve with a sharp cut-off at approximately 14,000 cycles, avoiding any risk of residual H.F. being impressed on the grid of the pentode. The grid bias battery provides nine volts negative potential for the control grid of the pentode, while the screened grid is connected to the terminal H.T.+2, which also supplies the anode with the maximum potential of 150 volts.

If the volume from the loud speaker when listening to the local station is overpowering it is possible to disconnect the lead from the pentode screened grid (the point of disconnection is shown at X in Figs. 1 and 6), and take, say, a 100-volt tapping from the H.T. battery direct to the terminal on the valve base, at the same time keeping the anode at the maximum potential and reducing the grid bias. By this alteration the anode current will be about halved, although the anode voltage has not been changed, for it is the screened grid which has almost sole control over the current passing through the valve.

The emission of the pentode at a small positive grid potential is so great that the grid bias must only be adjusted when the set is switched off. The pentode valve is accommodated in a special valve-holder with a fifth contact for making connection with the terminal on the side of the valve base. The L.T. current at four volts can be supplied from two quite small cells, as the total consumption is only ¼ amp. No rheostats are used, and a further economy is effected by avoiding terminals for the three H.T. and two L.T. connections,



**Plan view of the receiver. The grid leak can be seen suspended in the wiring. The wave-change switch when raised gives short waves.**

**Pentode Two.**—

which are made by flexible leads brought out through a hole in the paxolin terminal strip. The L.T. current is broken by the switch S2 interposed in the L.T.+ lead. The anode voltage of the detector (H.T.+1) should be about 70.

Perhaps one of the most striking advantages of this two-valve receiver over an equivalent receiver with three valves (det.–2 L.F.) is that it not only gives greater volume and avoids the necessary components for an extra coupling, but also that L.F. oscillation or distortion due to the resistance of a common H.T. battery is almost entirely absent. This is brought about by the thus a very real advantage in having only one intervalve coupling. The effect of internal H.T. battery resistance on quality was dealt with in an article[3] by the author earlier in the year, and the danger of incorporating two L.F. couplings without the anode feed scheme was explained.

If very considerable volume from the local station is required with this set a moving-coil loud speaker, wound with 2,500 turns,[4] can be used, but it would be desirable to employ choke filter output.

A careful inspection of the drawings shown in Figs. 4, 5, and 6, together with the two photographs, reveals

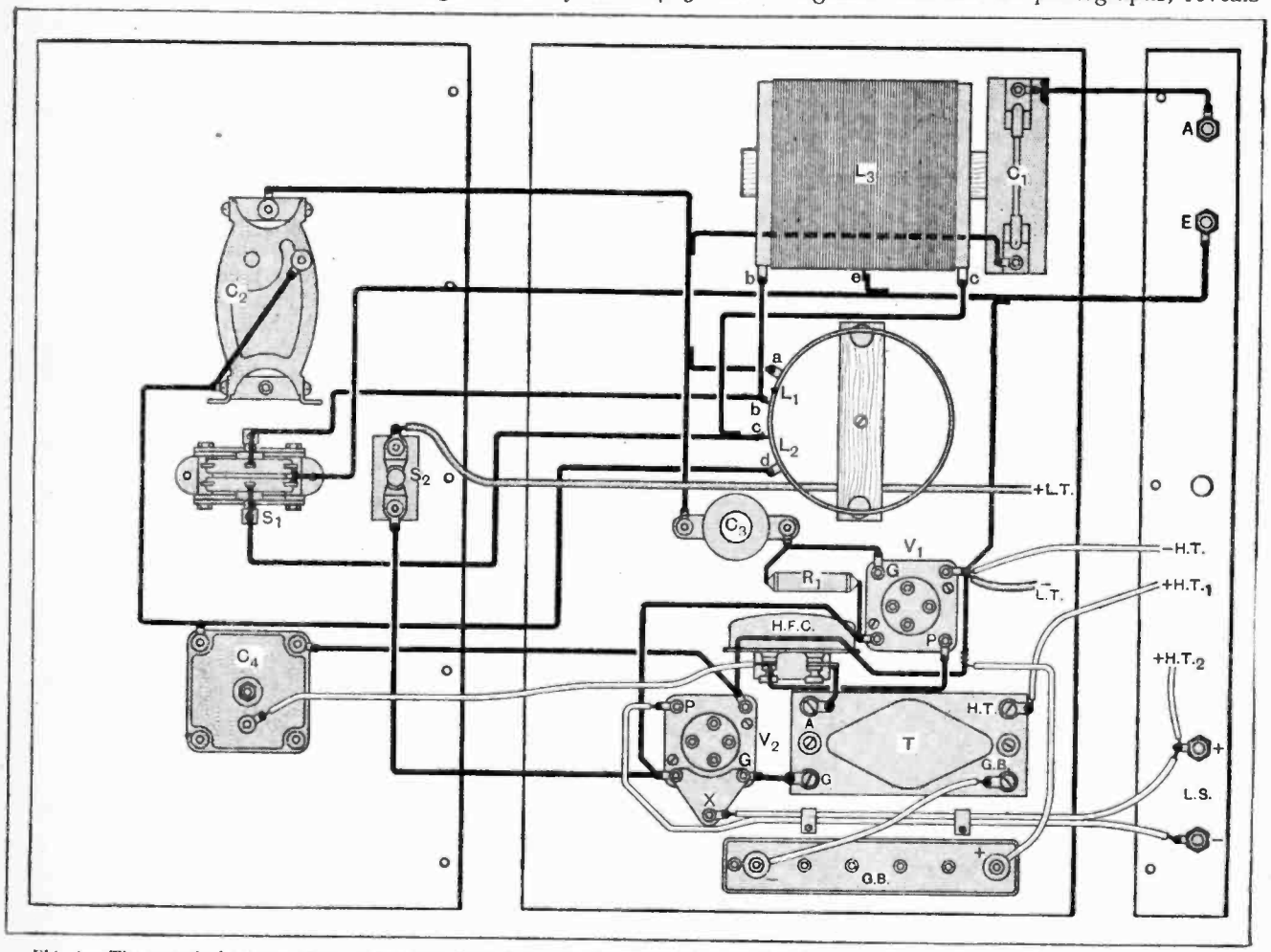


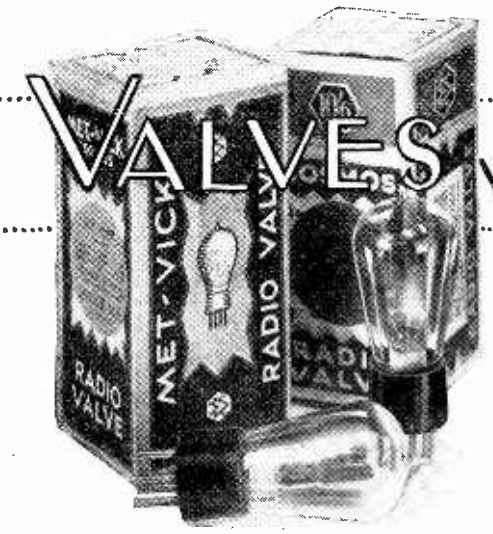

**Fig. 6.—The practical wiring plan. If the lead from L.S.+ is disconnected from X and a connection made from X to about +100 volts H.T., the volume from the loud speaker is slightly decreased while the anode current is halved.**

fact that there is only one intervalve coupling and any feed-back is more likely to impede oscillation than to assist it. As a test the resistance of a H.T. battery was artificially increased to over 1,000 ohms, but no instability or distortion was noticeable. Contrary to this, the very popular three-valve set with two stages of L.F. coupling will often howl when the internal battery resistance is a little under 100 ohms, suggesting that incipient oscillation accompanied by distortion will probably be taking place with dry-cell H.T. batteries not long after they have been put into use; there is that the set is extremely easy to construct, so that further details are unnecessary. The $\frac{3}{16}$in. paxolin panel with mahogany finish gives a pleasing appearance to the set and has the advantage that, if used close to the seaside, surface deterioration which might result ultimately in leakage, does not take place.

[3] "Battery Resistance and Distortion." *The Wireless World*, April 25th, 1928.

[4] *The Wireless World*, September 19th, 1928, page 353.

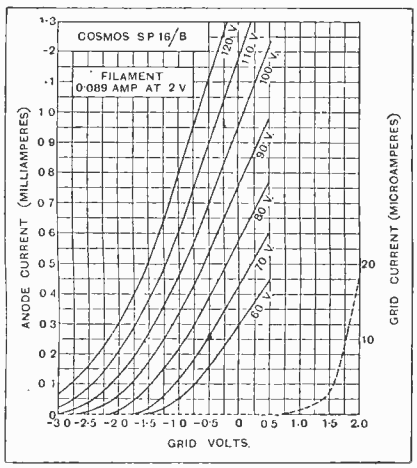
*This receiver will be available for inspection by readers at the Manchester Exhibition, and afterwards at the Editorial Offices of this Journal, 116-117, Fleet Street, London, E.C.4.*




# VALVES WE HAVE TESTED

## The SP.16 Series of 2-volt Met-Vick Valves.

THE output valve in the two-volt series of Met-Vick (Cosmos) valves is the well-known SP.18/RR; the three valves under review are designed specifically for the H.F. detector and first L.F. stages preceding this valve. The SP.16/B is a high-amplification valve designed for R.C.C. coupling, the SP.16/G a medium amplification valve for H.F. or L.F. work, and the SP.16/R, a general-purpose valve for leaky grid detection or L.F. amplification.




**A.C. resistance .. = 58,500 ohms.**
**Amplification factor = 28.6.**
**Mutual conductance = 0.59 mA/volt.**
**(Average values under operating conditions).**

All three are designed to run off a two-volt accumulator, and the filament consumption is in each case of the order of 90 milliamperes. The filament is of the vertical "hairpin" type, the two sides being parallel and close together. The top supporting wire is insulated from the filament by a dipping process, and is earthed to one leg of the filament by a thin wire to prevent undesirable capacity effects. The remaining electrodes are assembled on the well-known "short-path" principle.


**A typical valve of the SP.16 series.**

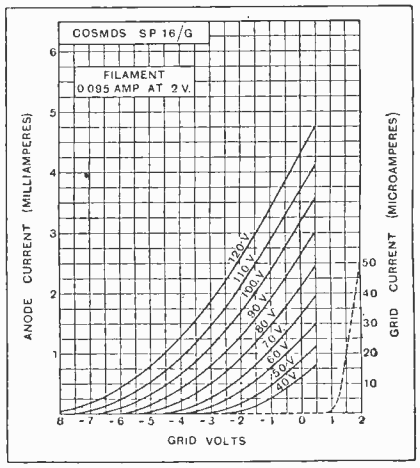
The valves are only "gettered," and the untarnished interior surface of the "getter" indicates that they are pumped hard before the "getter" is flashed. On test not the slightest trace of softness, as indicated by reverse grid current, was found.

SP.16/B.

*Rated characteristics:—*

| | |
|---|---|
| A.C. resistance ... | 70,000 ohms. |
| Amplification factor | 35 |
| Mutual conductance | 0.5 mA/volt. |
| Max. H.T. ... | 120 volts. |

Although the amplification factor of the tested specimen was less than the makers' rating, this was compensated for by the lower AC resistance, so that the mutual conductance was reasonably in agreement with the figure quoted.




**A.C. resistance .. = 20,800 ohms.**
**Amplification factor = 15.4.**
**Mutual conductance = 0.74 mA volt.**
**(Average values under operating conditions).**

The valve is well suited for L.F. amplification with resistance-capacity coupling, or as an anode bend detector followed by resistance coupling. The makers state that no grid bias is necessary under amplifying conditions. This is made possible by the high amplification factor, which implies an extremely small input, and the fact that grid current

**Valves we have Tested.—**

does not start until the grid is nearly 1 volt positive. Thus with zero grid bias an input amplitude of 1 volt is permissible corresponding to about 30 volts on the grid of the succeeding valve, which is more than most power valves are capable of handling. In practice, therefore, the input is likely to be considerably below 1 volt, and the makers' recommendation of no grid bias can be carried out with a wide margin of safety. To obtain zero grid bias, of course, the grid circuit is returned to L.T. minus.

SP.16/G.

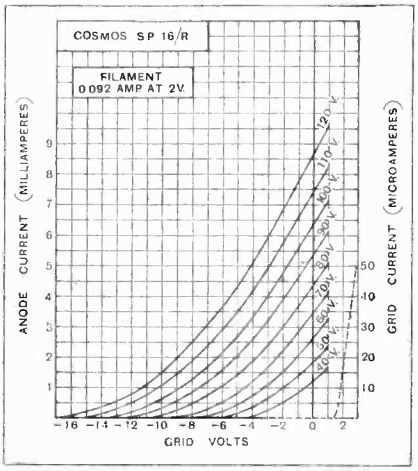
*Rated characteristics:—*

| | |
|---|---|
| A.C. resistance ... | 17,000 ohms. |
| Amplification factor | 15.4 |
| Mutual conductance | 0.95 mA/volt. |
| Max. H.T. ... | 150 volts. |

This is a good general-purpose valve, and is specially recommended by the makers for transformer coupling (H.F. or L.F.). A greater input amplitude is permissible than in the case of the SP.16/B, but grid bias is not really essential until the H.T. reaches 120 volts. The anode current under working conditions at three representative H.T. voltages is as follows:—

| H.T. | Grid Bias. | Anode Current. (mA). |
|---|---|---|
| 60 | 0 | 1.25 |
| 90 | 0 | 2.65 |
| 120 | -1½ | 2.95 |

The valve makes a good detector, and is particularly suitable for leaky grid rectification followed by transformer coupling.




**A.C. resistance = 12,500 ohms.**
**Amplification factor = 8.0.**
**Mutual conductance = 0.64 mA/volt.**
**(Average values under operating conditions).**

SP.16/R.

*Rated characteristics:—*

| | |
|---|---|
| A.C. resistance ... | 10,000 ohms. |
| Amplification factor | 9.0 |
| Mutual conductance | 0.9 mA/volt. |
| Max. H.T. ... | 100 volts. |

The permissible input to this valve is greater than either of the preceding valves, and grid bias is advisable for all H.T. values above 60 volts. In the particular valve tested, grid current did not start until the grid was 1.2 volt positive. This means that an amplitude (peak) 1.2 volt higher than the grid bias can be applied to the grid without distortion. The following grid bias settings are recommended:—

| H.T. | Grid Bias. | Anode Current. (mA). |
|---|---|---|
| 60 | -1½ | 1.75 |
| 80 | -3 | 2.4 |
| 100 | -4½ | 3.0 |

It should be noted that the H.T. should not exceed 100 volts.

The valve makes a good L.F. amplifier and leaky grid detector, and is successful as an oscillator in superheterodyne receivers.

The price of all three types is 10s. 6d.

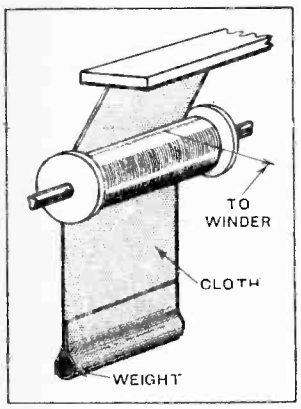
# LETTERS TO THE EDITOR.

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, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.**

### *COIL WINDING.*

Sir,—I have read with interest, in your current issue, an article on coil winding by "A. L. M. S." Far and away the best method of applying an effective brake to a spool of wire is to use the following method.




Rig up some sort of holder as suggested, and then provide yourself with a strip of smooth cloth, one end of which has been sewn up to form a loop. In this loop place any convenient weight, such as a short length of brass rod, and let the cloth be of a width to just fit in between the wooden ends of the spool. Pin the end of the cloth above the spool in such a way that it laps round an arc thereof. Thus the tension can be increased or diminished by using a greater or smaller weight and a very fine control over the tension is possible; in addition, the tension does not become greater as the spool becomes used up, as is the case with many braking systems.

It is, of course, the common way of applying an even tension to paper in reels and to prevent over-running, as in paper coating, etc., but I can assure you it is, in addition, admirable for coil winding.

THOS. P. MIDDLETON.

London, N.W.6.
October 3rd, 1928.

### *"THE MEGAVOX THREE."*

Sir,—I wish to convey to you my grateful thanks for having evolved such an excellent receiver as the "Megavox" recently described by you in *The Wireless World*.

The receiver is *all* that you claim for it, and after having built literally hundreds of sets, it is refreshing to find one which meets all needs. I thought your "Everyman Four" was the highest limit in set construction, but for sheer efficiency the "Megavox" is supreme. What I like about *The Wireless World* (which I have taken regularly for five years) is that it does not stoop to the horrible habit of dishing up old circuits clothed in new component parts, and which are obviously put forward to sell some particular line of goods.

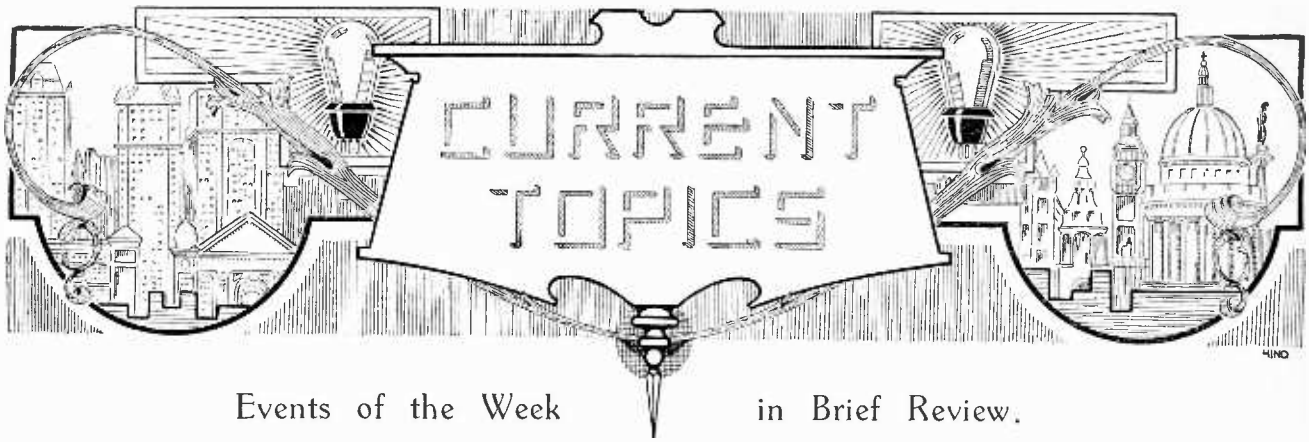
*The Wireless World* have never made extravagant claims about their receivers. The most honest and genuine help to wireless enthusiasts has always been my idea of your paper.

With my best wishes for the welfare of your paper, which I think I shall call "Honest John" from now onwards.

H. L. LEVITT.

Leeds,
October 1st, 1928.

**NEXT WEEK** constructional details will be given of a highly sensitive receiver with two screened-grid valves. By means of switching both wave ranges are covered; the H.F. amplification is remarkable, being in the order of one thousand.




## Events of the Week in Brief Review.

### SOLVING THE NAME PROBLEM.

A proud and enthusiastic listener has just informed the American National Broadcasting Company that his newly arrived son has been christened Radio.

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### ROYAL WIRELESS.

The value of wireless in the wilds is evidently recognised by the Duke of Gloucester, who included a multi-valve receiver in his kit when he left Nairobi a few days ago on his 3,000-mile hunting expedition across Africa.

oooo

### PROVISIONAL WIRELESS LICENCES.

Monthly wireless receiving licences are now issued by the Swiss Telegraph Administration. In an official announcement it is stated that the object of the new system is to enable owners of new receiving sets to test them thoroughly before applying for the ordinary annual licence, which costs 15 francs.

oooo

### WIRELESS POWER TRANSMISSION TESTS.

Experiments in the wireless transmission of power are reported to be in progress at Birmingham University, the particular object of the tests being the provision of power for tramcars. It is not intended to transmit power over a great distance but simply to eliminate the present mechanical trolley link between car and conductor rail by the substitution of high-frequency waves. A 20,000-cycle Poulsen arc is being used, the receiver power being converted by a mercury arc rectifier.

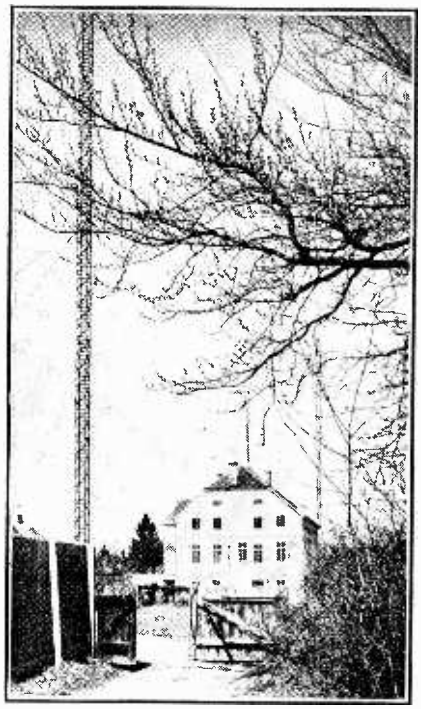
oooo

### SINGLE HIGH-POWER STATION FOR I.F.S.?

In opening the Dublin Wireless Exhibition last week, Mr. M. R. Hefferman, Parliamentary Secretary to the Free State Minister for Posts and Telegraphs, said that the ambition of the authorities was to bring reception within crystal-set range of the greatest possible number. The best method would be to set up a high-power station to serve the whole country, but there were technical difficulties to be faced. It was hoped, said Mr. Hefferman, that a scheme would soon be laid before the Dail for the future development of broadcasting in the Irish Free State.

### U.S. BROADCASTING AND THEATRE COMBINE.

Considerable interest has been created over the announcement that the Radio Corporation of America has purchased an interest in the Keith Albee Orpheum Incorporated. The latter organisation controls one of the largest chains of variety theatres in the United States, and it is understood that R.C.A. intends linking up these theatres with the broadcasting network.



**"MADE IN ENGLAND." A picturesque view of the Linz relay station, which has been constructed by the British Marconi Co. and is the first of its type in Austria.**

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### WANTED: AN INVENTOR.

A Hull correspondent, who states that his neighbour is a good chap but rather too fond of getting volume from a wireless set, asks for suggestions for making the thin dividing wall soundproof.

### PILLOWS AS PHONES.

The wireless installation at the Leasowe Children's Hospital, Liverpool, is equipped with "Pillowphones," which enable the children to enjoy broadcast programmes without the use of headphones.

oooo

### PROPOSED NEW TELEVISION SOCIETY.

A Television Society is proposed for the Walthamstow district. Persons interested are asked to communicate with Mr. H. J. Sarson, hon. secretary of the Walthamstow Amateur Radio Society, "Halcyon," Garner Road, E.17.

oooo

### OVERHEAD POWER LINE FATALITY.

A jury in Montreal has issued a verdict holding the municipality of Lakeside, Ontario, criminally responsible for the death of Mrs. Joseph Legault, who was electrocuted in the act of switching off the light while wearing headphones. Experts at the inquest agreed that a municipal 2,000-volt power line, with which the aerial came in contact, was too near the house.

oooo

### TELEARCHICS AT SEA.

Distant wireless control has been reduced to a fine art by members of the crew of the destroyer "Shikari," which directs the misfortunes of the target ship "Centurion." During gunnery manœuvres of the kind conducted last week in the Atlantic the "Shikari" steams at a respectful distance behind the target ship, controlling its movements in accordance with instructions from the officer in command of operations.

oooo

### WIRELESS ON HUNGARIAN TRAINS.

A wireless listening point for each passenger is one of the travel comforts which the Hungarian State Railways hope to provide in the near future. In a special train which will make its first run at the end of this month, each seat in all classes will be fitted with headphones, passengers being charged a fee of 3d. or 4d. for the privilege of listening. The broadcast receiver will be housed in a special compartment under the care of a qualified operator.

### YORK RADIO SHOW.

The York and District Radio held a successful wireless exhibition from Wednesday to Saturday last. Local wireless firms were well represented, and a number of exhibits were provided by members of the society.

oooo

### A CABINET QUESTION.

Shall we some day have wireless sets which cannot be mistaken for anything else? Our contemporary, *The Cabinet Maker*, answers in the affirmative. "The significant and characteristic form of the wireless cabinet," says that journal, "has not yet been evolved. Whatever is done now is almost certain to suggest a likeness to something else, and it will take a good deal of time to develop a structural design as characteristic, say, as the form of a grand piano, which never looks like anything but what it is. But the cabinet makers are fully alive to requirements, and will no doubt in the future produce something which even the electrician will be able to recognise as typical and tasteful."

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### SECRET WIRELESS IN A FOREST.

The discovery by the French police of a secret wireless transmitter in a forest cottage at Eze, near the Italian frontier, is reported by a correspondent of *The Times*. Keeping watch at midnight, the police arrested an Italian named Alessandro Pertini, a lawyer and a prominent anti-Fascist, who had several times been convicted in Italy of political offences. In the cottage were found a telephony transmitter with a range of 200 miles, a receiver and a telegraph set, together with a number of incriminating documents. The aerial was cleverly concealed in the trees.

### THE RADIO WORLD'S FAIR.

One of the most colourful events of the Radio World's Fair, writes our New York correspondent, was the coronation of Miss Lita Korbe, a city girl, as Radio Queen of America for 1928-29. Sixty thousand square feet of floor space in Madison Square Garden were converted into a gaily decorated salon. More than a million dollars worth of apparatus were on show, many models being exhibited for the first time to either trade or public.

Amateur set builders were also able to exhibit their work, and for the set embodying the highest quality of set building a gold medal was awarded by the management.

The first authentic radio wedding, with the minister in one place, the music "piped" from another, and the bridal couple in still a third took place on the Friday night before the close of the show, and was broadcast through station WGBS.

oooo

### ERRATUM.

It is regretted that an error occurred in Fig. 1 on p. 492 of our last issue in the article on the use of the screened valve as a detector. The ordinate should, of course, be read in microamps, not milliamps.

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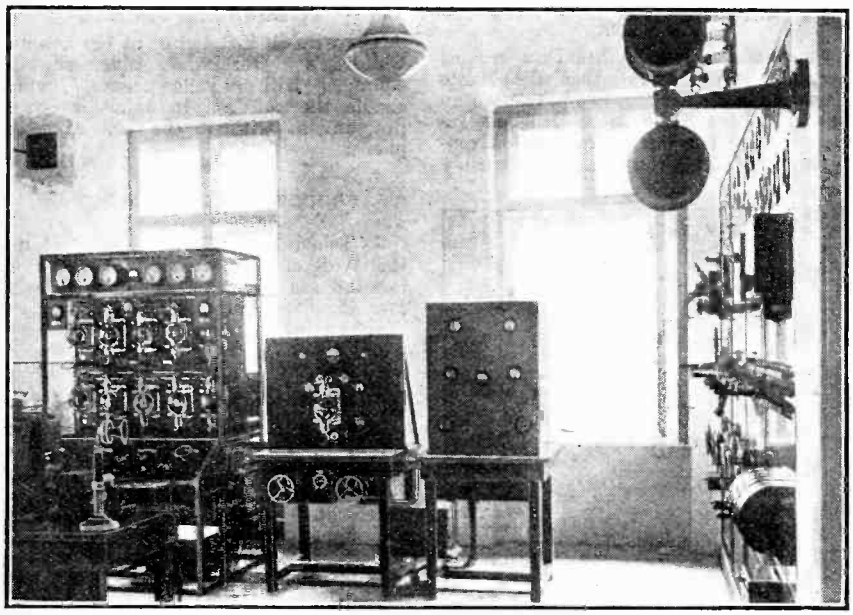
### THE BEETHOVEN PORTABLE.

Messrs. The Montague Radio Inventions and Development Company ask us to correct a mis-statement, which we much regret, on p.473 of our issue of October 3rd, in which the ownership of the Beethoven Portable Wireless set was assigned to the Enterprise Manufacturing Co. Although the Beethoven set was shown on the Enterprise stand at Olympia, there is no connection between the two firms.



**BRITISH APPARATUS IN AUSTRIA. The Marconi transmitter at Linz which has a power of 1½ kW. The station, which is crystal-controlled, relays the Vienna programmes for the benefit of crystal users in Upper Austria.**

## TRANSMITTERS' NOTES

### General Notes.

Mr L. A. C. Lawler tells us that his station G 6LR is now crystal-controlled; he is working in particular on 10 metres.

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Mr. J. W. Mathews, G 6LL, is transmitting every night at 23.00 and on Sundays at 14.30 G.M.T. on 10.21 metres, crystal-controlled. 2FN, Mr. F. Rodman, is co-operating with him in these tests, and reports will be welcomed by either station, as they wish to collect as much data as possible regarding reception on this wavelength.

oooo

### Short-wave Stations.

Our readers will recollect that, from time to time, we publish lists of short-wave stations transmitting regularly on wavelengths below 100 metres. In view of the many changes in call-signs and wavelengths that may become necessary when the new Regulations under the Washington Convention come into force, the present does not seem a suitable time for publishing a new list, as so many particulars will probably be changed next January. We are, however, constantly revising our records, and hope that our next list will be as complete and reliable as it is possible to make it.

oooo

We shall cordially welcome any authentic information which will enable us to add to and correct our existing records. The data required being wavelengths, call-signs, owners of stations, and nature and times of transmissions, i.e., telegraphy, telephony, broadcasting, time signals, etc. Verification of the wavelength generally employed is most desirable; this is sometimes a difficult matter, as many short-wave stations are experimenting with different wavelengths to discover which is most suitable, and this fact may account for the contradictory information we sometimes get from different listeners about identical stations. The number of short-wave stations is now so great that it is obviously impossible for our own staff to keep an accurate and complete track of all of them.

oooo

### Japanese Transmitters.

The nine stations licensed in Japan, whose call-signs are JXAX to JXIX, are restricted to 38 metres, the use of the 20-metre waveband being prohibited.

oooo

### New Call-signs and Stations Identified.

| | |
|---|---|
| **2CA** | C. E. Palmer Jones, 159, Dollis Hill Ave., Cricklewood, N.W.2. (Change of address.) |
| **2MW** | H. T. M. Wallis, "Roseland," Buckleburv), Reading. |
| **5WK** | (ex 2BAS), K. C. Wilkinson, 113, Half Moon Lane, Herne Hill, S.E.24, transmits on 23 metres. |
| **6AX** | (ex 2BCM), A. L. Clare, 15, Macmillan St., Rochdale, Lancs. Transmits on 160 metres and welcomes reports. |
| **6DG** | D. C. Gattiker, "Mon Desir," Boreham Wood, Elstree. |
| **2AMM** | C. J. L. Dixon, Middlefield, Wrecclesham, Farnham, Surrey. |
| **2AOK** | H. Heath, Beechwood, Stow-on-the-Wold, Glos. |
| **2BBR** | S. C. Keville, 6, Ferme Park Mansions, Crouch End, N.8. (Change of address.) |

# PROGRAMMES FROM ABROAD

## SATURDAY, OCTOBER 20th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**BARCELONA** (Radio Barcelona), Call EAJ1 **(344.8 metres)**; 1.5 kW.—**6.0,** Exchange Quotations. **6.10,** Sextet Selections: Overture to La Dame Blanche (Boieldieu); Selections from La Noche de Reyes (Serrano); Pizzicatti-Ballet (P. Fauchey); Slow Waltz, The Bird and the Rose (Cl. Worsley); Selection from Le Roi d'Ys (Lalo). **8.30,** French Lesson by Prof. Martin. **9.0,** Chimes, Weather Report, Exchange Quotations and News. **9.10,** Orchestral Concert: March, Gudrun (Siede); Selection from Jugar con fuego (Barbieri); Delicadeza (Soler); Serenata (Dvorák); Polonaise in B Flat (Schubert); Overture to Titus (Mozart). **10.0,** Programme relayed from **Madrid,** EAJ 7.

**BERGEN (370.4 metres)**; 1.5 kW.—**6.0,** Programme for Children. **6.30,** Talk for Girls. **7.0,** Orchestral Selections. **7.20,** Recitation by Mr. Torvald Tu. **7.50,** Topical Talk. **8.0,** Talk: Norwegian Literature from the Reformation to the Times of Holberg and Bellmann. **8.30,** Pianoforte Recital: Selections (Schumann), (a) Aufschwung, (b) Warum; Selections (Chopin), (a) Two Waltzes, (b) Etude; From the Carnival (Grieg); Minstrels (Debussy); La Fontaine (Hurum); Hungarian Rhapsody, No. 6 (Liszt). **9.0,** Weather Report, News and Time Signal. **9.15,** Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) **(1,250 metres)**; 40 kW.—**3.0,** Shorthand Dictation by Fritz Westermann. **3.30,** Talk by Joh. Lubahn. **4.0,** Programme from **Hamburg. 5.0,** Dr. W. Peiser, Talk: The Labour Press and Its Readers. **5.30,** Elementary Spanish Lesson. **5.55,** Herr Ohrmann, Talk: Bruckner. **6.20,** Dr. Eberhard Preussner, Talk: Modern Literature. **7.0,** Programme from **Leipzig. 9.0** (approx.), Programme from **Voxhaus.**

**BERLIN** (Voxhaus) **(484 metres)**; 4 kW.—**9.10 a.m.,** Market Prices. **9.15 a.m.,** Weather Report, News and Time Signal. **10.0 a.m.,** Programme of Gramophone Records. **10.30 a.m.,** Exchange Quotations. **11.55 a.m.,** Time Signal. **12.30,** Weather Report and News. **1.0,** Programme of Gramophone Records. **2.0,** Exchange Quotations, Agricultural Report and Time Signal. **2.45,** Dialogue. **3.30,** Concert: Overture to Der Erste Glückstag (Auber); Selection from Dalibor (Smetana); Boston-Serenade, Let Us Dream (Robrecht); Klingender Traum (Percy); Selection from The Merry Peasant (Fall); Lied Ohne Worte (de Micheli); Adagio Biargio (Mascheroni); Selection from Les Cloches de Corneville (Planquette); Liebesszene (Hölländer); Intermezzo, Bonzos Stelldichein (Krome); Concert-Tango, Expressionen (Brasse); followed by Announcements. **5.30,** Talk by Leopold Lehmann. **6.0,** Herr Erich Koch, Talk: Metal Aeroplane Construction. **6.30,** Wolfgang Schwarz, Talk: Problems of the Preservation of Peace. **7.0,** "Die Deutschen Kleinstädter," Comedy in Four Acts (Kotzebue), followed by Weather Report, News, Time Signal, Sports Notes and Dance Music.

**BERN (411 metres)**; 1.5 kW.—**6.29,** Time Signal and Weather Report. **6.31,** Emil Balmer, Talk: Rambles in Tessin. **7.0,** Tessin Programme: Choral and Mandoline Selections and Recitations. **8.45,** News and Weather Report. **9.0,** Orchestral Concert. **9.35,** Dance Music. **11.0** (approx.), Close Down.

**BRESLAU (322.6 metres)**; 4 kW.—**5.0,** Peer Lhot, Talk: The Baroco Period and Ourselves. **5.20,** Esperanto Lesson by Alfred Hanschke. **5.30,** The Interview with Director-General Beelzebub (Arnold Hahn) by Peer Lhot (Elocutionist). **6.25,** Shorthand Lesson. **6.50,** Natural History Talk by Prof. Oskar Meyer. **7.15,** Concert with Prof. Miquel Llobet (Guitarist): Spanish March, Los Banderillos (Volpatti); Guitar Selections, (a) Torre Bermeja (Albéniz) (b) Granada (Albéniz), (c) Selection from Amor Brujo (de Falla), (d) Fandauquillo (Torroba); Paso-doble, El Gallito (Lope); Guitar Selections, (a) Danse Espagnole (Granados), (b) Argentinian Dance, Vidala (Broqua), (c) Catalonian Dance, Corranda (Grau), (d) Bresilian Dance (Lobos); Lustige Szene (Fink); East Prussia (Lau); Unterm Kruschebaum (Egger-Sell); Der Sport (Lau); followed by Programme relayed from **Gleiwitz** (329.7 metres): Whistling Selections, (a) Romance from Mignon (Thomas) (b) Grüss Mir Mein Wien, from Countess Maritza (Kálmán); Cinema Organ Music (arr. Wellos); Hawaiian Song, Island of Dreams (Richards); Sag's Ihr beim Tanz; Der Hanschke (arr. Kardel); De Brill (Lau); De Scherbelei (Lau); Da staunt man (de Taye); Nu schlägt dreizehn (Lau); Der Pogg (Mabu); Das Schwein (Bink); Theodor, Du kommst mir komisch vor: Fox-Trot (Schaale). **9.30,** Dance Music. **11.0** (approx.), Close Down.

**BRÜNN (441.2 metres)**; 3 kW.—**4.30,** Talk. **4.45,** German Transmission. **5.15,** Weekly Report. **6.0,** "The Tales of Hoffmann"—Opera (Offenbach), from the National Theatre. **9.0,** Programme from **Prague. 9.25,** Concert by a Tzigane Orchestra, relayed from **Bratislava** (300 metres).

**BRUSSELS (508.5 metres)**; 1.5 kW.—**5 0.** Dance Music from the Armenonville Tea Rooms. **5.30,** Orchestral Concert from the Café Metropole. **6.0,** Elementary English Lesson. **6.25,** Advanced English Lesson. **6.45,** Concert from the Café Metropole (continued). **7.0,** Gramophone Selections. **7.30,** "Radio-Chronique." **8.15,** Gala Concert; Topical Talk during the Interval. **10.15,** News and Close Down.

**BUDAPEST (556.6 metres)**; 20 kW.—**4.0,** Reading by Alexius Mathé. **4.35,** Concert. **5.45,** Gustav Wilhelm, Talk: English Railways. **6.20,** Talk on the Occasion of the 25th Jubilee of the King's Theatre, by Edmund Lázár, Director of the King's Theatre. **8.0,** Concert by a Military Band. **9.10,** Time Signal, News, Results of the Trotting Races and Weather Report, followed by Tzigane Music, relayed from the Grand Hotel, Hungaria.

**DUBLIN,** Call 2RN **(319.1 metres)**; 1.5 kW.—**1.30** Weather Report and Gramophone Selections. **7.20,** News. **7.30,** Poem Recital by Frank Fay. **7.45,** Irish Lesson by Seamus O'Duirinne. **8.0,** Popular Concert: The Augmented Station Orchestra, (a) Calm Sea and Prosperous Voyage Overture, (b) In a Nutshell Suite (Percy Grainger); Bass Solos by Glyn Eastman; Orchestral Selection from Tosca (Puccini); Violin Solos by Fred Brough; Ballet Music from Hamlet (Thomas); Bass Solos by Glyn Eastman; Orchestral Selections, (a) The Bees' Wedding (Mendelssohn), (b) Dance of the Tumblers; Violin Solos by Fred Brough; Orchestral Selection; Waltz, Telegramme (Strauss). **9.30,** A Revue by J. O'Sheehan and Company. **10.15,** The Station Orchestra. **10.30,** News, Weather Report and Close Down.

**EINDHOVEN.** CALL PCJJ **(31.4 metres).** 5 kw (approx.). **7.40,** Concert relayed from the **Amsterdam** Concert Hall.; Marche Militaire (Schubert); Egmont Overture (Beethoven); Fantasia on Manon (Massenet); Souvenir de Chopin (Becce); Selections from Les Errinnyes (Massenet); Overture to Tannhäuser (Wagner).

**FRANKFURT (428.6 metres)**; 4 kW.—**3.35,** Vocal and Orchestral Concert: Overture and Song from Die Fledermaus (Joh. Strauss); Pesther Walzer (Lanner); Potpourri from La belle Hélène (Offenbach); Song from Orpheus in the Underworld (Offenbach); Selection from Fatinitza (Suppé); March from Die Gräfenberger (Gung'l). **5.10,** Reading by O. W. Studtmann. **5.45,** Wireless Correspondence. **6.15,** Shorthand Lesson by Georg Kalis. **6.45,** Dr. Herzfeld, Talk: Modern Youth as the Beginning of a New Social Life. **7.15,** Cinema and Cinema Music Fifteen Years Ago Introduction, Illustrations, Guessing Competition followed by "Men and Masks"—Play (Grauvogl), relayed from **Cassel** (252.1 metres), and Dance Music from **Voxhaus. 11.30** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse) **(394.7 metres)**; 4 kW.—**9.15 a.m.,** News. **10.0 a.m.,** Programme of Gramophone Records. **11.10 a.m.,** Weather Report. **11.15 a.m.,** Exchange Quotations. **11.30 a.m.,** Concert relayed from **Hanover** (297 metres). **11.45 a.m.** (in the Interval), Shipping Forecast. **11.55 a.m.,** Time Signal. **12.10,** News. **1.40,** Exchange Quotations. **2.30,** Book Review followed by Talk by Hans Friedrich Blunck. **3.0,** Labour Exchange Report. **3.15,** Talk by Prof. Arthur Kutscher. **3.40,** Talk by Karl Minor. **4.0,** Concert by the Scarpa Orchestra and the Lute-singer Niels Sörnsen: Potpourri of Folk Songs (Löns); Songs, (a) Verschütt (Löns), (b) Meiner Laute bunte Bänder (Ulrich-Sörnsen), (c) Minnelied (Reuter-Sörnsen), (d) Der Page von Hochburgund (Münchhausen-Groitssch), (e) Der Spuk (Löns-Sörnsen); Potpourri of Marching Songs (Larcher); Songs (a) Mein Mädel hat einen Rosenmund, (b) Die Auserwählte, (c) Gedanken sind frei, (d) Der Sang ist verschollen, (e) Ich gehe meinen Schlendrian; Potpourri of Students' Songs (Kohlmann). **6.0,** Programme relayed from the large Glockensaal in Bremen, with the assistance of Prof. Ed. Nössler and the Bremen Cathedral Choir: Fantasia for Organ (Bach); Choral Selection, Singet dem Herrn ein neues Lied (Bach); Addresses; Choral Selection, Fest und Gedenksprüche (Brahms); Passacaglia for Organ (Bach). **7.30,** "Fidelio"—Opera (Beethoven), followed by News, and Programme Announcements. **9.30** (approx.), Cabaret Concert.

**HILVERSUM (1,071 metres)**; 5 kW.—**11.40 a.m.,** Police Announcements. **12.10,** Concert of Trio Music. **1.40,** Concert relayed from the Tuschinski Theatre, Amsterdam. **3.10,** Talk and Italian Lesson. **4.40,** French Lesson. **5.30,** Concert, Overture to Lysistrata (Lincke); Major and Minor (Schreiner); Waltz, Diamantenregen (Waldteufel); Selection from No, No, Nanette (Youmans); Chin Chin Blues (Thurban); Finale; in the Interval, Time Signal. **6.30,** German Lesson. **7.25,** Police Announcements. **7.40,** Programme arranged by the Workers' Radio Society. **10.10,** Concert relayed from the Royal Picture House **Amsterdam. 11.15** (approx.), Close Down.

**HUIZEN (340.9 metres)**; 4 kW.—Transmits on 1,870 metres from 5.40 p.m. **12.10,** Concert of Trio Music. **2.40,** Programme for Children. **5.10,** Gramophone Selections. **6.40,** English Lesson. **7.10,** Lesson in Dressmaking. **7.40,** Talk by Prof. Kaag. **8.0,** Orchestral and Choral Concert from **Kaatsheuvel**: Baritone Solos, Talks by M. Besouw, Mayor of Kaatsheuvel and Father Glaudemans; Recitations.

**JUAN-LES-PINS** (Radio L.L.) **(244 metres)**; 1.5 kW.—**1.0,** Concert. **8.30,** Medical Talk, Cookery Notes, Talk for Women by Mme. la Comtesse de Tremeuge and Concert.

**KALUNDBORG (1,680 metres)**; 7 kW.—Programme also for **Copenhagen** (337 metres).—**6.30 a.m.,** Morning Gymnastics. **10.0 a.m.,** Weather Report. **10.15 a.m.,** Educational Talk. **2.0,** Children's Corner. **2.30,** Instrumental Concert. In the Interval, Recitation by Poula Bondesen. **5.20,** Talk. **5.50,** Weather Report. **6.0,** News and Exchange Quotations. **6.15,** Time Signal. **6.30,** Georg Borup, Talk: The Great Copenhagen Fire of 1728. **7.0,** Chimes from the Town Hall. **7.2** (approx.), Concert of Old Dances: Old French Dances (Scherzer), (a) Bourrée, (b) Sarabande, (c) Minuet, (d) Gavotte, (e) Musette; Old British Dances (de Witt), (a) Pop Goes the Weasel, (b) Irish Washerwoman, (c) Speed the Plow, (d) Miss MacLeod's Reel; Old Dances of North-West Jutland, (a) Kronprinsens March, (b) Vals, (c) Den lille jydske, (d) Oksekov, (e) Sekstur, (f) Kehraus. **8.0,** News. **8.15,** Reading by Aage Brandt. **8.45,** Concert of Light Music: Overture to Princess of Trapezunt (Offenbach); Waltz from The Sleeping Beauty (Tchaikovsky); Träumerei for Strings (Schumann); Fantasia on English Melodies (Schumann); Rustle of Spring (Siuding); Serenata di baci (Micheli); Gavotte from Das süsse Mädel (Reinhardt); It's a long way to Tipperary (Judge and Williams). **9.45,** Dance Music. **11.0,** Chimes from the Town Hall. **11.15** (approx.), Close Down.

## Programmes from Abroad.—

**KATTOWITZ** (422 metres); 10 kW.—**3.0,** Programme of Gramophone Records. **4.10,** Music Lesson by F. Sachse. **4.35,** Children's Letter Box. **5.0,** Programme for Children. **6.0,** Announcements. **6.30,** Dr. T. Dobrowolski, Art Talk: Monuments in Silesia. **6.55,** Agricultural Report. **7.5,** Talk by Mr. K. Zienkiewicz. **7.30,** Programme from **Warsaw. 9.0,** Time Signal, Weather Report and News. **9.30,** Dance Music.

**KAUNAS** (2,000 metres); 7 kW.—**4.45,** Talk. **5.30,** Announcements. **6.0,** Weather Report and News. **6.15,** Programme Announcements. **6.30,** Programme from the National Theatre.

**LAHTI** (1,522.8 metres); 35 kW.—**4.0,** Orchestral Concert: March (Herzer); Viennese Waltz (Benatzky); Ein Fest in Aranjuez (Demerssemann); Spanish Dance (Saint-Saëns); Selection from The Circus Princess (Kálmán). **5.15,** Talks. **6.0,** Violin Recital. **6.20,** Talk. **6.40,** Orchestral Selections: Overture to The Merry Wives of Windsor (Nicolai); Caprice Italienne (Tchaikovsky). **7.10,** Recital of Songs. **7.30,** Orchestral Selection, Moldau (Smetana). **7.45,** News in Finnish and Swedish. **8.15,** Dance Music. **9.0** (approx), Close Down.

**LANGENBERG** (468.8 metres); 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**11.10 a.m.,** Gramophone Selections. **12.5,** Vocal and Instrumental Concert: Slavonic March (Tchaikovsky); Overture to Benvenuto Cellini (Berlioz); Concert-Waltz in E Major (Moszkovsky); Four Songs; Variation on a Gluck Theme (Tovey); Ständchen, Op. 17, No. 2 (Strauss); Serenade, Op. 25 No. 1 (Zilcher); German Dances (Reger). **1.30,** Hints for the Housewife. **2.40,** Talk on Wireless by Arnold Stecher. **3.0,** Richard Wetz, Talk: Rhenish Workdays and Holidays in Literature. **3.30,** Programme from **Königswusterhausen. 4.0,** Talk for Women by Frl. Mundorff. **4.20,** Elementary English Lesson by Prof. Hase. **4.45,** Vocal and Orchestral Concert: Festival Overture (Glazounoff); Songs with Orchestral Accompaniment, (a) Morgen (R. Strauss), (b) Verführung (R. Strauss), (c) Weylas Gesang (Wolf); Four Slavonic Dances, Nos. 9, 10, 11 and 12 (Dvorák). **5.30,** Prof. Honigsheim, Talk: The Social Significance of the Youth Movement. **6.15,** Talk for Workers by Dr. Karl Würzburger. **6.40,** Dr. Otto Förster, Talk: German Cathedrals. **7.0,** Variety Programme followed by News, Sports Notes, Business Announcements and Dance Music. **12.0 Midnight** (approx.), Close Down.

**LEIPZIG** (365.8 metres); 4 kW.—**3.30,** Orchestral Concert. **4.45,** Wireless News and Talk. **5.20,** Weather Report, Time Signal and Labour Exchange Report. **5.30,** Programme from **Königswusterhausen. 6.0,** Rector Greef, Talk: Psychology. **6.30,** Talk by R. Gerber. **7.0,** Recital of German Folk Songs. **7.30,** Concert: Folk Songs for Vocal Quartet; Pianoforte Selection Op. 32 (Zilcher). **9.0,** News, Sunday Programme Announcements and Sports Notes. **9.30,** Dance Music relayed from **Voxhaus.**

**MADRID** (Union Radio), Call EAJ7 (**375 metres**); 3 kW.—**7.0,** Chimes and Exchange Quotations, followed by Sextet Music: Selection from Frauenfresser (Eysler); Suite Op. 98 (Dvorák); Interlude by Luis Medina. **8.0,** Sextet Selections of Dance Music. **8.25,** News. **9.45,** Market Prices. **10.0,** Chimes, followed by Selection from "Pepé Conde": Musical Play (Vives) and News. **12.30 a.m.** (approx.) (Sunday), Close Down.

**MILAN,** Call IMI (**549 metres**); 7 kW.—**3.30,** Time Signal, followed by Concert of Quintet Selections: Overture to The Merry Wives of Windsor (Nicolai); Selection from Adrienne Lecouvreur (Cilea); Love Song (Sammartini); Spanish Caprice (Pennati Malvezzi); Fourteenth Rhapsody (Liszt). **4.0,** Exchange Quotations. **4.20,** Programme for Children. **4.45,** Agricultural Report and News. **7.15,** Time Signal and Announcements. **7.35** Time Signal. **7.37,** C. Vidusso, Talk: Verdi, with Pianoforte Illustrations. **7.45,** News. **7.50,** Vocal and Instrumental Concert from the Works of Verdi; "Sei tu?" (Sodini) by F. M. Martini (Elocutionist). **9.55,** News. **10.0,** Orchestral Concert from the Hotel Majestic Diana. **10.45** (approx.), Close Down.

**MOTALA** (1,380 metres); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Böden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres), **Sundsvall** (545.6 metres).—**6.15,** "Uppsägningen," Play (Thorsson). **6.45,** Pianoforte Recital: Barcarolle (Liadov); Melody in E Major (Rachmaninoff); Etude, Op. 2 (Scriabine); Albumblatt, Op. 45 (Scriabine); Polka (Merwolff). **7.0,** Programme relayed from **Göteborg:** Folk Music, Popular Ballads and Tales. **8.0,** Topical Talk. **8.15,** News and Weather Report. **8.45,** Dance Music. **11.0** (approx.), Close Down.

# Saturday, October 20th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**NAPLES,** Call INA (**333.3 metres**); 1.5 kW.—**3.45,** Weather Report and News. **3.50,** Variety Selections. **3.58,** Chamber of Commerce Report. **4.0,** Concert: Orchestral Selection, Intermezzo, Syren Song (Billi); Serenata (Becce); Soprano Solo, O dolce meraviglia (Tosti); Orchestral Selection, Romance (Grumfeld); Soprano Solo, Strana (Tirindelli); Orchestral Selection, Potpourri from A Waltz Dream (Strauss); Soprano Solo, Madonna Renzuola (Donandy); Orchestral Selection, Intermezzo, Un idillio (Krome); Soprano Solo, Spanish Serenade (Buzzi-Beccia); Orchestral Selections, (a) Intermezzo, Fior di neve (Bertelli), (b) Gavotte, Mignonne (Billi). **4.30,** Time Signal. **4.35,** Foreign Report. **7.20, Wireless Notes. 7.30** Announcements. **7.40,** Time Signal. **7.45** News. **7.48,** Harbour Notes. **7.50,** Recital by the Chorus of the San Carlo Theatre. **9.0,** "The Telephone," Drama (de Lorde), followed by "Cure by Homeopathy," Comedy (Zambaldi); in the Interval: Topical Review. **9.55,** Calendar, followed by Programme Announcements. **10.0,** Dance Music, relayed from the Trocadero Restaurant. **10.30** (approx.), Close Down.

**OSLO** (**461.5 metres**); 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres) and **Rjukan** (448 metres).—**6.0,** Programme for Children. **6.15,** Weather Report, News and Agricultural Report. **6.30,** Talk: The Copenhagen Fire of 200 Years Ago. **7.0,** Time Signal. **7.30,** Programme from **Hamburg. 9.0,** Weather Report and News. **9.15,** Topical Talk. **9.30,** Dance Music from the Grand Hotel. **10.30** (approx.), Close Down.

**PARIS** (Ecolé Supérieure), Call FPTT (**458 metres**); 0.5 kW.—**6.30,** "Radio Journal de France." **8.0,** Sports Notes and Announcements, followed by Temperance Talk, News, Time Signal, Weather Report and Dance Music from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL (**2,650 metres**); 5 kW.—**5.45,** "Le Journal Parlé." **7.10,** Weather Report. **7.30,** Concert: España (Albéniz); Suite funambulesque (Busser); L'Ile heureuse (Chabrier); Joyeuse Marche (Chabrier); La Légende du papillon (Colomb); Rêverie sous les palmes (Duhamel); Prelude to the Fourth Act of Aphrodite (Erlanger); Le mariage des roses (Franck); Lied (Franck); Aubade sentimentale (Fourdrain); Danse Latine (Fourdrain); Spanish Dance (de Falla); Berceuse (Gaubert); Cantiques d'amour (Georges); Deuxième Suite mourcienne (Jacquet); La ville morte (Korngold); La Habanera (Laparra); Harmonie du soir (Lazzari); Premier nocturne (Pierné); Venise (Richepin); Marche burlesque (Cadou).

**PARIS** (Petit Parisien) (**340.9 metres**); 0.5 kW.—**8.45,** Gramophone Selections, Talk, News and Announcements. **9.0,** Concert: Overture to Le Roi l'a dit (Delibes); Selection from Véronique (Messager), Finale from the Fourth Symphony in B Flat (Beethoven); Concert, on B Flat for Bassoon and Orchestra (Mozart); Ballet Music from Rosamunde (Schubert); Liebestraum (Liszt); Finale from the Ballet from Philemon and Baucis (Gounod); News during the Intervals.

**PARIS** (Radio-Paris), Call CFR (**1,750 metres**); 6 kW.—**12.30,** Concert of Gramophone Selections: Chirp, Chirp, by Fred Rich and his Orchestra; Waltz, Raniona, by Ben Selvin and his Orchestra; Are You Lonesome To-night? by Layton and Johnstone; Cavaquinho (Milano); L'Invitation au voyage (Duparc), by Mme. Croiza; Air from Faust; Violin Solo, Tambourin chinois (Kreisler); Pianoforte Solos, Preludes Nos. 4, 5 and 6 (Chopin); Overture to The Mastersingers (Wagner); Norwegian Dances (Grieg); News in the Interval. **1.50,** Market Prices and Religious Information. **3.45,** Dance Music; News in the Interval **8.0.** Agricultural Report. **8.15,** Talk, arranged by the Union des Grandes Associations Françaises, Market Prices and News. **8.30,** Concert, arranged by "Le Matin": Berceuses modernes; Melodies; Symphony Concert; News in the Intervals.

**POSEN** (**344.8 metres**); 1.5 kW.—**6.0,** Talk. **6.25,** English Lesson by Dr. Arend. **6.50,** Talk for Women, by Mme. Sabina Swidzinska. **7.10,** Finance Report. **7.30,** Concert. **9.0,** Time Signal, News and Weather Report. **9.20,** Miscellaneous Items. **9.40,** Dance Music from the Carlton Restaurant. **11.0,** Concert, arranged by Maison Philipps. **1.0 a.m.** (approx.) (Sunday), Close Down.

**PRAGUE** (**348.9 metres**); 5 kW.—**4.30,** Programme of Talks. **4.50,** Agricultural Report. **5.0,** German Transmission. **6.0,** Programme from **Brünn. 9.0,** Time Signal and News. **9.25,** Concert by a Tzigane Orchestra.

**ROME,** Call 1RO (**447.8 metres**); 3 kW.—**7.10,** Sports Notes, News, Exchange Quotations and Weather Report. **7.26,** Topical Talk and Time Signal. **7.45,** "L'Enfant prodigue"—Opera (Debussy), followed by "I Dispettosi Amanti"—Comedy (Parelli); in the Interval, Review of Art and Literature, Fashion Talk, and Selections from "William Tell"—Opera (Rossini). **9.50,** News and Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF (**21.96 and 31.4 metres**); 30 kW.—**12.0 Midnight,** Statler's Pennsylvanians, directed by Johnny Johnson, from **New York. 12.30 a.m.** (Sunday), Concert from the Hotel Sagamore, **Rochester. 1.0 to 4 a.m., New York** Relay. **1.0 a.m.,** Musical Programme. **1.30 a.m.,** "The Park Bench." **2.0 a.m.,** Variety Programme. **3.0 a.m.,** American Tobacco (Lucky Strike) Programme. **4.0 a.m.,** Time Signal and Dance Music from the Hotel Ten Eyck, **Albany. 5.0 a.m.** (approx.), Close Down.

**STAMBOUL** (**1,200 metres**); 5 kW.—**7.30,** Weather Report and Time Signal. **7.40,** Orchestral Concert: Scheherazade—Symphonic Poem (Rimsky-Korsakoff); Song; Ballet from Hérodiade (Massenet). **9.0,** News and Close Down.

**STUTTGART** (**379.7 metres**); 4 kW.—**3.35,** Concert. **5.0,** Time Signal and Weather Report. **5.15,** Talk by Prof. Krebs, relayed from **Freiburg** (577 metres). **5.45,** Lesson in Book-keeping by Dr. Wolff. **6.15,** Art Talk by Paul Westheim. **6.45,** Sports Notes. **7.0,** Ballad Recital by Käte Graber, followed by "Stage and Boards" Concert under the direction of Carl Struve: Overture to Fidelio (Beethoven); Russian Romance, Pray for me (Machotin); Die liebe, goldene Meisterin (Steinbrecher); Russian Cradle Song (Irving Berlin); Overture to Pique Dame (Suppé); "The City lies in Darkness"—Wireless Comedy (Auerbach); Waltz from The Czardas Princess (Kálmán); Drei arme, kleine Mädel (Kollo); Du, ich halt im Arm dich fest (Grün); Wozu erschuf der liebe Gott denn bloss das Herz (Stransky); Weine nicht (Brommer); Sündig und süss (Stofford); Humorous Selections; March, Frohsinn (Siede); followed by News and Dance Music from the Excelsior Pavillon.

**TOULOUSE** (Radiophonie du Midi) (**391 metres**); 3 kW.—**12.45,** Concert. **8.0,** Exchange Quotations and News. **8.30,** Concert: Orchestral Selections, (a) Overture to The Mountebanks (Ganne), (b) The Ride of the Valkyries (Wagner), (c) La Feria (Lacôme), (d) Schlittschuhläufer (Waldteufel), (e) Waltz, Estudiantina (Waldteufel); Mandoline and Guitar Selections, (a) The Millions of Harlequin (Drigo), (b) Prelude (Rachmaninoff), (c) Un peu d'amour (Silesu), (d) Gavotte Louis XIII (Lincke); La vie heureuse (Schrammee); Orchestral Selections from Faust (Gounod). **10.0,** Argentine Tangos. **10.15,** North African News. **10.25** (approx.), Close Down.

**VIENNA** (**577 and 517.2 metres**); 1.5 and 15 kW.—**4.45,** Programme for Children. **5.15,** Reading by Fritz Delius, Tristan and Isolde. **6.15,** Chamber Music: String Quartet, Op. 109 (Reger). **7.5,** "Hanneles Himmelfahrt"—Dream Poem in Two Acts (Gerhart Hauptmann), followed by Orchestral Concert: Comedy Overture (Fall); Serenade from The Millions of Harlequin (Drigo); Waltz, Aus den Bergen (Joh. Strauss); Selection from Tiefland (d'Albert); Albumblatt (Wagner); Dorfgeschichten—Character Sketch (Gillett); Ballet Music from Faust (Gounod); Waltz, Weana Madl'n (Ziehrer); Selections from Joh. Strauss' Operettas (Schlögel); March (Kemeter), followed by Photo Telegraphy Transmission.

**VILNA** (**435 metres**); 1.5 kW.—**3.10,** News in Lithuanian. **3.30,** Talk for Women by Mme. Ela Buncler. **3.55,** News. **4.10,** Gramophone Selections. **4.35,** Talk relayed from **Warsaw. 5.0,** "L'Aveugle," Wireless Comedy (Halina Hohendlinger). **5.45,** News. **6.0,** Art Talk by Prof. Jules Klos. **6.30,** Talk relayed from **Warsaw. 6.55,** News, followed by Gramophone Selections. **7.30,** Concert, Time Signal, News and Dance Music relayed from **Warsaw.**

**WARSAW** (**1,111 metres**); 10 kW.—**3.0,** Programme of Gramophone Records. **4.10,** Geography Lesson, by Mr. Siwek. **4.35,** Talk. **5.0,** Programme for Children, relayed from **Cracow. 6.0,** Miscellaneous Items, followed by Announcements by the Polish Horse-breeding Association. **6.30,** "Radio-Chronique" by Dr. M. Stepowski. **6.55,** Market Report. **7.5,** News. **7.30,** Concert of Light Music; in the Interval, News in French. **9.0,** Time Signal, Aviation Notes and Weather Report. **9.5,** News. **9.20,** Police Announcements and Sports Notes. **9.30,** Dance Music. **10.30** (approx.), Close Down.

## Programmes from Abroad.—

**BARCELONA** (Radio Barcelona), Call EAJ1 (**344.8 metres**); 1.5 kW.—**11.0 a.m.**, Chimes, relayed from the Barcelona Cathedral, followed by Weather Report for Europe and Weather Forecast for North-East Spain, and Aviation Route Report. **1.30**, The Iberia Trio in a Programme of Light Music; Gramophone Records in the Intervals. **2.45 to 6.0**, No Transmission. **6.0**, Market Prices. **6.10**, Concert by the Barcelona Wireless Orchestra and Vocalists; in the Interval, at **7.0**, Weekly Agricultural Talk, arranged by the Catalonian Agricultural Institute at Saint Isidro. **8.40**, Sports News. **9.0** (approx.), Close Down.

**BASLE** (**1,010 metres**); 1.5 kW.—Programme relayed from **Bern.** **7.0**, Programme from the Basle Münster: Schubert Festival; the Münster Choir, conducted by Rudolf Moser; Mass in A Flat Major (Schubert). **9.0** (approx.), Sports Notes, News Bulletin and Weather Report. **9.15** (approx.), Close Down.

**BERGEN** (**370.4 metres**); 1.5 kW.—**9.30 a.m.**, Relay of Church Service and Sermon. **11.30 a.m.**, Weather Forecast and General News Bulletin. **4.0**, Concert. **7.0**, Concert by the Station Orchestra. **7.50**, Current Topics. **8.0**, Pianoforte Recital by Trygve Stangeland: Sonata, Op. 13 ("Pathetic") and Sonata, Op. 27, No. 2 (Beethoven). **9.0**, Weather Report, Late News Bulletin and Time Signal. **9.15**, Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) (**1,250 metres**); 40 kW.—**7.55 a.m.**, Chimes, relayed from **Potsdam.** **8.0 a.m.**, Recital of Music, relayed from **Voxhaus**, followed by Relay of the Cathedral Chimes. **10.15 a.m.** (approx.), Instrumental Concert, relayed from **Voxhaus.** **2.30 to 3.25**, Three Talks on Agriculture, relayed from **Voxhaus.** **4.0**, Selections of Light Music, relayed from **Voxhaus.** **5.30**, Talk. **6.0**, Talk, followed by Relay from another German Station. **9.15**, Late News Bulletin. **9.30**, Dance Music. **11.30** (approx.), Close Down.

**BERLIN** (Voxhaus) (**484 metres**); 4 kW.—**7.55 a.m.**, Chimes, relayed from the Potsdam Garrison Church. **8.0 a.m.**, Vocal and Instrumental Concert, followed by Chimes, relayed from the Berlin Cathedral. **10.15 a.m.** (approx.), Concert of Instrumental Selections. **2.30** Practical Hints for Farmers. **2.45**, Market Reports for the Week. **2.55**, Talk: The Care of Animals. **4.0 to 5.0**, Light Music, followed by Advertisements and Talks. **7.15** (approx.). Orchestral Concert. **9.15**, Weather Report, Time Signal, Sports Notes and Late News Bulletin. **9.30**, Dance Music. **11.30** (approx.), Close Down.

**BERN** (**411 metres**); 1.5 kW.—**9.30 a.m. to 10.30 a.m.**, Religious Address. **12.0 Noon**, Time Signal and Weather Report. **12.5**, Orchestral Concert. **6.30**, Talk, relayed from **Basle**, Dr. Paul Lang: Swiss Alpine Poetry. **7.0**, Relay from **Basle.** **9.0** (approx.), Sports News, General News Bulletin and Weather Report. **9.15**, Orchestral Concert. **9.35** (approx.), Close Down.

**BRESLAU** (**322.6 metres**); 4 kW.—Programme relayed by **Gleiwitz** (329.7 metres). **10.0 a.m.** (approx.), Catholic Recital of Choral and Instrumental Selections and Address. **1.0**, Guessing Competition. **1.35**, Chess Problems. **2.0**, Children's Corner. **2.30**, Agricultural Notes, followed by Talks and Music. **7.30**, Concert of Military Music. **9.0**, Late News Bulletin, followed by Programme of Music. **11.0** (approx.) Close Down.

**BRÜNN** (**441.2 metres**); 3 kW.—**8.0 a.m.**, Concert. **9.0 a.m.**, Agricultural Talk. **9.30 a.m.**, Talk. **10.0 a.m.**, Orchestral Selections. **11.0 a.m.**, Instrumental Concert. **5.0**, Transmission for German Listeners. **6.15** (approx.), Programme of Music. **9.0**, General News Bulletin, relayed from **Prague**, followed by Music.

**BRUSSELS** (**508.5 metres**); 1.5 kW.—**5.0**, Relay from the Tea Room of the Palace Hotel, Brussels; Dance Music by the Orchestra. **6.0**, Children's Programme by the Clowns Bonzo and Sylvia of the Théâtre des Enfants. **6.30**, Concert by the Station Trio. **7.30**, "Le Journal Parlé de Radio-Belgique." **8.15**, Orchestral and Vocal Concert. **10.15**, Late News Bulletin. **10.30** (approx.), Close Down.

**BUDAPEST** (**556.6 metres**); 20 kW.—**8.0 a.m.**, News from the Press, followed by Beauty Notes. **9.0 a.m.** Relay of Church Service. **11.15 a.m.** (approx.), Concert. **2.30**, Talk for Farmers, arranged by the Ministry of Agriculture. **3.15** (approx.), Children's Corner. **4.15**, Concert. **9.30**, Relay of Music by the Pertis Tzigane Orchestra at the Hotel Britannia. **10.30** (approx.), Close Down.

**COLOGNE** (**283 metres**); 4 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Langenberg** (468.8 metres), and **Münster** (250 metres).—**7.15 a.m.**, Musical Selections. **7.35 a.m. to 7.55 a.m.**, Lesson in Esperanto.

# SUNDAY, OCTOBER 21st.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**8.0 a.m.**, Morning Recital of Music and Address. **10.0 a.m.**, Talk on the German Language. **10.35 a.m.**, Talk for Farmers. **10.55 a.m.**, Music Talk with Illustrations. **12.0 Noon**, Orchestral Concert. **2.0**, Talk on Literature, followed by Talk on Chess. **3.30**, Orchestral Concert. **6.0** (approx.), Transmission for Workers. **7.0**, "Der Freischutz," Opera by Weber. Musical Director: Herr Kühn; Renderings by the Zimmermann Choir, followed by Late News Bulletin, Sports Notes and Dance Music. **11.0** (approx.), Close Down.

**CORK**, Call 6CK (**400 metres**); 1.5 kW.—**8.30**, Vocal and Instrumental Concert, with Violin Solos by Fred Brough. **11.0**, Weather Report and National Anthem. **11.15** (approx.), Close Down.

**CRACOW** (**566 metres**); 1.5 kW.—**9.15 a.m. to 10.45 a.m.**, Relay of Morning Service. **11.0 a.m. to 11.10 a.m.**, Fanfare, relayed from the Church of Notre Dame, Time Signal and Weather Forecast. **7.0**, Relay of Fanfare from Notre Dame. **7.15**, Sports Notes. **7.30**, Concert of Light Music, Songs and Selections from Operettas, Pianoforte renderings of Modern Dance Tunes, and American Grotesques. **9.0**, Programme relayed from **Warsaw.** **9.30**, Concert relayed from the "Pavillon" Restaurant. **10.30** (approx.), Close Down.

**DUBLIN**, Call 2RN (**319.1 metres**); 1.5 kW.—**8.30 to 11.15** (approx.), Programme relayed from **Cork**; Music by the Station Sextet and Mezzo-Soprano Solos by Mrs. Baker. **11.0**, Weather Report and National Anthem. **11.15** (approx.), Close Down.

**FRANKFURT** (**428.6 metres**); 4 kW.—Programme relayed by **Cassel** (252.1 metres).—**7.30 a.m.** (approx.), Morning Recital. **10.0 a.m.**, Talks. **12.0 Noon**, Notes by the Wiesbaden Agricultural Institute. **3.30** (approx.), Concert. **7.30**, Musical or Literary Programme. **9.30** (approx.), Dance Music. **11.0** (approx.), Close Down.

**HAMBURG**, Call HA (in Morse) (**394.7 metres**); 4 kW.—Programme relayed by **Bremen** (272.7 metres), **Hanover** (297 metres) and **Kiel** (254.2 metres).—**7.25 a.m.**, Time Signal. **7.30 a.m.**, Weather Forecast and General News Bulletin. **8.0 a.m.**, Talk on Legal Matters. **8.15 a.m.**, Morning Recital of Music. **9.55 a.m.** (for **Kiel** only), Relay of Church Service. **11.55 a.m.**, Time Signal, relayed from **Nauen.** **12.5** (for **Hanover**), Concert of Popular Gramophone Selections. **1.0**, Children's Corner, conducted by Funkheinzelmann (Hans Bodenstedt). **2.0**, Instrumental Concert. **4.0**, Orchestral Concert. **6.0**, Talk. **6.30**, Talk, arranged by the Hamburg School of Physical Training. **6.40**, Sports News. **6.55**, Weather Report. **7.0** (approx.), Concert or Play. **8.30** (approx.), General News Bulletin and Weather Report for North Sea and Baltic, followed by Concert. **10.0** (approx.), Close Down.

**HILVERSUM** (**1,071 metres**); 5 kW.—**12.40 to 2.10**, Concert by the Hilversum Wireless Trio. **2.10 to 4.40**, Concert, followed by Selections by the Station Orchestra, under the direction of Nico Treep. **7.40**, Weather Report and General News Bulletin. **7.55**, "Carmen," Opera, by Bizet. **11.0** (approx.), Close Down.

**HUIZEN** (**340.9 metres**); 4 kW.—Transmits on 1,870 metres from 5.40.—**8.10 a.m.**, Morning Service and Address. **9.30 a.m.**, Relay of Morning Service. **12.10**, Trio Concert. **5.30**, Relay (on 1,870 metres) of Evening Service from the "Nieuwe Kerk" at Delft; Sermon by the Minister, the Rev. H. P. Brandt. **7.55** (approx.), Vocal and Instrumental Concert. **10.25**, Choral Epilogue, conducted by Mr. Jos. H. Pickkers. **10.40** (approx.), Close Down.

**JUAN-LES-PINS** (Radio L.L.) (**244 metres**); 1.5 kW.—**1.0 to 2.0**, Popular Programme by the Station Orchestra. **9.0**, General News Bulletin, Sports News and Weather Report. **9.15**, Concert of Orchestral Selections. **10.0**, Dance Music by the Orchestra at the Municipal Casino. **10.30** (approx.), Close Down.

**KALUNDBORG** (**1,680 metres**); 7 kW.—Programme also for **Copenhagen** (337 metres).—**9.0 a.m.**, Morning Service, relayed from a Church in **Copenhagen.** **10.30 a.m. to 10.40 a.m.** (**Kalundborg** only), Weather Report from the Meteorological Institute. **12.0 Noon to 12.25**, German Lesson, arranged by "Radiolyttern." **12.30 to 12.55**, French Lesson, arranged by "Radiolytteren." **4.0**, Divine Service, relayed from a Church in **Copenhagen.** **5.30**, Programme for Children. **5.50** (**Kalundborg** only), Weather Report from the Meteorological Institute. **6.0**, News from the Press. **6.15**, Time Signal. **6.30**, Talk. **7.0**, Relay of Chimes from the Town Hall, **Copenhagen.** **7.5**, "Klampenborg" Evening; Introductory Talk by Hans Werner: An Outline of Klampenborg's History; Music by the Copenhagen Station Orchestra, under the direction of Emil Reesen. **8.30**, General News Bulletin. **8.45**, Concert by the Copenhagen Wireless Orchestra. **9.45**, Relay of Dance Music Programme; in the Interval at **11.0**, Chimes, relayed from the Town Hall, **Copenhagen.** **11.30** (approx.), Close Down.

**KATTOWITZ** (**422 metres**): 10 kW.—**9.15 a.m.**, Relay of Church Service. **11.0 a.m.**, Time Signal and Weather Report. **6.20**, Humorous Items. **6.45**, Review of the Weekly Press. **7.30**, Concert, relayed from **Warsaw**: the Polskie Radio Orchestra, conducted by J. Oziminski; Mme. S. Strzelecka (Soprano); Mme. M. Wilkomirski (Pianoforte); C. Wilkomirski ('Cello). **9.0**, Time Signal, Weather Forecast, News from the Press and Sports Notes. **9.30**, Selections of Dance Music. **10.30** (approx.), Close Down.

**KAUNAS** (**2,000 metres**); 7 kW.—**10.15 a.m.**, Concert of Orchestral Music. **11.0 a.m.**, Weather Forecast and News from the Press. **11.30 a.m.**, Programme of Music. **12.0 Noon**, Children's Half-Hour. **12.30**, Gymnastics. **4.0**, Talk: Economics and Life. **5.25**, Musical Interlude. **6.0**, Weather Report and News from the Press. **6.30**, Literary Programme, and Concert by the Band of the Kaunas Garrison. **9.30** (approx.), Close Down.

**KÖNIGSBERG** (**303 metres**); 4 kW.—Programme relayed by **Danzig** (272.7 metres).—**8.0 a.m.**, Morning Recital of Music with Address. **10.0 a.m.** (**Königsberg** only), Weather Forecast. **10.15 a.m.**, Orchestral Concert, with Songs. **11.55 a.m.**, Time Signal, relayed from **Nauen**, followed by Weather Report. **1.50**, P. S. Leonhardt, Talk on Chess. **2.20**, Spanish Instruction for Beginners by Kurt Metze, Lecturer in Spanish at the Technical Institute, Königsberg. **4.0**, "The Art of the Fugue" (Bach), arranged for Strings, Wood and Brass Instruments, Organ and Cembalo, by Wolfgang Gräser; the Station Orchestra, directed by Hermann Scherchen. **6.30**, Talk. **9.15**, General News Bulletin and Sports Notes. **9.30** (approx.), Dance Music by the Danzig Station Orchestra, conducted by Alois Salzberg. **11.30** (approx.), Close Down.

**LAHTI** (**1,522.8 metres**); 35 kW.—Programme also for **Helsingfors** (375 metres).—**8.0 a.m.** (approx.), Relay of Morning Service. **9.50 a.m.**, Press News. **10.0 a.m.**, Exchange Quotations. **10.5 a.m.**, Musical Programme. **10.50 a.m.**, Weather Report and Time Signal. **11.0 a.m.**, Relay of Church Service in Swedish **3.0**, Concert by the Station Orchestra, conducted by Erkki Linko. **4.0**, Talk. **4.25**, Concert by the Station Orchestra. **4.57**, Time Signal and Weather Report. **5.10**, History Talk. **5.40**, Talk. **6.0**, Concert. **7.45**, Late News Bulletin given in Finnish and Swedish. **9.0** (approx.), Close Down.

**LANGENBERG** (**468.8 metres**); 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**7.15 a.m.**, Musical Programme. **7.35 a.m. to 7.55 a.m.**, Esperanto Talk. **8.0 a.m.**, Vocal and Instrumental Concert with Address. **10.0 a.m.**, Talk: The German Language. **10.35 a.m.**, Two Talks on Agriculture and Music. **12.0 Noon**, Concert of Orchestral Music, followed by Talks. **3.0**, Dr. Franz Dülberg, Talk: A Picture of German Intellectual Life in the Sentimental Period. **3.30**, Instrumental Concert. **7.0**, Programme from **Cologne**, followed by Late News Bulletin, Sports Notes and Programme of Light Music. **11.0** (approx.), Close Down.

**LEIPZIG** (**365.8 metres**); 4 kW.—Programme relayed by **Dresden** (275.2 metres).—**7.30 a.m.**, Relay of Organ Recital. **8.0 a.m.**, Concert of Choral and Instrumental Items. **12.0 Noon**, Two Talks on Agricultural Subjects, followed by Notes from the Foreign Press. **5.30**, Talk. **6.0**, Talk. **6.30**, Programme relayed from the New Theatre in Leipzig, "Madame Butterfly," Opera in Three Acts by Puccini. **9.0**, Sports News. **9.30**, Dance Music relayed from **Berlin.** **11.30** (approx.), Close Down.

**LYONS** (Radio Lyon) (**291 metres**); 1.5 kW.—**7.45**, The Radio Lyon "Journal Parlé," General News Bulletin and News from the Press. **8.0**, Concert: Pianoforte Solos by Madame Ducharne; Violin Solos by M. Camand and Cello Solos by M. Testanière. **9.0** (approx.), Close Down.

**MADRID** (Union Radio), Call EAJ7 (**375 metres**); 3 kW.—Programme relayed by **Salamanca.** EAJ22 (405 metres).—**11.30 a.m.**, Relay of Concert (weather permitting) by the Municipal Band from "El Retiro," conducted by Señor Villa. **2.0**, Relay of Chimes and

# Sunday, October 21st.

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## Programmes from Abroad.—

Time Signal. **2.5,** Light Musical Selections by the Madrid Wireless Orchestra, Interlude by Luis Medina. **3.30 to 7.0,** No Transmission. **7.0,** Selections by the Station Sextet. **8.30 to 10.0,** No Transmission. **10.0,** Chimes and Time Signal. **10.5,** Orchestral Concert. **12.0 Midnight,** Programme of Dance Music, relayed from the "Palermo en Rosales." **12.30 a.m** (approx.), (Monday), Close Down.

**MILAN,** 1MI **(549 metres);** 7 kW.—**9.30 a.m. to 10 a.m.,** Vocal and Instrumental Concert of Sacred Music. **11.30 a.m.,** Time Signal and Programme by the Station Quartet. **12.30 to 3.0.** No Transmission. **3.0,** Opening Signal. **3.5,** Music by the Station Quintet and Vocal Solos: Sonata in G Minor (Schumann); Pianoforte Solo by Carlo Vidusso. Followed by Agricultural Talk. **5.0 to 7.25,** No Transmission. **7.25,** Opening Signal and General News Bulletin. **7.35,** Time Signal and Talk. **7.45,** Sports News. **7.50,** Relay of an Opera, with Late News Bulletin and Sports News at the end of the Second Act. **10.45** (approx.), Close Down.

**MOTALA (1,380 metres);** 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres), and **Sundsvall** (545.6 metres).—**10.0 a.m.** Divine Service, relayed from a Church in **Stockholm. 11.35 a.m.,** Weather Forecast. **11.45 a.m.,** Exchange Quotations. **11.55 a.m.,** Time Signal. **4.0** (approx.), Children's Corner. **4.55,** Chimes relayed from the Town Hall, **Stockholm. 5.0,** Evening Service, relayed from **Stockholm. 7.15,** Concert of Bass Songs and Orchestral Selections. **8.15,** General News Bulletin. **8.30.** Weather Report. **8.40,** Concert. **10.0** (approx.), Close Down.

**MUNICH (535.7 metres);** 4 kW.—Programme relayed by **Augsberg** (566 metres), **Kaiserslautern** (277.8 metres), and **Nuremberg** (241.9 metres).—**10.0 a.m.,** Chimes relayed from the Munich Town Hall. **12 Noon** Time Signal, Weather Forecast and Programme Announcements. **2.0,** Musical Selections. **5.45** (approx.), Concert. **7.0,** "Countess Maritza," operetta by Kálmán. **9.5,** General News Bulletin. **9.30,** Outside relay of a Concert. **10.45** (approx.), Close Down.

**NAPLES,** Call 1NA **(333.3 metres);** 1.5 kW.—**9.0 a.m.,** Programme of Sacred Music. **3.45,** Children's Corner. **4.0,** Variety Concert, with Soprano Solos by Signor Carla Spinelli. **4.30,** Time Signal. **7.20,** Topical Notes. **7.40,** Time Signal. **7.48,** Communications from the Harbour Authorities of Naples. **7.50,** Concert of Orchestral and Vocal Items: "Ma chi vien" from "La Gioconda," by Ponchielli, Duet for Mezzo-Soprano and Tenor, sung by Signora A. Testa and Signor R. Rotondo, accompanied by the Station Orchestra. **9.0,** Sports Notes. **9.55,** Calendar and Announcements on Forthcoming Programmes. **10.0** (approx.), Close Down.

**OSLO (461.5 metres);** 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—**6.15,** Weather Report and Press News, followed by Music or Talk. **8.30,** Weather Report and Press News. **8.45,** Topical Talk. **9.0,** Programme of Dance Music by the Hotel Bristol Orchestra. **10.45** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT **(458 metres);** 0.5 kW.—Programme relayed at Intervals by the following Stations: **Bordeaux,** PTT (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres) **Lille,** PTT (264 metres), **Limoges** (285 metres), **Lyons** PTT (480 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse,** PTT (260 metres).—**8.0 a.m.,** General News Bulletin and Time Signal. **10.25 a.m.,** International Time Signal and Weather Forecast. **12.0 Noon,** Concert. **1.0,** Economic Report. **1.30,** Orchestral Concert, arranged by the General Association of French Wireless Listeners: Danses alsaciennes, by Lévadé. **2.30,** Concert of Symphony Music, organised by "Le Journal." **4.0,** Relay of the Pasdeloup Symphony Concert at the Théâtre des Champs Elysées. **6.30,** "Le Radio Journal de France." **8.0,** Talk, under the Auspices of the General Union of French Associations. **8.30,** Concert of Instrumental and Vocal Items, followed by Late News Bulletin, Time Signal and Weather Report. **10.30** (approx.), Dance Music, relayed from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL **(2,650 metres);** 5 kW.—**7.56 a.m.,** Time Signal on 32.5 metres. **9.26 a.m.,** Time Signal on 2,650 metres. **5.45,** "Le Journal Parlé," par T. S. F., including the following Talks: Dr. Pierre Vachet: Portez-vous bien; M. René Casalis: Events in the World of Sport; Detective Ashelbé: Police Anecdotes. **7.10 to 7.20,** Weather Report. **7.30 to 9.0,** Orchestral Programme, under the direction of Mario Cazes. **7.56,** Time Signal on 32.5 metres. **10.26,** Time Signal on 2,650 metres. **11.15** (approx.), Close Down.

**PARIS** (Petit Parisien) **(340.9 metres);** 0.5 kW.—**8.45,** Gramophone Selections. **8.50,** Talk. **8.55,** Press News. **9.0,** Concert of Orchestral Music. **9.25,** General News Bulletin. **9.30,** The Symphony Half-Hour: Concerto in E for Violin and Orchestra (Mendelssohn); M. Bellanger (Violin) and the Station Orchestra. **10.0,** Late News Bulletin. **10.15,** Concert of Instrumental Music. **11.0** (approx.), Close Down.

**PARIS** (Radio LL) **(370 and 60 metres);** 1 kW.—**12.30,** Programme organised by "Radio-Liberté," with General News Bulletin and Topical Talk, followed by Concert. **1.0,** Carillon de Fontenay. **3.0,** Selections of Light Music.

**PARIS** (Radio-Paris), Call CFR **(1,750 metres);** 6 kW.—**3.0 a.m.,** General News Bulletin and News from the Press. **12.0 Noon,** Address and Recital of Religious Music, arranged by "La Vie Catholique." **12.30,** News Bulletin. **12.45,** Musical Selections by the Albert Locatelli Orchestra. **4.30,** Gramophone Music, arranged by the "L'Industrie Musicale"; Press News in the Interval. **8.0,** Notes for Farmers and News from the Press. **8.15,** The Radio Paris Circus. **8.45,** Orchestral Concert of Symphony Compositions; in the Intervals: Notes from the Evening Press and General News Bulletin.

**PITTSBURGH,** Call KDKA **(63 and 27 metres);** 25 kW.—**4.0,** Church Service. **7.0,** Roxy's Stroll Programme. **9.45,** Relay of Evening Service, from the Shadyside Presbyterian Church; Sermon by the Pastor, the Rev. Hugh Thomson Kerr. **11.0,** Time Signal, followed by Musical Programme. **11.30,** Relay of Concert from WJZ: The Whittall Anglo-Persians. **1.0 a.m.** (Monday), Programme relayed from WJZ, **New York. 1.15 a.m.,** Collier's Radio Hour. **2.15 a.m.,** Musical Programme. **3.15 a.m.,** Time Signal. **3.30 a.m.** (approx.), Close Down.

**POSEN (344.8 metres);** 1.5 kW.—**9.15 a.m. to 10.45 a.m.,** Relay of Cathedral Service. **11.0 a.m.,** Time Signal. **11.5 a.m.,** Two Agricultural Talks. **11.55 a.m.,** Talk by Mr. Winiewicz. **2.15,** Symphony Concert, relayed from **Warsaw. 4.20,** Children's Corner. **6.20 to 7.10,** Two Talks, relayed from **Warsaw. 7.30,** Concert by the Polish Railways' Musical Society, under the direction of Mr. Antoine Zdun: Soprano, Baritone and Violin Solos. **9.0,** Time Signal, Weather Report and Sports News. **9.10,** Variety Programme. **9.30,** Dance Music. **11.0** (approx.), Close Down.

**PRAGUE (348.9 metres);** 5 kW.—**8.0 a.m.,** Morning Recital of Music. **9.0 a.m.,** Talk for Farmers. **10.0 a.m.,** Orchestral Concert. **11.0,** Popular Musical Selections. **12.5,** Economic Report. **12.20,** Topical Notes. **5.0,** German Transmission. **6.15** (approx.), Concert. **9.0,** Time Signal and General News Bulletin, followed by Light Music.

**RIGA (526.3 metres);** 4 kW.—**9.15 a.m.,** Morning Service, relayed from the Mara Church. **12.0 Noon,** Children's Programme of Songs and Stories. **3.0,** Orchestral Concert, conducted by Arved Parups. **4.0 to 6.0,** Four Talks. **6.0,** Orchestral Concert, with Soloists. **8.0,** Weather Report and Late News Bulletin. **8.30,** Programme relayed from the Café de l'Opéra. **10.0** (approx.), Close Down.

**ROME,** Call 1RO **(447.8 metres);** 3 kW.—**9.0 a.m.,** Opening Signal. **9.5 a.m.,** Concert of Vocal and Instrumental Selections. **9.45 a.m. to 12.0 Noon,** No Transmission. **12.0 Noon,** Opening Signal. **12.5 to 1.0,** Trio Music. **1.0 to 4.0,** No Transmission. **4.0,** Opening Signal. **4.5,** Dance Music, relayed from the Casinetta. **5.0 to 6.40,** No Transmission. **6.40,** Opening Signal. **6.45,** News Bulletin. **7.0,** Talk for Farmers, followed by Sports Notes and General News Bulletin. **7.45,** Concert of "Autumn" Music with Vocal and Instrumental Solos and Symphony Compositions, including L'Autonme, from "Chanson grises," by Reynaldo Hahn, sung by Maria Elena Cattani (Soprano). **9.50,** Late News Bulletin. **10.15** (approx.), Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF **(21.96 and 31.4 metres);** 30 kW.—**3.30,** Relay of Service from the First Presbyterian Church at **Albany** N.Y. Sermon by the Pastor, the Rev. W. H. Hopkins. **6.30 to 7.0,** Programme of the United Radio Corporation, relayed from **New York. 10.30,** Acousticon Programme from **New York. 11.0,** Concert by the American Legion Band, relayed from **Boston, Mass. 12.0 Midnight,** Lehigh Half-hour relayed from **New York. 12.30 a.m.** (Monday), Relay from the Capitol Theatre, **New York. 2.0 a.m.,** Talk by the Editor of the United States Daily, relayed from **Washington, D.C. 2.15 a.m.,** Atwater Kent Hour, relayed from **New York. 3.15 a.m.,** Experimental Transmission of Television Signals. **3.30 a.m.,** (approx.), Close Down.

**SEVILLE** (Union Radio), Call EAJ5 **(434.8 metres);** 1 kW.—**2.0 to 3.0,** Concert by the Station Orchestra from the Works of Spanish Composers. **9.30,** Orchestral Concert with Vocal and Instrumental Solos, followed by Flamenco Songs and Dance Music by the Station Orchestra. **11.30** (approx.), Close Down.

**STAMBOUL (1,200 metres);** 5 kW.—**3.30,** Orchestral Concert. **4.30,** Stock Market Report. **5.15,** Concert from the Works of Turkish Composers. **7.30,** Weather Report and Time Signal. **7.40,** Orchestral Concert. **9.0,** Late News Bulletin. **9.30** (approx.), Close Down.

**STUTTGART (379.7 metres);** 4 kW.—Programme relayed by **Freiburg** (577 metres).—**10.10 a.m.** (approx.), Recital of Orchestral Music and Address. **11.0 a.m.** (approx.), Concert, followed by Gramophone Selections. **1.0,** Children's Programme. **7.30** (approx.), Concert and Popular Programme, followed by General News Bulletin and Sports Notes.

**TOULOUSE** (Radiophonie du Midi), **(391 metres);** 3 kW.—**12.30,** Weather Forecast and Market Prices for Toulouse. **12.45,** Vocal and Instrumental Concert. **1.0,** Carillon. **1.45,** News from the Press. **8.0,** Stock Exchange Quotations from Paris, and News from the Fournier Agency. **8.15** News from "La Dépêche" and "Le Petit Parisien." **8.30,** Orchestral Concert: Selections from "L'Arlesienne" (Bizet). **9.0,** Carillon. **9.5,** Instrumental Concert. **10.15,** The North African "Journal sans papier" and late News Bulletin. **10.30** (approx.), Close Down.

**VIENNA (577 and 517.2 metres);** 1.5 and 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres), and **Linz** (254.2 metres).—**9.30 a.m.,** Recital of Organ Music. **10.0 a.m.,** Symphony Concert by the Vienna Orchestra. **3.0,** Programme of Vocal and Instrumental Music. **5.10,** Travel Talk. **6.0,** Concert with Vocal and Instrumental Solos. **7.5,** "Die Liebesinsel," Operetta in Three Acts by Richard Wilde and M. Schurz: Music by Charles Weinbergen, followed by Light Music. **10.0** (approx.), Close Down.

**VILNA (435 metres);** 1.5 kW.—**9.15 a.m.,** Relay of Cathedral Service from **Posen. 11.0 a.m. to 11.10 a.m.,** Time Signal and General News Bulletin relayed from **Warsaw. 6.25,** Talk. **6.45,** Talk. **7.10,** General News Bulletin. **7.30,** Concert relayed from **Warsaw.** Selection from "Pique Dame" (Tchaikovsky). **9.0,** Time Signal, Aviation Route Report, Weather Report and General News Bulletin, followed by Sports and Police News, relayed from **Warsaw. 9.30,** Dance Music from the "Oaza" Restaurant, **Warsaw. 10.30** (approx.), Close Down.

**WARSAW (1,111 metres);** 10 kW.—**9.15 a.m. to 10 a.m.,** Morning Service relayed from a Cathedral. **11.0 a.m.,** Time Signal and Fanfare, relayed from the Tower of Notre Dame in **Cracow,** followed by Aviation Route Report, and Weather Forecast. **11.10 a.m.,** Symphony Concert relayed from the Philharmonie de Varsovie. **1.0,** Three Talks for Farmers. **2.0,** Weather Report. **2.15,** Concert by the Philharmonie de Varsovie Orchestra: Fifth Symphony in C Minor (Beetboven). **4.20** Talk. **4.45,** Aviation Talk. **5.0,** Popular Programme. **6.0,** Notes by the Society of Polish Horse-Breeders. **6.20,** Talk. **6.45,** Talk. **7.10,** General News Bulletin. **7.30,** Vocal and Orchestral Concert. **9.0,** Time Signal, Aviation Route Report, and Weather Forecast. **9.5,** General News Bulletin. **9.20,** Police Notes and Sports News. **9.30,** Dance Music by the Orchestra at the "Oaza" Restaurant. **10.30** (approx.), Close Down.

**ZAGREB (309.2 metres);** 0.7 kW.—**10.30 a.m.,** Concert of Orchestral Music. **4.0,** Relay of Dance Music from the "Club-Bar." **6.45,** Radio Talk. **7.0,** Relay of Opera from the Zagreb National Theatre, with Late News Bulletin and Weather Report in the Interval.

**ZURICH (588 metres);** 1 kW.—**10.0 a.m.,** Concert of Orchestral Selections. **11.0 a.m.,** Weather Report. **11.30 a.m.,** Concert by the Zurich Wireless Orchestra. **3.0,** Relay of Programme by the Castellano Orchestra from the Carlton Elite Hotel. **6.30.** Time Signal, and Weather Report. **6.35,** Religious Address. **7.0,** Concert devoted to works of Schubert: "Schubertiade," by Joseph August Lux; Reading by Josef Gyr and Music by the Zurich Wireless Orchestra. **9.0,** Late News Bulletin. **9.30** (approx.), Close Down.

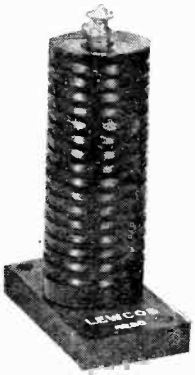

## A Review of Manufacturers' Recent Products.

### LEWCOS H.F. CHOKE.

The new Lewcos H.F. choke was introduced at the Show where it attracted considerable attention on account of its massive design and the unusually large amount of wire used in its construction. Since then we have had an opportunity of measuring the impedance at various wavelengths, and the results are given in the accompanying curve. The impedance values on the medium and long B.B.C. wavelengths are as follow :—

| Wavelength (metres). | Impedance (ohms). |
|---|---|
| 200 | 12,500 |
| 300 | 21,800 |
| 500 | 45,500 |
| 1,600 | 214,000 |

These figures clearly indicate the superiority of the Lewcos choke even in the 200-500-metre band; yet the self resonance is well above 3,500 metres and in circuit would probably approach 5,000 metres. A high resonance wavelength is generally achieved at the expense of the performance on short waves, but by careful adjustment of the ratios of inductance capacity and H.F. resistance the designer has succeeded in effecting an all-round increase of impedance which definitely establishes the Lewcos choke in the front rank of its class.




The new Lewcos H.F. choke.

The former is 3in. high and 1⅛in. in diameter and is mounted on a base 2½in. × 1¼in. These dimensions are above the average and care must be taken to avoid coupling with other coils in the receiver. Naturally, the cost of production of this choke is high and the price of 9s. is above the average, but in our opinion the small extra cost is justified by its high performance.

The makers are the London Electric Wire Co. and Smith's, Ltd., Church Road, Leyton, London, E.10.

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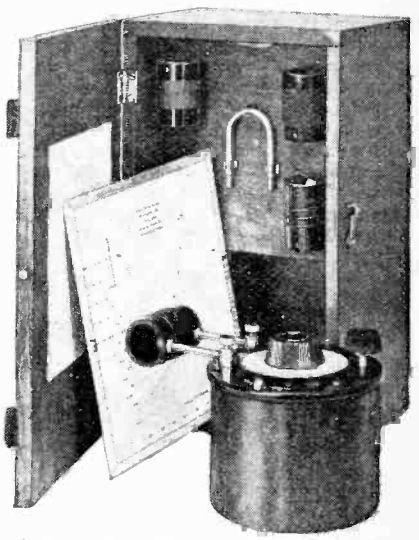
### AMATEUR-BAND WAVEMETER.

The new Post Office regulations for the maintenance of amateur short-wave transmitting stations[1] state that every station must be equipped with an accurate wavemeter of approved design. While we have no official intimation that the G.R.C. Type 558 wavemeter would satisfy

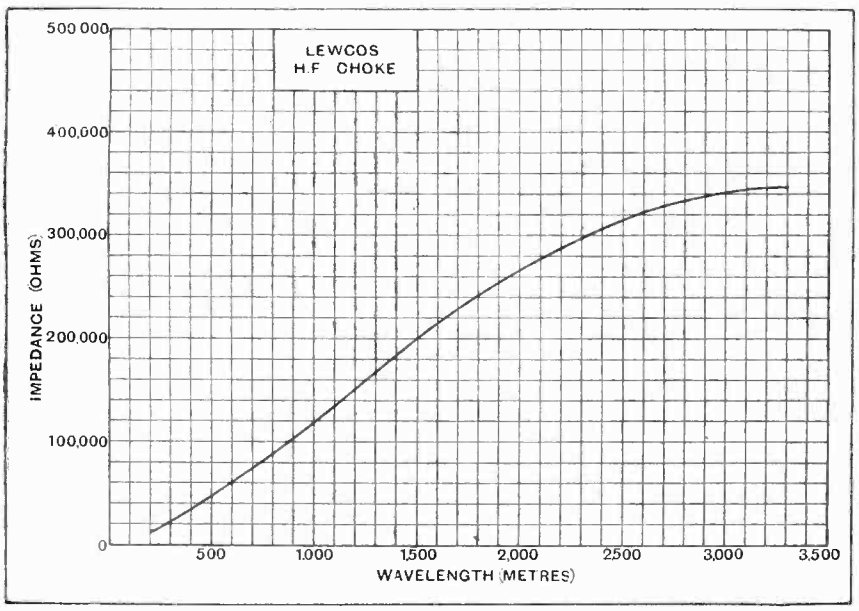


G.R.C. type 558 absorption wavemeter which covers the majority of the new amateur wavebands.

the requirements of the P.M.G., it seems probable that the guaranteed accuracy of 0.25 per cent. would meet with approval having regard to the fact that the width of the allocated wavebands are equivalent to variations of from 2 to 10 per cent.

The improved accuracy in the G.R.C. absorption wavemeter is brought about by making the variable capacity only a fraction of the total capacity across the

[1] See *The Wireless World*, September 12th, 1928, page 318.

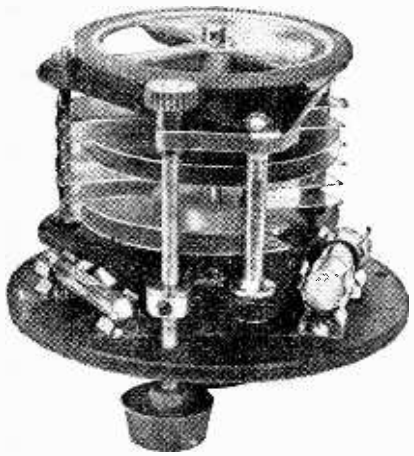



Impedance curve of the Lewcos H.F. choke; external capacity 8 micro-mfd.

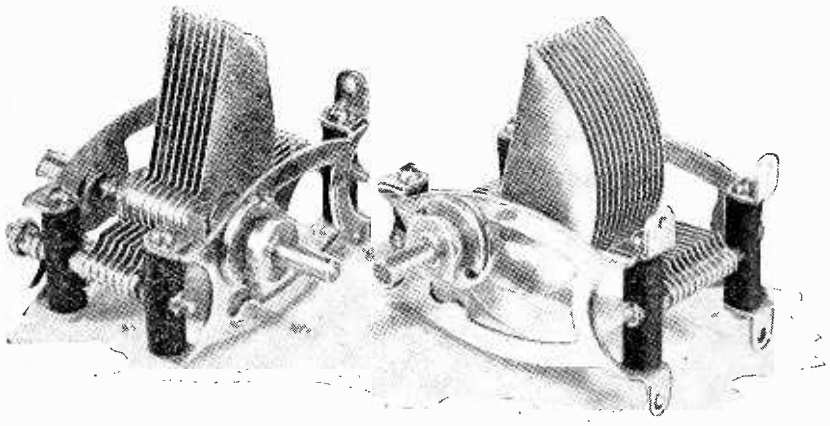
**New Apparatus.—**

inductance; by this means the wavelength change equivalent to one degree of the condenser dial is considerably reduced and the accuracy correspondingly increased. Of the four vanes mounted on the condenser spindle, two are circular and constitute the fixed capacity; the remaining two are shaped to give a straight-line variation of wavelength. The spacing of the vanes is unusually wide in the interests of stability calibration. A specially designed neon tube protected by a series resistance gives indication of resonance when the power of the transmitter is sufficiently high; in low-power transmitters the variation of anode current at resonance should be observed.

Coils are provided for the following wave bands :—(A) 4.7-5.6 metres; (B) 9.7-10.8 metres; (C) 18.5-21.5 metres; (D) 37-43 metres; (E) 74-86 metres. These ranges cover all the amateur bands with the exception of the 152.2-172.3 metre band allocated by the P.M.G.



The unit removed from its cover.



Lissen variable condensers.

## LISSEN VARIABLE CONDENSERS.

The principal point of interest in the new Lissen variable condensers is the method of supporting the moving vanes. The main bearing is machined out of a brass block of square section. Slots are milled each side of the bearing block to accommodate a steel wire spring which presses in a groove turned in the standard ¼in. diameter spindle. This spring not only locates the moving vanes laterally, but also provides the requisite degree of friction. The lower end of the spindle is supported in a plain bearing so that there is no pressure between the two end plates. Connection to the moving vanes is made through a braided copper pigtail.

The condensers are particularly suitable for connection together in gangs, as the ¼in. spindle protrudes from both ends; special connecting sleeves for joining the spindles together are being designed and will be available in the near future. The fixing bush requires a ½in. hole and can be mounted on panels of any thickness between ⅛in. and ⅜in.

Two specimens submitted for test had the following maximum and minimum capacities :—

| Nominal (mfd.). | Maximum (mfd.). | Minimum (micro-mfd.). |
|---|---|---|
| 0.0003 ... | 0.000296 ... | 12.5 |
| 0.0005 .. | 0.000513 ... | 20 |

The vanes are of the corrected square law type. The price of the 0.0003 mfd. model is 6s., and the 0.0005 mfd. 6s. 6d. Other models with maximum capacities of 0.0001, 0.0002 and 0.00035 are available.

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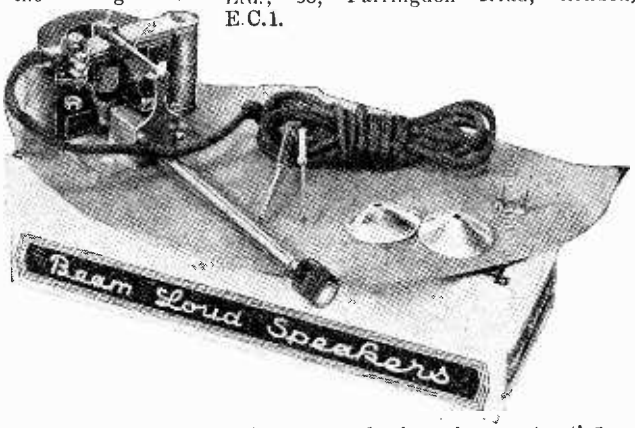
## "BEAM" CONE LOUD SPEAKER UNIT.

The body of this unit is a die casting which carries two permanent magnets and four laminated pole pieces and coils. The vibrating reed is disposed centrally between the pairs of pole pieces and is clamped rigidly at one end. The other extremity is damped by two rubber washers and is controlled by a cam movement which enables the air gap between the reed and the poles to be adjusted to suit conditions. The cam movement is provided with a 4in. extension rod and adjusting knob.

Each unit is supplied complete with cone washers and a template for marking out the diaphragm. The price is 21s. and supplies are available from Messrs. Beam, Ltd., 35, Farringdon Road, London, E.C.1.



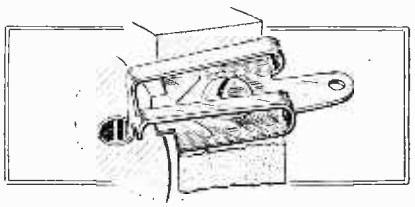

Beam unit and accessories for cone loud speaker construction.

## LOTUS MINIATURE VALVE HOLDER.

In addition to the standard "Buoyancy" anti-microphonic valve holders, a new type has been introduced for the coming season. This is a miniature addition of the older types, which are being continued, and measures 1⅝in. in diameter.

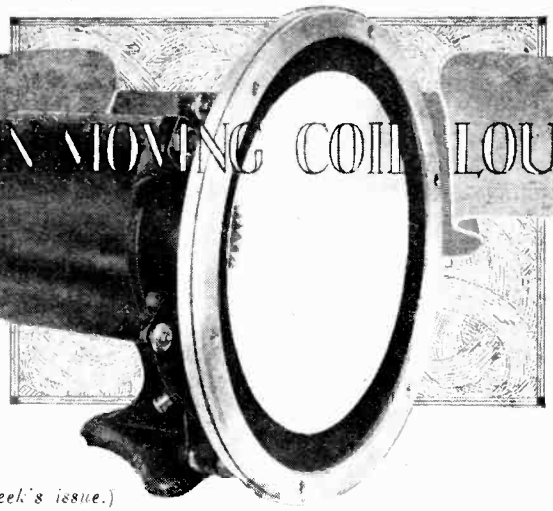
Lotus miniature anti-microphonic valve holder.

One-piece sockets and springs, pressed from sheet phosphor bronze, are a feature of the new holder, and the provision of guides and stops prevents all possibility of damage through rough usage. Both terminals and soldering tags are provided for connections, and the price is 1s. 3d. The makers are Messrs. Garnett, Whiteley and Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.



One-piece socket and spring in the Lotus valve holder.

# RESONANCE IN MOVING COIL LOUD SPEAKERS



## PART II.

## Quantitative Analysis of the Effect of the Surround.

By
N. W. McLACHLAN,
D.Sc., M.I.E.E.,
F.Inst.P.

(*Concluded from page 499 of last week's issue.*)

IN conducting the experiments on surround resonances at low frequencies, the amplitude of the diaphragm was considerable. I have shown previously in this journal that at low frequencies the amplitude varies *inversely as the square of the frequency*[1] when the acoustic output is constant. For example, if the amplitude at 200 cycles were 0.1 millimetre, at 40 cycles it would be $25 \times 0.1 = 2.5$ millimetres. The complete to and fro excursion would therefore be twice this, i.e., 5 mm., or about $\frac{1}{5}$in. Reproduction of an orchestra at this level would be extremely loud. In order to obtain a reasonable output current in the coil (about 40 mA) which can be accurately read on the meter at the higher frequencies, it was essential to apply a voltage of 40 volts or more to the power valves. This voltage being kept constant at all frequencies, caused a relatively large amplitude at low frequencies. At resonance the amplitude was, of course, a maximum. The extreme positions of the coil were clearly visible and were about $\frac{1}{8}$in. to $\frac{1}{4}$in. apart.

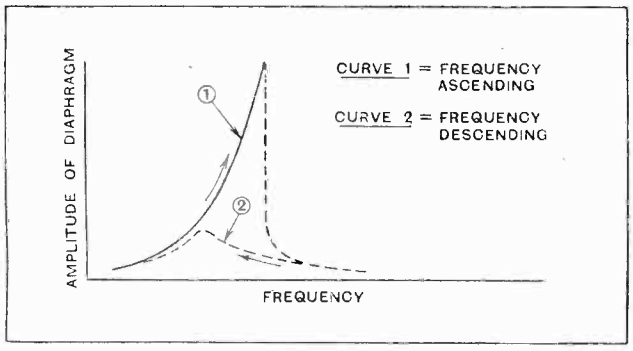



**Fig. 8.—Diagram showing peculiar resonance effect with rubberised silk surround. This was due in part to the frame in which the silk was held.**

Owing to this enormous excursion, there was at times a good deal of chattering of the coil on the pot, due to wobble. Even below the resonance frequency the chattering continued, due to the large amplitude, e.g., at 25 cycles. The current curves exhibiting the sudden increase in coil impedance at the mechanical resonance frequency of the surround had to be secured with the coil in the pot. However, when the surround resonance frequency alone is required—apart from the current—by far the better plan is to withdraw the coil from the pot. Although the magnetic field is then much weaker, the acoustic output with 40 mA in a 1,000-turn coil is alarmingly apparent, and there is little difficulty in detecting the resonance point by ear. Even with a comparatively weak field the amplitude is considerable.

Some interesting results bearing on the non-elastic, the asymmetric, and the wobble characteristics of the system were revealed. Starting at, say, 25 cycles, the frequency was gradually raised. Near the resonance point the sound grew louder and louder, finally becoming intense, and then suddenly ceasing. On reducing the frequency the resonance was not so pronounced and

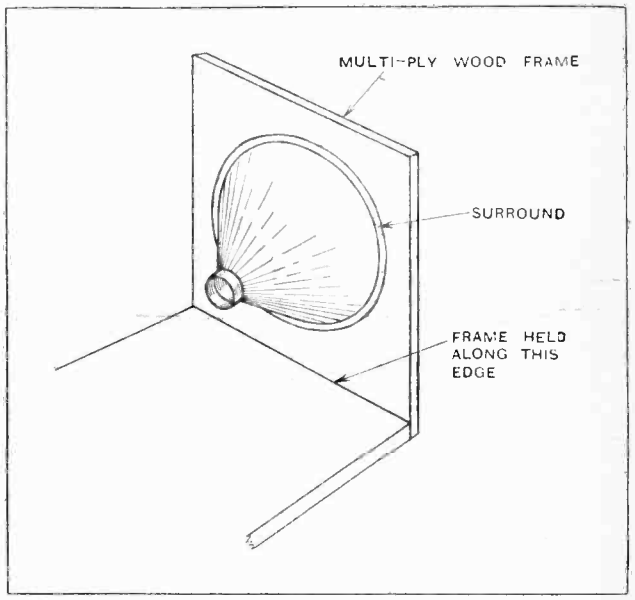



**Fig. 9.—Diagram showing method of holding frame during surround experiments.**

[1] Assuming the diaphragm to move as a whole.

**Resonance in Moving Coil Loud Speakers.—**

occurred at a lower value. These points are illustrated diagrammatically in Fig. 8.

With the leather surround used in conjunction with the small diaphragm there was equality of conditions in both frequency directions, i.e., whether ascending or descending. This diaphragm was mounted in a very rigid framework. The larger diaphragm was mounted in a wooden frame, and this frame was secured along its bottom edge only (see Fig. 9). By reducing the frequency to 10 cycles per second, the whole system i.e., frame surround and diaphragm, resonated substantially as a single mass, the amplitude being considerable.

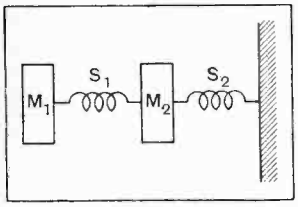



**Fig. 10.—The compound system of Fig. 9 is here shown. $M_1$ is the mass of the diaphragm; $S_1$ the surround (spring); $M_2$ mass of frame; $S_2$ spring effect of frame.**

With the rubberised silk surround different results could be secured by straining the frame, thereby altering the constraint due to the surround. For example, as stated above, on reducing the frequency the resonance was less pronounced. But by twisting the frame, the resonance could be established with its former violence. When the phenomenon was near its zenith, it could be extinguished by inserting one's head in the cone. The explanation is simply that the presence of the head caused an increase in air pressure since the usual free expansion and contraction was prevented, i.e., a back pressure was created which upset the conditions for oscillation. Moreover, in these experiments we were dealing with a compound system.

**Hooke's Law Violated.**

This system has two mechanically coupled components, namely, (1) the frame constrained along one edge, (2) the diaphragm constrained by its surround. This is illustrated in Fig. 10. A further complication was added, since the amplitude of the diaphragm affected the degree of constraint imposed by the surround, until finally instability was reached when the vibration suddenly subsided. Put in another way, Hooke's law of linearity was violated, i.e., the restoring force due to the surround was not proportional to the amplitude. The degree of violation depended upon the amplitude of the motion, the position of the diaphragm relative to the frame, and the position of the frame relative to its support. With rubberised silk elasticity was conspicuous by its absence, and there was no dynamic position of equilibrium. The motion even with rubber was characterised by appreciable wobble due to asymmetry of the surround constraining forces, i.e., inequality round the periphery. When the restraining force of the surround is not directly proportional to the deflection or axial movement (straight line law deviation) the effect of a sine wave input is complex. The fundamental note is accompanied by a series of overtones whose frequencies depend upon the action of the surround. Thus large amplitudes will be accompanied by wave form distortion.

A point of unusual interest arises in performing experiments at these very low frequencies, namely, the musical value of the sounds. The amplitude of motion with rubberised silk was certainly curbed, i.e., with a truly elastic material it would have been greater. At, say, 25 cycles the diaphragm was arrested at the extremity of each excursion, i.e., each half-cycle, with a jerk, and this may have been in part responsible for the sensation of a dull thud. With rubber this was hardly the case, but there did appear to the ear to be a rapid succession of thuds. This may have been due to the comparatively low frequency. One was conscious of considerable energy being let loose; in fact, prolonged audition was rather disconcerting, particularly in the neighbourhood of the source. To alleviate the acoustic situation the baffle was removed. By virtue of the interference between the front and rear of the diaphragm the sound at low frequencies is focused, as shown in Fig. 11, just as it is at higher frequencies with the baffle in position. By keeping well to the side one's aural organs suffered less discomfort, although there was still room reflection with which to contend.

**Peculiar Sensation at 25 Cycles.**

To really appreciate any musical sensation at 25 cycles the required energy in my particular case is rather more than I can stand with comfort. Of course, I am now speaking of pure tones which are known to be peculiarly trying and deceptive. Doubtless the situation would be vastly improved by adding a few har-

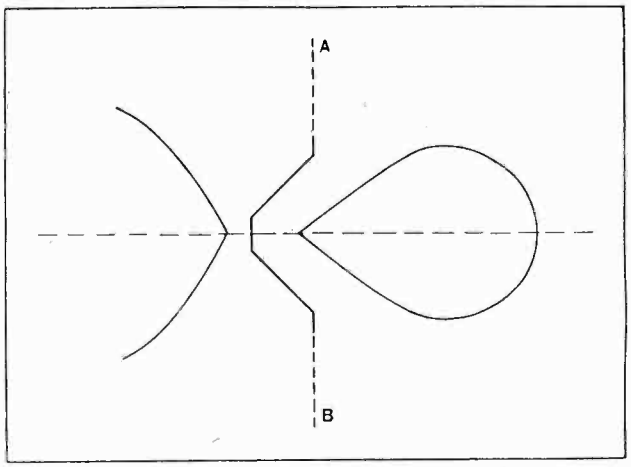



**Fig. 11.—Diagram (not from measurement) illustrating focusing effect of conical diaphragm at low frequencies, due to the absence of a baffle. If the diaphragm were a flat disc, there would be no sound on the line AB. The effect is due to the interference of positive and negative waves from the two sides of the diaphragm.**

monics, thereby allowing the 25 cycles to supply the high tension, so to speak. Fifty cycles is a more comfortable frequency, but even here the requisite energy to arouse a musical sense is by no means small.

At the higher frequencies one becomes bewildered with the standing waves. They have their advantages nevertheless, for one finds a palliative in picking out a node. It is this interference effect which makes it almost impossible to discriminate resonances aurally in a large room, unless it is very highly damped.

**Resonance in Moving Coil Loud Speakers.—**

At low frequencies there was a distinctly curious sensation obtained by bringing one's head, face, or hands near the diaphragm. One's hair seemed to be electrified—a new form of massage by action at a distance—and one's hand seemed to feel a draught, due to forced vibrations caused by variation in air pressure.

With a rubberised silk surround the jerks concomitant with a lack of elasticity probably excite the diaphragm in such a manner that it breaks up into " modes " more readily than would be the case when using a pure rubber surround. In the vicinity of 200 cycles there was a peculiar sizzling noise as if something were buzzing. By reference to a previous article dealing with the diaphragm in question, it will be seen that there was a " mode " of vibration at 200 cycles. This was characterised by the appearance of nodal meridians, or radii, familiar in chime bells. There may have been overtones, due to the impulsing effect of the jerk.

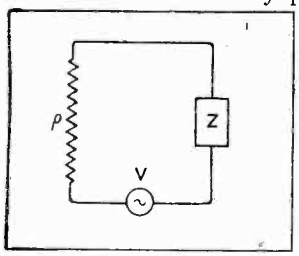



**Fig. 12.—The equivalent circuit of a power valve. ρ is the internal valve resistance; Z, the impedance of the loud speaker; while V is the voltage of the fictitious alternator.**

**Mechanical Resonance and the Electrical System.**

I think the " V " in the current curve of Fig. 1 (in last week's issue) must intrigue the reader—it ought to considering the trouble taken in the experiments. It seems fitting, therefore, that this article should conclude with a short description of the relationship between the mechanical resonance and its effect on the electrical system.

The problem can be simplified by taking it in a series of simple steps—one may be a water jump! It is clear that the acoustic output represents energy radiated. This acoustic energy has to be obtained from somewhere. It is clearly derived from the electrical input to the coil. Thus when the acoustic output suddenly increases, the equivalent amount of energy must be extracted from the electrical circuit. There is a distinct and inevitable coupling between the electrical circuit and the mechanical moving parts, so that energy is transferred directly from one to the other. The energy radiated as sound can be expressed as $i^2R_m$, where i is the coil current and $R_m$ a resistance in series with the coil known as the motional or radiation resistance.

Fig. 12 illustrates the equivalent circuit of the power valve replete with loud speaker, etc. Here we have $\rho$ the internal valve resistance, Z an impedance representing the loud speaker, and V our customary fictitious alternating current generator. We specify that the voltage of the generator shall be constant at all frequencies. Now if Z were invariable with change in frequency, the current supplied by V would be constant. At the surround resonance we know that the current decreases to a fraction of its normal value. Since $\rho$ is unaltered, clearly Z must have increased considerably. Suppose then we were asked to substitute for Z a simple circuit which would suddenly increase in impedance at a certain frequency, what would we do? Think about it first, of course! Why do we use a tuned anode circuit? Because the impedance of the coil and condenser at the tune point is very high. Here, then, is the key to our problem. The simple device to simulate Z might be a coil and condenser as shown in Fig. 13. If the inductance and capacity were large enough the resonance frequency could be made as low as we please.

The reader will say, this is all very well, but how do you relate inductance and capacity with a moving coil? The coil obviously has an inductance, but it is only a fraction of a henry, and the condenser required to resonate at 25 cycles would be unduly large.

The condenser effect I have explained on a previous occasion.[2] It is purely fictitious, of course, but the coil moving in the magnetic field has an E.M.F. induced in it, which causes a current of the same phase and magnitude as a condenser. This is shown in Fig. 13, where the surround has a resonance indicated by the $L_mC_m$ combination.

**Some Numerical Examples.**

If we have a mass on the end of a spring it will oscillate up and down when set in motion. The frequency will depend upon the stiffness of the spring and the magnitude of the mass. The less the stiffness and the greater the mass, the lower will be the frequency of vibration. In our case the surround is the spring and the diaphragm is the mass. Now we can readily see the electrical analogue, since the condenser which stores the charge is equivalent to the spring, whilst the mass which reduces the frequency is equivalent to the inductance.

Moreover, if we know the value of the condenser effect in the loud speaker, the inductance is that which yields the mechanical frequency of the surround.

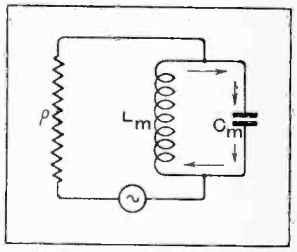



**Fig. 13.—By including inductance and capacity the simple equivalent power valve circuit at the resonance frequency of the surround.**

Looking once more at Fig. 13, although the impedance of the $L_mC_m$ circuit is large and reduces the alternator current, the current circulating round the condenser and inductance combination is large, which corresponds to a large movement of the diaphragm.

Some numerical values may make the matter more tangible. The value of the fictitious capacity is approximately 1 mfd., and the resonance frequency with a rubber surround is 25 cycles per second. Using the well-known formula $\omega^2L_mC_m = 1$, or $4\pi^2f^2L_mC_m = 1$, we get by transformation

$$L_m = \frac{1}{4\pi^2f^2C_m} = \frac{1}{40f^2C_m}$$

Inserting the preceding values of $f$ and $C_m$, we find that $L_m = 40$ henrys. Moreover, our " wave-trap " circuit consists of $C_m = 1$ mfd. and $L_m = 40$ henrys.

[2] *The Wireless World*, March 31st, 1927.

**Resonance in Moving Coil Loud Speakers.—**

To complete the argument it is essential to introduce the mechanical side of the problem. The reader may not be quite so familiar with the calculation of mechanical frequencies as he is with the electrical variety. Moreover, the following may require a little extra concentration.

The total equivalent mass of the diaphragm under consideration is about 20 grams. The constant $C^2$ which has been introduced before,[2] is a value not required now. By mathematical analysis we arrive at the following formulæ:—

$C_m = \frac{m}{C^2}$ where $m$ = mass of diaphragm in grams,

$L_m = \frac{C^2}{k}$ where $k$ = force in dynes to deflect diaphragm surround axially 1 cm. = coefficient of restitution (see Fig. 14).

**Equivalent Circuits.**

Electrically we have at resonance $\omega^2 L_m C_m = 1$. Inserting the above values of $L_m$ and $C_m$ we get $\omega^2 m/k = 1$, or $\frac{4\pi^2 f^2 m}{k} = 1$.

We know $f$ and $m$, so that $k$ can be calculated. Its value is $4\pi^2 f^2 m = 40 f^2 m = 40 \times 625 \times 20 = 5 \times 10^5$ dynes per centimetre. That is to say a steady force of $5 \times 10^5$ dynes would be required to cause the diaphragm to move axially through a distance of 1 centimetre against the constraint of the surround. Here we have assumed that the surround is perfectly elastic and will stretch 1 cm. In general this large stretch does not occur, but it is usual in dynamical problems to express "$k$" (the coefficient of restitution or stiffness) as so many dynes per cm. Clearly a deflection of 1 millimetre would require a force of $\frac{1}{10}$th the above amount, *i.e.*, $5 \times 10^4$ dynes = 0.12 lb. A lower value would be accompanied by a lower mechanical resonance frequency. Incidentally, from the preceding we can write the frequency $f = \frac{1}{2\pi}\left[\frac{k}{m}\right]^{\frac{1}{2}} = \frac{1}{2\pi}\left[\frac{\text{stiffness}}{\text{mass}}\right]^{\frac{1}{2}}$, which is a well-known dynamical formula.

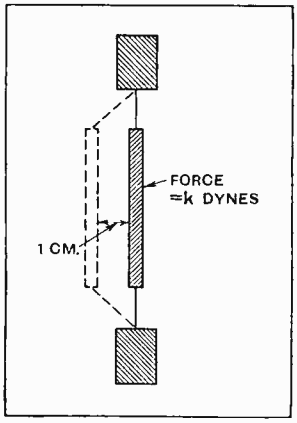



Fig. 14.—Illustration showing the coefficient of restitutional or stiffness (k).

These formulæ can obviously be applied to the reed-drive loud speaker. In this case the frequency is that of the reed which is usually above 1,000 cycles. This entails a much greater stiffness, *i.e.*, $k$ is enhanced. However, there is no necessity at the moment to pursue this problem, but it is of interest to point out this likeness between the coil and reed-drive despite the widely different resonance frequencies.

**Elasticity of the Surround.**

For completeness I have appended the orthodox equivalent diagrams (Fig. 15) of the power valve circuit, in which the elasticity of the surround has been incorporated. The simple $L_mC_m$ circuit only holds good, of course, when the elastic member obeys Hooke's law.

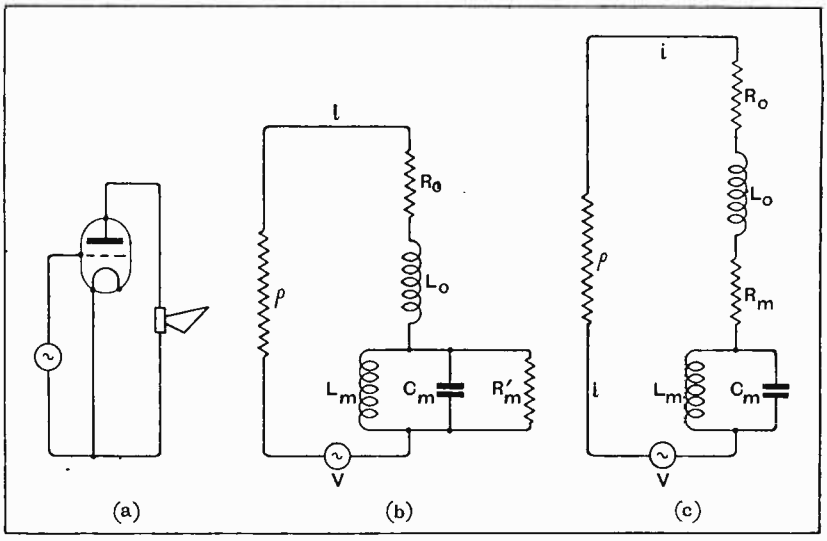



Fig. 15.—Diagrams illustrating the equivalent circuit of a loud speaker and power valve. The loud speaker has a member which exhibits the phenomenon of mechanical resonance. This applies equally to coil-drive and reed drive speakers. $\rho$ = valve resistance; $R_0$ = A.C. static coil resistance; $L_0$ = A.C. static coil inductance; $L_m$ = motional inductance; $C_m$ = motional capacity; $R'_m$ = motional resistance. In (c) $R_m$ is in series and the acoustic power is $R_m i^2$.

When the motional resistance is in series with the $L_mC_m$ combination instead of being in parallel, its value is smaller, and it is then designated $R_m$.

At resonance in the case of (b) Fig. 15, the impedance of the $L_mC_m$ combination is infinite so that the current passes through $R'_m$ only.

At higher or lower frequencies the current is also passed by $C_m$ and $L_m$, so that the total impedance is less than that at resonance; moreover, the current is greater than that at resonance.

**Concertina Action.**

Lastly, there is another major resonance in the coil-drive speaker due to "concertina action" between the coil and the diaphragm. This arises from elasticity of the connection between the two, and accounts for the whistling on high notes which is observed when stiff paper is used.

Fig. 10 represents the system if $M_1$ is regarded as the coil, $S_1$ the connecting link, $M_2$ the diaphragm, and $S_2$ the surround. At an upper frequency $M_1$, $S_1$ and $M_2$ resonate. I hope to treat this in greater detail in another article at a future date.

[2] *The Wireless World*, March 31st, 1927.

# BROADCAST BREVITIES

*By Our Special Correspondent.*

***B.B.C. and Television.—A Valve Methuselah.—Fewer Oscillators ?—Berlin's "Surprise Night."—Nottingham and the Regional Scheme.—Moscow Relays Chelmsford.***

### Capt. Eckersley at a Television Show.

The Baird Television apparatus was demonstrated to several members of the B.B.C. on Tuesday of last week. Among the party were Capt. Eckersley and Mr. Gladstone Murray, of the Information Branch. The demonstration was conducted between two rooms about 40 yards apart, connected by wire, and I hear that the B.B.C. officials remained at the receiving end the whole of the time.

An official announcement may be made before these lines appear, but at the moment of writing the B.B.C. experts are "considering their report." Does this suggest anything startling?

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### 5XX Uses XXXX Valves!

5XX is making a bid for the valve longevity record. A modulator valve which has just been superannuated on account of low emission has spent a useful life of 12,571 hours 17 minutes. Work it out and you will find that this amounts to almost 524 days of continuous working!

The valve was first put in circuit on November 21st, 1925, and has functioned for every minute of Daventry's transmission since that date. There are several other valves at Daventry which are well on the way to equalling this record. One has been in use for between ten and eleven thousand hours and another for nearly ten thousand, and they are both going strong.

oooo

### Why Not a Museum?

It would be a pity to throw away valves with such a history. Some sort of museum ought to be found for them, or they could be auctioned for charity. By the way, a B.B.C. museum seems overdue. It has been explained to me that there is no room for such an institution at Savoy Hill, but that is no reason why historic apparatus could not be stored until a proper setting can be found for them in the marble halls of Broadcasting House. A good nucleus for a broadcasting museum is available in the exhibits which appeared at the Olympia Show.

oooo

### The Wrong Word.

How many readers observed a curious lapse in the Second News Bulletin on Monday of last week? In regard to the Atlantic trip of the Graf Zeppelin it was stated that the airship would carry a television (sic) apparatus for the reception of maps.

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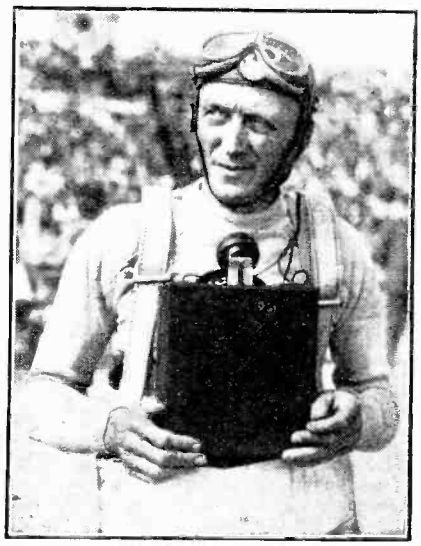
### Where Are the Oscillators?

Is it possible? Savoy Hill says so, so one supposes it is so. "There is no apparent increase in interference caused by local oscillation."

October is generally the grand rally month for oscillators. What has happened? Is the old *esprit de corps* dead?



**TALKS FROM A PARACHUTE. "Slim" de Villiers, a Los Angeles airman who recently broadcast during a parachute descent. The short wave transmitter is fed by dry batteries strapped round his waist.**

### What the Sage Said.

The oscillators are still holding on in the little bit of N.W. London with which I am most familiar. They sound their fanfares at all hours, but more especially during talk periods. The noblest type of all, the "silent point" oscillator who can make listening a mockery to everyone in the locality, still proclaims his awful presence.

Said Thomas Carlyle in one of his letters: "I have been kept awake all night by a dog howling; oh! that I had the creature by the hind legs against a stone wall!"

Sh!

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### "Surprise Night" in Berlin.

After the comic opera episode in Berlin last week, when a Socialist speaker was abducted and his place at the microphone usurped by a political rival, we shall all feel very dubious about some of these talks from 2LO.

Suppose, one of these nights, Sir Walford Davies were spirited away for an hour or two while an impersonator stressed the futility of fugues and the importance of jazz ("Listen for the saxophone, please, and note how I whistle through my teeth"). In future, how shall we know whether it is really A. J. Alan speaking and not Sir Oliver Lodge? ("And—er—when I got back to Holland Park, you know, it was quite dark, and—er—the keyhole rather reminded me of the discontinuity of matter. While on that topic . . .")

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### Precautions at Savoy Hill.

As a matter of fact, the B.B.C. has always taken elaborate precautions to prevent hoaxes at the microphone. Someone with discretionary powers is always listening, and more than once the prerogative of a sudden switch-off has been exercised when a too voluble speaker has exceeded the limits of his manuscript.

Still, one never knows!

oooo

### The Situation in Nottingham.

As from November 1st, Nottingham will take its place beside Birmingham in the service area of 5XX and 5GB, and thenceforward the B.B.C. hopes to draw extensively on the cultural and artistic resources of the Nottingham area.

To celebrate the event, an hour's programme, provided entirely by Nottingham artists, has been arranged for 5GB listeners on November 1st, and Nottingham listeners, who will no longer have their local transmitter, should tune in to Daventry experimental.

The recent "silent nights" in Nottingham, when 5NG has temporarily closed down to enable listeners to test their reception of Daventry, have been produc-

tive of a number of complaints, mostly, however, from crystal users who employ indoor aerials. These people have no right to complain, for the B.B.C. has never been expected to give a service to listeners who are inadequately equipped.

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**A Sad Sequel.**

I am sorry to have to record a real tragedy in connection with the wireless "duel" challenge which Captain Eckersley received recently and which was referred to in these columns last week. The writer of the letter, whose desire to interview the Chief Engineer had become an obsession, suffered a breakdown and died a few days ago.

In correspondence (which I have been privileged to see) Captain Eckersley had explained at length and in the most sympathetic terms that the demands on his time precluded personal interviews except in matters of fundamental importance to the progress of wireless.

No one will reproach "P.P." for such a reply, though I have no doubt that, had he been aware of the seriousness of this particular case, he would have stretched a point in the poor man's favour.

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**Mr. Baldwin at the Microphone.**

The political celebrities are getting plenty of practice in microphone technique in preparation for next year's General Election. Mr. Ramsay MacDonald and Mr. Lloyd George have both been heard recently. On October 26th the Prime Minister's speech at the tenth annual birthday meeting of the League of Nations Union will be relayed from the Albert Hall to 5GB.

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**"Sermons in Stones" (and Anthems in Coal!)**

"A program of sacred songs has been chosen by The Lehigh Coal and Navigation Company for the next offering . . . to be broadcast through the N.B.C. system . . ."

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**It's the Life!**

In what happier frame of mind could we approach the winter season than by apostrophising its delights in the eloquent words of *La TSF Moderne*?

"October, the approach of winter . . . Season awaited by the *sans-filistes*, who, in the silence of a reposeful ether, are able to taste the delights of a distant concert while their compatriots, as yet unattracted by the marvel which has captivated us, find life tedious as they gaze outside of an evening upon the falling rain!"

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**Tommy Handley's Dilemma.**

I hear that Tommy Handley, whose witty shows at the microphone have won him a large "outside" public, suffered considerable embarrassment at a Mothers' meeting in Hertfordshire a few days ago. He had been entertaining his audience without the aid of music for nearly an hour. An hour! Think of it! Finally he decided to flavour the ending with a song, and he choose "Constantinople." But none of the ladies could (or would) play the piano.

It was then that the local "lion"—in public life a famous orchestral conductor—was prevailed upon to play the accompaniment. The embarrassment began with the discovery that playing "Constantinople" needs talents which do not enter into the conducting of an orchestra. Anyway, Tommy Handley won!

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**Later Dance Music from 2LO.**

On Wednesdays, starting in November, 2LO will transmit late dance music with Daventry (5XX) from 11 p.m. to 12 midnight. This hour will be provided by Jack Payne and the B.B.C. Dance Orchestra

**FUTURE FEATURES.**

**London and Daventry (5XX).**

OCTOBER 21ST.—A Military Band Concert.
OCTOBER 23RD.—"Should Married Women Work?" a discussion between Dame Beatrix Lyall and Mrs. E. D. Simon.
OCTOBER 24TH.—"Michael," a play by Tolstoy.
OCTOBER 26TH.—B.B.C. Symphony Concert, relayed from the Queen's Hall.
OCTOBER 27TH.—Viennese Dances and Marches.

**Daventry Experimental (5GB).**

OCTOBER 23RD.—Haydn and Mozart Music.
OCTOBER 25TH.—"The House with the Twisty Windows," a play by Mary Pakington.

**Cardiff.**

OCTOBER 22ND.—"The Lady Lawyer," an operetta by John W. Ivimey.

**Manchester.**

OCTOBER 21ST.—Programme of famous Classics.
OCTOBER 22ND.—Speeches relayed from the opening of the Radio Exhibition at the City Hall.

**Newcastle.**

OCTOBER 24TH.—The Electric Sparks Concert Party.

**Glasgow.**

OCTOBER 23RD.—Half an hour of Ketelbey's music.

**Aberdeen.**

OCTOBER 22ND.—"The Compleat Compromise," a dialogue by Edwin Lewis.

**Belfast.**

OCTOBER 27TH.—Favourite songs of the Boer War and the Great War.

**Post Office Psychology.**

An observant writer in a Liverpool journal draws attention to the printer's reference on Post Office Form T268, which requests listeners to renew their licences. The reference runs: "WT. 1345/1182 1,000,000 . . ." etc. He deduces therefrom that a million of these forms were printed, and implies that the Post Office deemed that it would be necessary to remind a million listeners when their next 10s. was due. No doubt he is right. The Post Office people are wonderful psychologists.

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**"A Nonsensical Playlet."**

"Evening Dress Indispensable" is described by the author, Roland Pertwee, as "a nonsensical playlet." It will be broadcast from 5GB on October 30th. In the cast will be Janet Eccles, who toured South Africa, Australia, and New Zealand as juvenile lead with Irene Vanbrugh and Dion Boucicault.

**Moscow Relays 5SW.**

The Leeds Festival Concert on the evening of October 3rd was relayed by the Moscow Comintern station. The secretary of the Festival has received a letter from Mr. G. A. Birkett, a lecturer in Russian at Sheffield University, in which he says:—

"At 8.30 p.m. Moscow closed down for half an hour announcing that at nine there would be an experimental relay of foreign stations. Just after 9 p.m. I turned to Moscow again and heard that they would try to relay the programme of Chelmsford, the English short-wave station. Almost immediately there came through the item that I had been getting a few minutes previously from Daventry—Brahms' German Requiem.

"I listened to it from Moscow for about 25 minutes from 9.10 to 9.35. Reception was as clear as from the English station and so powerful that it had to be cut down."

The Indian Broadcasting Company has recently relayed several of Chelmsford's transmissions, so it really looks as if the short-wave station is at last coming into its own.

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**Scottish Short Story Readings.**

The winter programme of the Scottish stations of the B.B.C. again lays considerable stress on contemporary Scottish production in music and letters. One new series of broadcasts which promises to be particularly popular is the series of short-story readings by Scottish novelists. The next of the stories will be told on November 3rd by Miss Christine Orr.

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**A Grand Smash.**

I referred to "Cracked China" last week. This piece (or pieces?) will be broadcast on Wednesday next, October 24th. The materials have been collected by K. B. Indoe and Gordon McConnell, and stuck together by Bruce Winston, with the help of Olive Groves, Robert Chignell and St. Barbe West.

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**The Romantic Age.**

"Moyen Age," the romantic experiment which is being broadcast from 2LO on Friday next, is by the author of that recent success, "Blue on the Boulevard."

It is woven round the fancy that the spirit of the Romantic Age has found expression in César Franck's Symphony, which will be heard as a background throughout the broadcast of speech and other music.

Thornton Wilder, the author of "The Bridge of San Luis Rey," has given permission for one of his short unpublished plays to be included.

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**Concerto with a Military Band!**

Something unusual in military band music will be heard on October 30th, when Belfast will broadcast a concerto by Louis Hassler for bassoon and military band. Probably on only one previous occasion has a concerto been broadcast with military band accompaniment, viz., the Grieg pianoforte concerto, played by Maurice Cole and the Wireless Military Band from 2LO.

# MANCHESTER EXHIBITION.

## OCTOBER 22nd TO NOVEMBER 3rd.

## Alphabetical List of Exhibitors.

A.F.A. Accumulators, Ltd., (37)
120, Tottenham Court Rd., London, W.1.
Alphian Wireless, Ltd., (51)
Mortimer St., London, W.1.
Association of British Radio Societies. (115)

BAKER, A., (74)
42, Cherry Orchard Rd., East Croydon.
Barraclough, G. D., (19)
16-18, Moult St., Cross St., Manchester.
Belling & Lee, Ltd., (7)
1, Queensway, Ponders End, Middlesex.
Brandes, Ltd., (33)
2-3, Norfolk St., Strand, London, W.C.
British Ebonite Co., Ltd., (17)
Nightingale Rd., Hanwell, London, W.7.
British General Manfg. Co., Ltd. (38)
Brockley Works, London, S.E.4.
British Thomson-Houston Co., Ltd., (47)
Rugby.
Brown Bros., Ltd., (59)
273, Deansgate, Manchester.
Brown, Ltd., S. G., (41)
Western Av., North Acton, London, W.3.
Brownie Wireless Co. (Gt. Britain), (46)
Ltd.,
Nelson St., London, N.W.1.
Burgoyne Manfg. Co., Ltd., (92)
34a, York Rd., King's Cross, London, N.1.
Bush House Radio, (81)
40, Deansgate, Manchester.

CARBORUNDUM Co., Ltd., (14)
Trafford Park, Manchester.
Celestion Radio Co., (31)
29, High St., Hampton Wick, Kingston-on-Thames.
Chloride Electrical Storage (29)
Co., Ltd.,
Clifton Junction, Manchester.
Clarke & Co. (M/c.), Ltd., H., (42)
Atlas Works, Old Trafford, Manchester.
Climax Radio Electric, Ltd., (25)
Quill Works, Putney, London, S.W.15.
Cole, Ltd., E. K., (9)
"Ekco" Works, London Rd., Leigh-on-Sea.
Coranto Cabinet Co., (63)
51, Naylor St., Hulme, Manchester.
Cossor, Ltd., A. C., (53)
Cossor House, Highbury Grove, London, N.5.
Crauford-Frost Wireless (113)
Products, Ltd.,
32, Alma Rd., Windsor, Berks.
Curry's (1927), Ltd., (95)
24-28, Goswell Rd., London, E.C.1.

DAYZITE, Ltd., (75)
17, Lisle St., London, W.C.2.
Detex Distributors, Ltd. (71)
Detex House, Rosebery Av., London, E.C.1.
Dubilier Condenser Co. (1925), Ltd., (62)
Ducon Works, Victoria Rd., North Acton, London, W.

EASTICK & Sons, J. J., (101)
118, Bunhill Row, London, E.C.1.
Econasign Co., (105)
94, Jermyn St., London, W.1.
Edison Swan Electric Co., Ltd., (43)
123-125, Queen Victoria St., London, E.C.4.
Electramonic, Ltd., (77)
Bear Gardens, Southwark, London, S.E.1.
Electrical Machine & Apparatus Co., (73)
Cromford Court, Corporation St., Manchester.
Electron Co., Ltd., (36)
122, Charing Cross Rd., London, W.C.
Epoch Radio Manufacturing Co., (103)
53, Gracechurch St., London, E.C.3.
Ever-Ready Co. (Gt. Britain), Ltd., (20)
Hercules Place, Holloway, London, N.

FERRANTI, Ltd., (54 & 55)
Hollingwood, Lancs.
Fuller Accumulator Co. (1928), Ltd., (72)
Chadwell Heath.

GAMBRELL Radio, Ltd., (84)
Buckingham House, Buckingham St., Strand, London, W.C.2.
Garnett, Whiteley & Co., Ltd., (27)
Broadgreen Rd., Liverpool.
General Electric Co., Ltd., (50)
Victoria Bridge Manchester.
Gottlieb & Co., J. L., (2)
Cromer St., Gray's Inn Rd., London, W.C.1.
Graham Amplion, Ltd., (26)
25, Savile Row, London, W.1.
Green & Co., (110)
94-96, Hurst St., Birmingham.

HALCYON Wireless Co., Ltd., (32)
Camberra House, 313, Regent St., London, W.1.
Hardies (Manchester), Ltd., (22)
Bull's Head Yard, Corporation St., Manchester.
Harlie Bros., (111)
Balham Rd., Edmonton, London, N.9.
Hart Bros. Electrical Manfg (106)
Co., Ltd.,
4, Queensway, Ponders End, Middlesex.
Hirst, Ibbotson & Taylor, Ltd., (66)
7a, Blackfriars St., Manchester.
Holzman, Louis, (60)
34, Kingsway, Holborn, London, W.C.2.
Hughes & Co., Ltd., F. A., (28)
204-206, Gt. Portland St., London, W.

IGRANIC Electric Co., Ltd., (52)
147, Queen Victoria St., London, E.C.
Iliffe & Sons Ltd., (24)
Dorset House, Tudor St., London, E.C.4.

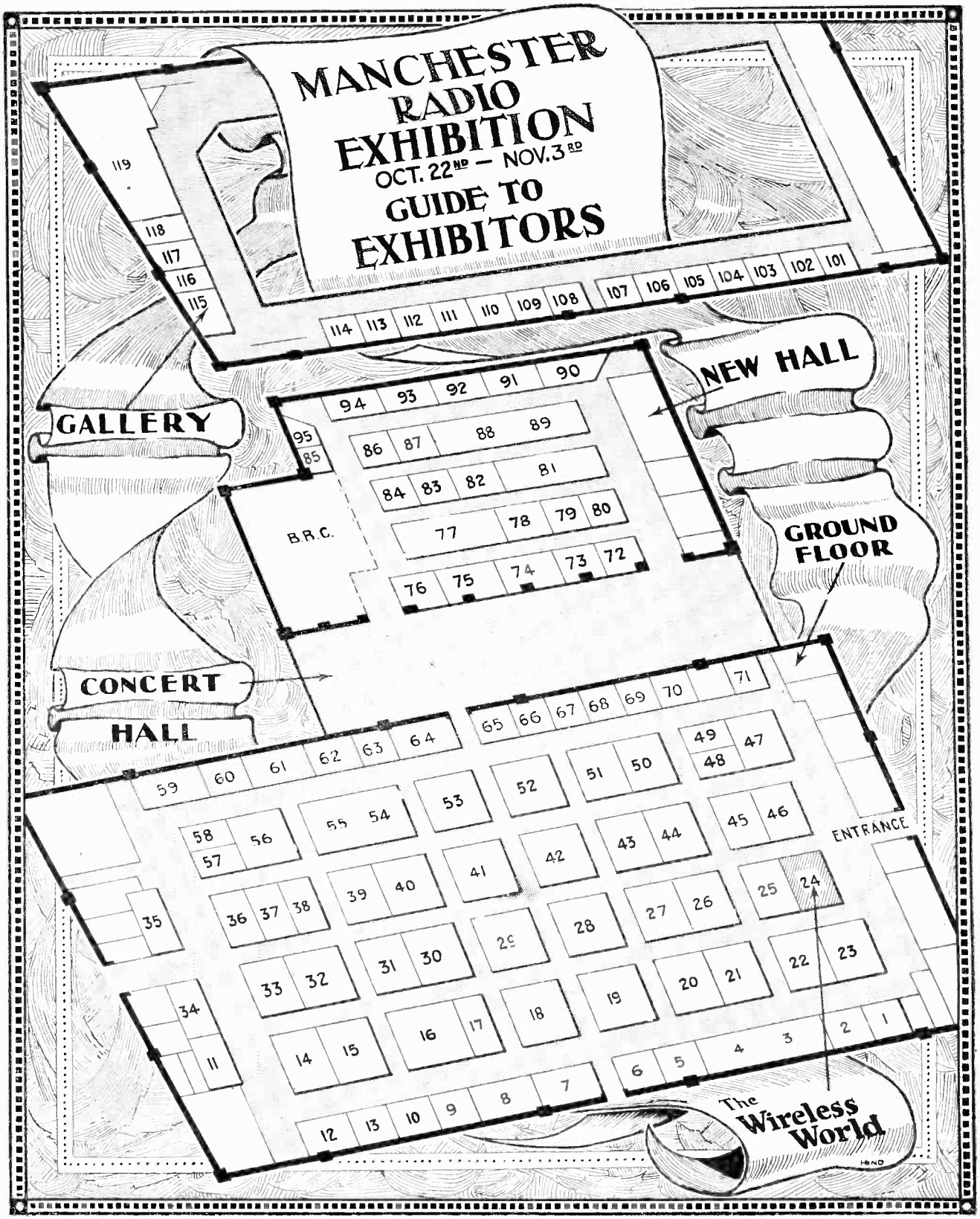
K.N. Electrical Products, Ltd., (107)
87, Wardour St., London, W.1.
Kalinsky (Aldgate), Ltd., S., (91)
75, Aldgate High St., London, E.
Kay, Ltd., P., (83)
183, Old St., London, E.C.1.

LANCASHIRE Dynamo & (64)
Motor Co., Ltd.,
Trafford Park, Manchester.
Langham Radio, (79)
Rosslyn House, 96, Regent St., London, W.
Lectro-Linx, Ltd., (112)
254, Vauxhall Bridge Rd., London, S.W.1.
Lichtenberg & Jones, Ltd. (86)
40-44, Holborn Viaduct, London, E.C.1.
Lissen, Ltd. (88 & 89)
Worple Rd., Isleworth, London, S.W.
London Metal Warehouses, Ltd., (76)
Hill St., Blackfriars Rd., London, S.E.1.
London Radio Manfg. Co., Ltd., (6)
Trafalgar Works, Station Rd., London, S.W.19.
Lyons, Ltd., Claude, (13)
76, Old Hall St., Liverpool.

M.P.A., Ltd., (23)
62, Conduit St., London, W.1.
Makerimport Co., (49)
50a, Lord St., Liverpool.
Marconiphone Co., Ltd., (40)
210, Tottenham Court Rd., London, W.1.
McMichael, Ltd., L., (56)
Wexham Rd., Slough.
Melhuish, C. D., (114)
8, Gt. Sutton St., London, E.C.1.
Metro-Vick Supplies, Ltd., (30)
Trafford Park, Manchester.
Mic Wireless Co., (87)
Whitehorse Place, Market St., Wellingborough.
Moores & Co., John, (8)
Ravald St. Works, Salford.
Mullard Wireless Service Co., Ltd., (45)
Mullard House, Denmark St., London, W.C.2.

NEW London Electron Works, Ltd., (78)
East Ham, London, E.6.

OLDHAM & Sons, Ltd., (44)
Denton, Manchester.
Ormond Engineering Co., Ltd., (67)
Pentonville Rd., London, N.1



# CLUB REPORTS AND TOPICS

*Secretaries of Local Clubs are invited to send in for publication club news of general interest All photographs published will be paid for.*

### The Case for Informal Meetings.

Members of the South Croydon and District Radio Society are asked to note that the Society's meetings are now held on Tuesday evenings at 8 o'clock, at the Surrey Drovers' Hotel. Visitors are cordially welcomed. In a recent discussion the opinion was widely held that informal evenings are a considerable attraction to many enthusiasts who do not welcome stereotyped lectures at every meeting. Several informal meetings are, therefore, to be held during the present session.

The Hon. Secretary, who has been re-elected, is Mr. E. L. Cumbers, 14, Campden Road, South Croydon.

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### Tottenham Society's Successful Year.

A flourishing state of affairs was revealed at the sixth annual general meeting of the Tottenham Wireless Society on October 3rd. Financially, technically and socially the past year has obviously been a success, and there is every indication that the Society's activities will maintain the standard already set. A special invitation is extended to new members; those interested should either call at headquarters, 10, Bruce Grove, Tottenham, on any Wednesday evening at 8 o'clock, or communicate with the Hon. Secretary, Mr. R. C. A. Haynes, 159, Lordship Lane, N.22.

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### Birmingham Visits Olympia.

A party of members of Slade Radio (Birmingham) paid an interesting flying visit to Olympia on September 29th.

At the subsequent meeting of the Society Mr. A. Freeman described the Show to those members who had been unable to join the party. The Society is busy on the construction of a screened grid receiver. Visitors are welcomed at the meetings which are held on Thursdays at the experimental station, 8, Victoria Road, Erdington.

Hon. Secretary: Mr. H. Clews, 52, St. Thomas Road, Erdington, Birmingham.

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### All About Accumulators.

Valuable information concerning the manufacture of different types of accumulators was provided by Mr. Lockton, of the Exide Company, at the Southend and District Radio Society. The lecturer, who illustrated his remarks with lantern slides, gave some very useful hints and tips on the working of accumulators and their charging and maintenance.

Hon. Secretary: Mr. F. J. Waller, Eastwood House, Rochford, Essex.

### Open Meetings.

The Leyton and Leytonstone Radio Society issues a special invitation to the public to attend an interesting series of demonstrations and lectures to be given on Thursday evenings at 8 o'clock, at Grove House, High Road, Leyton, E.10.

## FORTHCOMING EVENTS.

**WEDNESDAY, OCTOBER 17th.**

*Edinburgh and District Radio Society. At 8 p.m. At 117, George Street. Lecture on "Wave Meters."*

*Wigan Technical College Radio Society. Lecture: "Modern Wireless Batteries and their Operation," by Mr. C. P. Lockton, M.Sc., of Messrs. The Chloride Electrical Storage Co., Ltd.*

*Tottenham Wireless Society. Second annual dinner.*

**THURSDAY, OCTOBER 18th.**

*Stretford and District Radio Society. At 8 p.m. At 6A, Derbyshire Lane. Lecture on Public Address Systems, by a representative of the Marconiphone Co., Ltd.*

*Slade Radio (Birmingham). At 8, Victoria Road, Erdington. Members' night. Fourth talk on Electricity.*

*Leyton and Leytonstone Radio Society. At 8 p.m. At Grove House, High Road, Leyton. Demonstration of the "Everyman Four."*

**MONDAY, OCTOBER 22nd.**

*Newcastle-upon-Tyne Radio Society. At Carliol House. Film depicting activities of the Newcastle Electric Supply Co., Ltd.*

*Hackney Radio and Physical Society. At 8 p.m. At the Electricity Hall, 18-24, Lower Clapton Road, E.5. Lecture: "'All Mains' Receivers," by Messrs. G. V. Cole and J. H. Nicholls.*

### Ilford Society issues a "C.Q."

Mr. J. E. Nickless, 2KT, was re-elected President of the Ilford and District Radio Society at the annual general meeting on October 6th. A good programme has been prepared for the coming session and all interested are invited to communicate with the Hon. Secretary, Mr. C. E. Largen, 16, Clements Road, Ilford.

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### Lectures for Beginners.

All wireless enthusiasts and beginners in the Peckham district are cordially invited to attend the meetings of the Radio Society which has been formed in connection with the Peckham Literary Evening Institute, County Secondary School, Peckham Road, S.E.15. Meetings are held under the direction of Capt. Jack Frost, who dealt with "Electric Units" in his lecture on Thursday last, October 11th.

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### Kensington Radio Society.

At last Thursday's meeting of the Kensington Radio Society, held at 136, Holland Park Avenue, W.11, Dr. Gordon-Wilson gave a demonstration of two interesting portable sets—a screened grid instrument and an 8-valve super-het.

Hon. Secretary: Mr. G. T. Hoyes, 71a, Elsham Road, W.14.

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### Society's Printed Transactions.

The Transactions of the Edinburgh and District Radio Society are included in the October issue of the Edinburgh Journal issued by the various Societies whose headquarters are at 117, George Street, Edinburgh. The Radio Society is holding its meetings at this address at 8 p.m. on Wednesdays, continuing until April next. An attractive syllabus has been prepared and negotiations are in progress for a lecture on "The Screened Grid and Pentode Valves" to be given in November by a representative of one of the leading valve firms.

Hon. Secretary, Mr. E. I. Robertson, 10, Richmond Terrace, Edinburgh.

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### Third Oldest Wireless Society?

The Croydon Wireless and Physical Society, which has just opened its winter session, claims to be the third oldest wireless society in Great Britain, having been founded in 1913.

If sufficient support is forthcoming, the Society proposes to hold "practical and conversational" evenings in addition to the more formal lecture meetings.

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

# READERS' PROBLEMS ANSWERED

*The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced in the interest of readers themselves.*

*A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.*

"The Wireless World" Supplies a Free Service of Technical Information.

### A Low-magnification Stage.

*My set comprises an anode-bend detector with a resistance in its anode circuit. The next L.F. stage is coupled to the output valve by means of a transformer. Now I should like to try the pentode, but understand that it would not be suitable unless I cut out one of the L.F. stages. However, instead of doing this, would it be permissible to reduce the overall magnification by substituting the present coupling resistance by one of a few thousand ohms, as an alternative to taking out the existing first L.F. stage?* P. T. M.

We cannot see any serious objection to your proposed plan. If possible, you should try various values of resistance in the anode circuit of the detector, finally choosing one which will cause the pentode to be fully loaded when a signal voltage of sufficient strength for good rectification is applied to the detector grid circuit.

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### Condenser Insulation.

*I have lately been testing some old Mansbridge-type condensers by connecting leads from the H.T. battery to them, and noting how long a charge is retained. On short-circuiting the terminals, I find that they all give a good spark after half an hour; do you think that this indicates that they are in good order?* D. S.

In making a test of this sort, a good deal depends on the humidity of the atmosphere, and consequently the amount of dampness across the terminals. We think, however, you can rest assured that the insulation of your condensers is adequate.

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### "Decoupling" a Screened Valve.

*Will you please give me a diagram showing how decoupling wiring may be applied to a screened-grid amplifying valve?* L. V. H.

As with an ordinary triode, the oscillatory currents in grid and plate circuits should be prevented from flowing in leads which are common to other circuits. This end may be attained by adopting the scheme of connections shown in Fig. 1, from which you will see that the grid return lead is taken direct to the negative filament of the valve through its biasing battery. Similarly, a stopping resistance is inserted at the low-potential end of the anode circuit in order to deflect H.F. currents through the by-pass condenser to the same point. These precautions are also observed in the wiring of the screening grid.

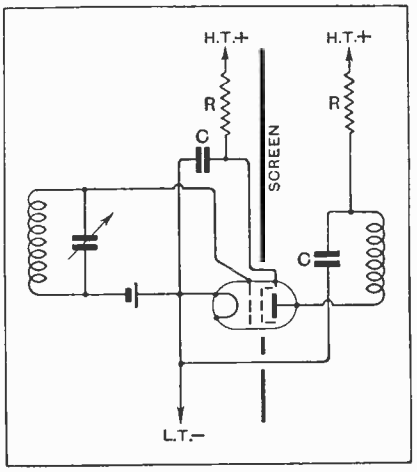


**Fig. 1.—Isolating the various circuits associated with a screened-grid valve. R, decoupling resistances; C, by-pass condensers.**

*RULES.*

(1.) *Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."*

(2.) *Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.*

(3.) *Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.*

(4.) *Practical wiring plans cannot be supplied or considered.*

(5.) *Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.*

(6.) *Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.*

*Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.*

### Underloading the Detector.

*My receiver has one H.F. stage followed by an anode-bend detector and two L.F. amplifiers. Due possibly to my unfavourable situation from the point of view of receiving conditions, I am unable to get many distant stations in daylight, and am thinking of adding a third optional L.F. amplifier. I am well aware that this practice has been deprecated on the grounds that instability will probably be caused by interaction between the various circuits, but am prepared to take all precautions against this, if you recommend me to add another valve.* E. C. D.

Apart altogether from the question of L.F. instability—which is very difficult to avoid when three high-magnification L.F. stages are used—we cannot recommend your proposed addition. The receiver is (or should be) designed so that a signal of sufficient amplitude adequately to operate the detector will fully load the output valve. If, however, you add another L.F. stage, it will be obvious that the input to the detector for a given L.F. output will be very much less, and, especially with anode-bend rectification, it is almost certain that the L.F. amplification obtainable from three stages will be altogether excessive.

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### Aerial-earth Connections.

*My three-valve set as originally installed gave good results, but since moving it into another room it is impossible to get loud speaker signals of reasonable strength, even from the local station. Can you suggest where I should look for the fault?* H. C. M.

Although you do not give details, we expect that you have fitted extension wires to the aerial and earth leads, and taken them side-by-side from one room to the other. If this is so, there will almost certainly be an excessive addition of capacity to the aerial-earth circuit; this might well be sufficiently serious to cause the diminution in volume of which you complain.

You can easily check the correctness of our diagnosis by temporarily replacing the set in its original position; if we are right, we recommend you to leave it there, and if necessary to fit an extension for the loud speaker to the other room.

# The Wireless World AND RADIO REVIEW

(16th Year of Publication)

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Assistant Editor: F. H. HAYNES.

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## THE B.B.C. AND TELEVISION.

ON several occasions during past months the B.B.C. have pointed out that they had not had a demonstration of television and were, therefore, not in a position to express an opinion upon it. Recently, as the result of an application on the part of the Baird Television Development Company to the Postmaster-General for permission to conduct television broadcasts, the B.B.C. was asked by the Postmaster-General to arrange with the Baird Company for a demonstration with a view to ascertaining the suitability of the system in its present state of development for broadcast transmissions to be commenced. A demonstration was accordingly arranged between the Baird Company and the B.B.C. on October 9th, and was attended by administrative and technical officials of the Corporation. Subsequently, the following official announcement was issued by the Corporation: "The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify trial through a B.B.C. station.

"The Board of the Corporation has decided that an experimental transmission through a B.B.C. station shall not be undertaken at present. The Corporation would be ready to review this decision if and when development justified it."

This decision on the part of the B.B.C., although it may be one which has not come as a surprise, creates a peculiar situation. Wireless transmissions in this country are under the control of the Post Office; a monopoly in broadcasting has been granted to the British Broadcasting Corporation; and a commercial company to exploit television has been formed which presumably depends for its existence on the establishment of a service and the sale of apparatus.

It is inconceivable that the Postmaster-General should, in view of the B.B.C.'s attitude, contemplate granting anything in the nature of a separate licence for broadcasting to the Baird Company; yet quite a good case has been created for the shareholders of the Company to feel that they have a legitimate complaint against the authorities; whilst the directors of the Baird Company can, of course, take up the attitude that they can no longer be held responsible for the financial success of the concern. On the other hand, we must remember that the non-technical public is naturally optimistic, and has been primed with the rosiest aspect of the future of television in the daily Press and elsewhere, and for this reason it seems to us a pity that some means cannot be devised whereby the public generally could have an opportunity of acquiring first-hand knowledge of the present state of the art.

The B.B.C. maintain that the demonstration they were given failed to fulfil the conditions which would justify a trial through B.B.C. stations, and they are undoubtedly competent to make such a decision, but is there not some way in which a compromise could be arranged? Outside B.B.C. broadcasting hours and through, say, the stand-by transmitter at Marconi House, the Baird Company might be given an opportunity of showing what they may be able to achieve, receiving apparatus being installed at a number of places where the public could attend. There need be no commitment on the part of the B.B.C. in making such an arrangement, and it can be for a definitely limited period with no promise whatsoever that the service would be extended. Such an arrangement would provide a means of satisfying public opinion as to the true position to-day, and clear up once and for all the uncertainty existing in the public mind as a result of the publication of so many conflicting reports on the subject.

# The KILO-MAG FOUR

## A Screened Grid Set with a Thousand-fold H.F. Amplification.

By H. F. SMITH.

*Description of a receiver with two cascade H.F. valves giving the maximum amplification which can usefully be employed. Complete stability is achieved by effective isolation of individual circuits and not by introducing damping or by reducing the magnification of each stage. Coils for medium and long broadcast wavebands are placed in circuit by means of switches.*

WHEN the screened grid valve first appeared it was hailed as the solution of all our problems with regard to H.F. amplification, and the opinion was freely expressed that it would quickly displace the neutralised triode, particularly in amplifiers with more than one stage. At the outset, unfortunately, things did not work out quite in accordance with expectations; this was due to various reasons, not the least important of which was an imperfect general appreciation of the need for thorough isolation of the different grid and plate circuits. The result was that some of the receivers produced gave a disappointing performance; to attain stability, so much magnification had to be sacrificed that they compared none too favourably with their predecessors of more conventional design.

The problems involved have of late received a very considerable amount of attention, and it is now possible to put forward a two-stage H.F. amplifier in which stability is attained without deliberately throwing away any part of the possible gain, beyond that made necessary by the requirements of selectivity. The writer set himself the task of designing a set on these lines, endeavouring in the interests of his prospective readers to avoid any difficult constructional work or the use of unduly expensive components. As ample space is allowed, the design may be followed by those who wish to employ existing parts of larger dimensions than those used in the construction of the receiver to be described. Matters are so arranged that the amateur may easily make a compromise between sensitivity and selectivity to suit his own conditions and requirements—no set can be best for *all* conditions. By a simple alteration, single-ended or double-ended valves may be used, as desired.

Shorn of complications, the circuit arrangement is as shown in Fig. 1, from which it will be seen that the two H.F. stages are coupled by means of tuned transformers. In spite of the fact that these introduce some elaboration of the wiring, their use is considered to be justified, if only by the fact that valve noises—always prevalent in an amplifier of this kind—are less troublesome than with the alternative "tuned anode" device, which requires intervalve blocking condensers and grid leaks.

Anode bend detection has been chosen in preference to the grid circuit method because it functions at its best with the large high-frequency voltage input so

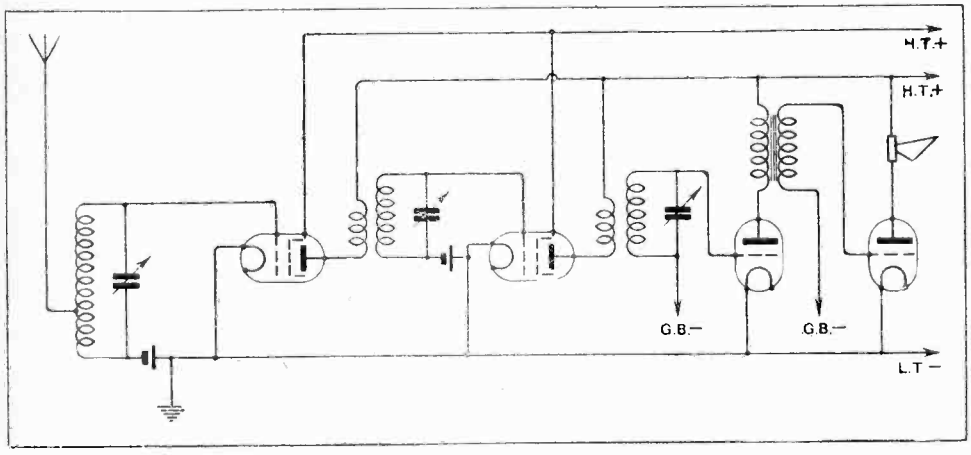



Fig. 1.—The simplified circuit diagram, omitting de-coupling devices and switches.

**The Kilo-Mag Four.—**

readily obtained when it is preceded by a two-stage amplifier, and, in addition, it does not introduce damping in its grid circuit. True, this could be offset by reaction, but this addition would introduce undesirable complications, particularly in view of the fact that wave-changing switches are included. Another point in favour of anode rectification is that valves for this purpose are now obtainable with characteristics making them suitable for use with a L.F. transformer, which in this case serves to couple the detector to the output valve. By these means an overall amplification more than sufficient for average requirements is obtained from a total of four valves, but it should be pointed out that still greater L.F. magnification may, when needed, be obtained either by fitting a pentode output valve, or by adding another ordinary stage. These modifications will be dealt with later.

A good idea of the precautions taken to prevent inter-stage coupling can be gathered from a consideration of Fig. 2, which also shows the connections of the wave-changing switches. This diagram is drawn in a somewhat unconventional manner in order to show the disposition of the various components with relation to the screening boxes and outside screens; the circuits can be traced more easily than from a practical wiring plan (which, by the way, will be given in next week's issue). It will be seen that each H.F. anode and screen grid circuit is "tied down" (by means of de-coupling resistances $R_1$, $R_2$, $R_3$, $R_4$, and by-pass condensers $C_4$, $C_5$, $C_6$, $C_7$) to the negative filament lead of its own valve. As for the detector, similar treatment is given to both grid and plate circuits; in the latter a large part of the H.F. component is deflected by the combined action of the radio-frequency choke and by-pass condenser $C_9$.

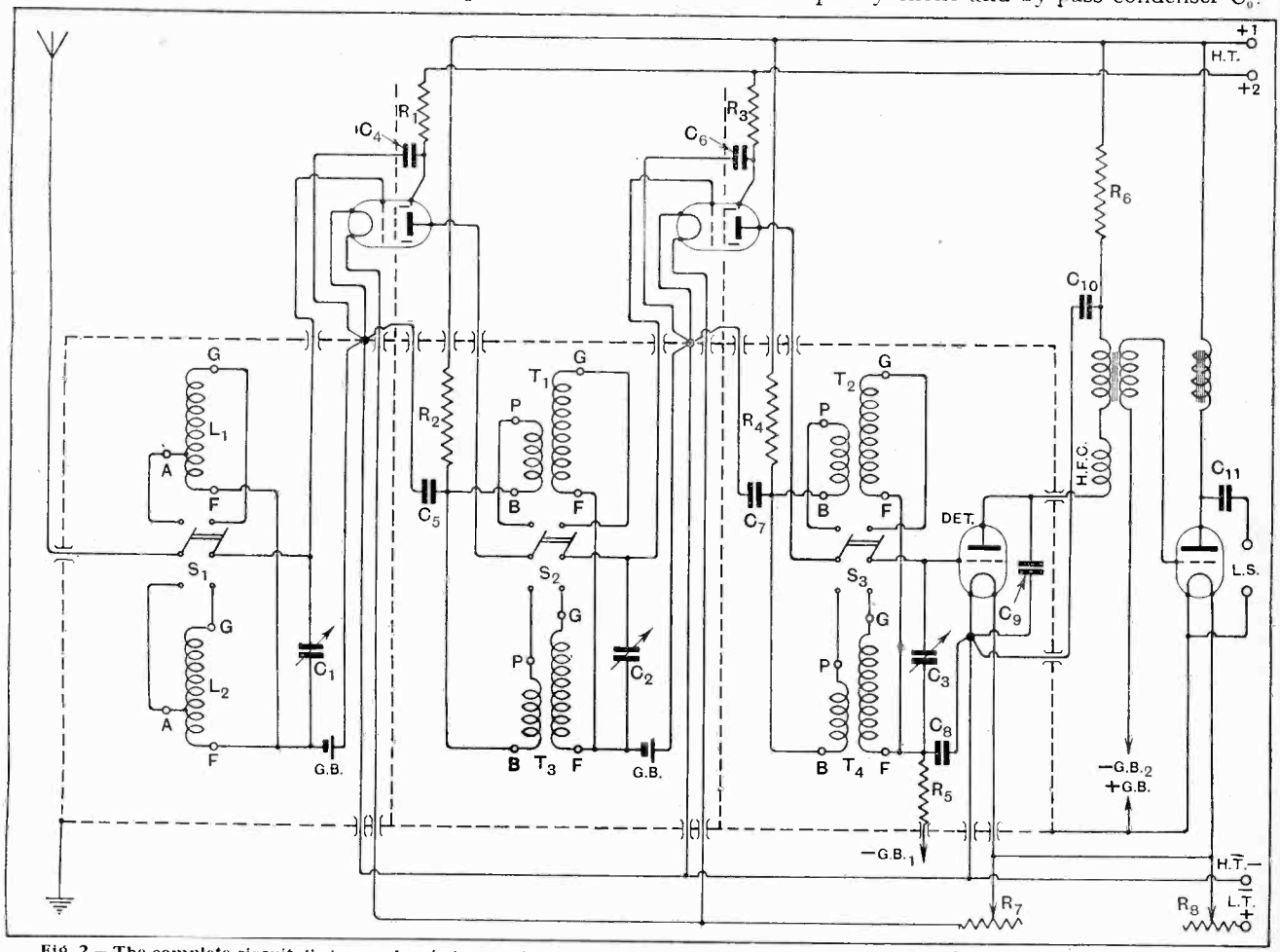


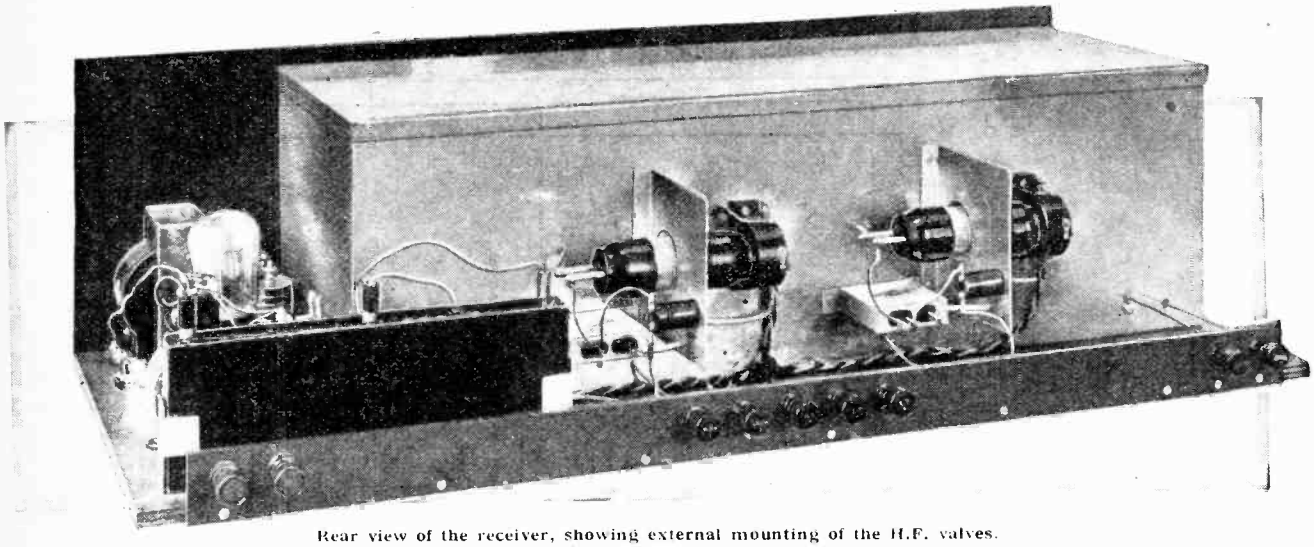

**Fig. 2.—The complete circuit diagram, showing screening of the various components, $C_1$, $C_2$, $C_3$, 0.0003 mfd.; $C_4$, $C_5$, $C_6$, $C_7$, $C_8$, 0.5 mfd.; $C_9$, 0.0003 mfd.; $C_{10}$, 1 mfd.; $C_{11}$, 2 mfds.; $R_1$, $R_2$, $R_3$, $R_4$, $R_5$, $R_6$, de-coupling resistances, 600 ohms; $R_7$, volume control rheostat, 10 or 20 ohms, depending on filament consumption; $R_8$, master rheostat, 6 ohms; $L_1$, medium-wave aerial-grid coil; $L_2$, long-wave aerial-grid coil; $T_1$, $T_2$, medium-wave H.F. transformers; $T_3$, $T_4$, long-wave H.F. transformers; $S_1$, $S_2$, $S_3$, wave-range switches.**

There is a choke filter output for the loud speaker, but this is not essential to the design. It should be observed, however, that a resistance is inserted in series with the L.F. valve grid in order to prevent, or rather to reduce, the development of high-frequency voltages across this circuit.

Two filament rheostats are fitted; the first, $R_8$, acts as a master switch, while the second, $R_7$, which regulates the heating current of the H.F. valves, serves as a volume control, and, incidentally, can be used to a limited extent for increasing selectivity.

**The Kilo-Mag Four.—**

It is not difficult to follow the operation of the wave-range switches. In each of the circuits where changes have to be made, the low-potential ends of the coils are joined together and to the appropriate point—transformer primaries to H.T. positive *via* decoupling resistances, and grid coils to negative filament *via* bias cells. The high-potential ends of these coils are connected to the outer contacts of the switches, the centre points of components associated either with the input circuit or an intervalve coupling, except that the detector valve, with its anode by-pass condenser, is mounted in the third box. The high-frequency valves are carried on "outboard" mountings, in order that they may not be influenced by the magnetic field of the coils; they are supported in "Aermonic" holders through which connection is made to filament and working (inner) grid pins. A small projecting shield is arranged to coincide



Rear view of the receiver, showing external mounting of the H.F. valves.

which are joined to plate and grid of the preceding and succeeding valve. This applies to switches $S_2$ and $S_3$, which control the intervalve couplings; the arrangement of $S_1$, which changes over the aerial-grid coils, is slightly different, but will be sufficiently obvious from the circuit diagram.

The layout of components calls for some comment, although the various positions are clearly shown in the accompanying drawings and photographs. Each of the three screening compartments contains only the H.F.

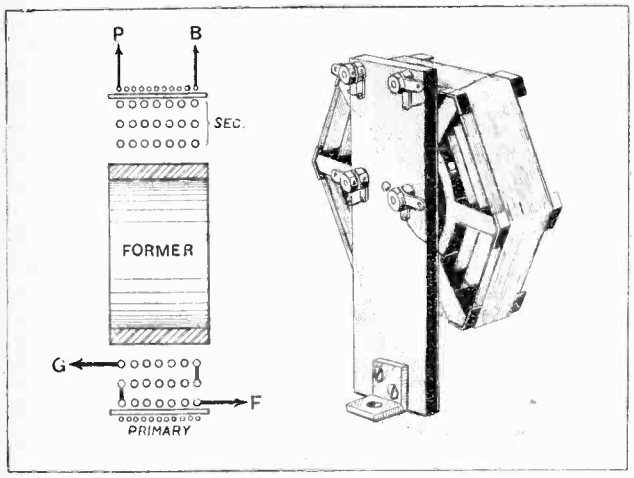



Fig. 3.—Sectional sketch of windings of the H.F. transformers; the lettering indicates the connections of the various ends, and corresponds to that in the other diagrams. On right: method of mounting the transformers; a similar support for the aerial-grid coil is fitted with three terminals.

with the internal screen, to which it acts as an extension. Connection to anode and screen grid pins is made by means of sockets secured to flexible leads.

Double-ended valves of the S.625 type were used in initial tests, and the foregoing remarks apply more particularly to this pattern; single-ended types may be substituted by moving the holder about ½in. nearer to the projecting shield and replacing the "screen" socket by a connection to the appropriate terminal of the valve-holder. At the same time, the diameter of the hole through the shield must be increased to 1½in.

### Avoiding Magnetic Couplings.

It is important that the disposition of the coils within the screening compartments should be in fairly close agreement with that shown; it is a difficult matter to ensure that the lid shall fit perfectly, and, failing a complete "seal," it is found necessary to arrange for the axes of the transformers in the centre compartment to be at right angles with their counterparts (long or short wave) in adjoining boxes.

The screening case, of No. 22 gauge copper, was made to the writer's specification by Messrs. White Bros. and Jacobs; its dimensions are shown in Fig. 4. All joints are soldered, and the edges are turned.

Apart from the screening box, the only non-standard components are the 600 ohm isolating resistances and H.F. couplings. As to the former, suitable elements are now manufactured by Messrs. Wright and Weare for the "Megavox Three" receiver, so it is unnecessary to describe them further than to say that they consist of 3 yards of No. 47 Eureka D.S.C. wire

### LIST OF PARTS.

*3 Variable condensers, 0.0003 mfd. (Polar "Ideal").*
*5 Condensers, 0.5 mfd. (Camden Electrical Co.).*
*1 Condenser, 1 mfd. (Camden Electrical Co.).*
*1 Condenser, 2 mfd. (Camden Electrical Co.).*
*1 Condenser, 0.0003 (McMichael: Clip-in type).*
*1 Panel, 30in. by 8in. (Paxolin).*
*2 Coils, No. 60 (Edison Bell).*
*1 Coil, No. 75 (Edison Bell).*
*3 Coils, No. 250 (Edison Bell).*
*2 Valve holders (Acrmonic: Type E).*
*2 Valve holders (Sterling: Non-pong).*
*1 L.F. transformer (Igranic: Type G, 3.6 : 1 ratio).*
*1 L.F. choke (Igranic: Type F).*
*1 Grid leak holder, porcelain (Bulgin).*
*1 Grid resistance, 100,000 ohms (Ediswan).*
*3 Switches, D.P.D.T. (Wearite: Anti-capacity type).*
*9 Terminals (Belling Lee).*
*1 H.F. choke (Climax).*
*1 Rheostat, 6 ohms (Igranic: porcelain type).*
*1 Rheostat, 10 ohms (Igranic: porcelain type).*
*1 pair grid bias battery clips (Bulgin).*
*1 Grid bias battery, 16½ volts (Siemens).*
*2 Dry cells (Ever-ready: "0" size).*
*1 Terminal strip, 28ins. by 1½in.*
*Baseboard (30 ins. by 12½ ins.), wire, screws, ebonite, etc.*

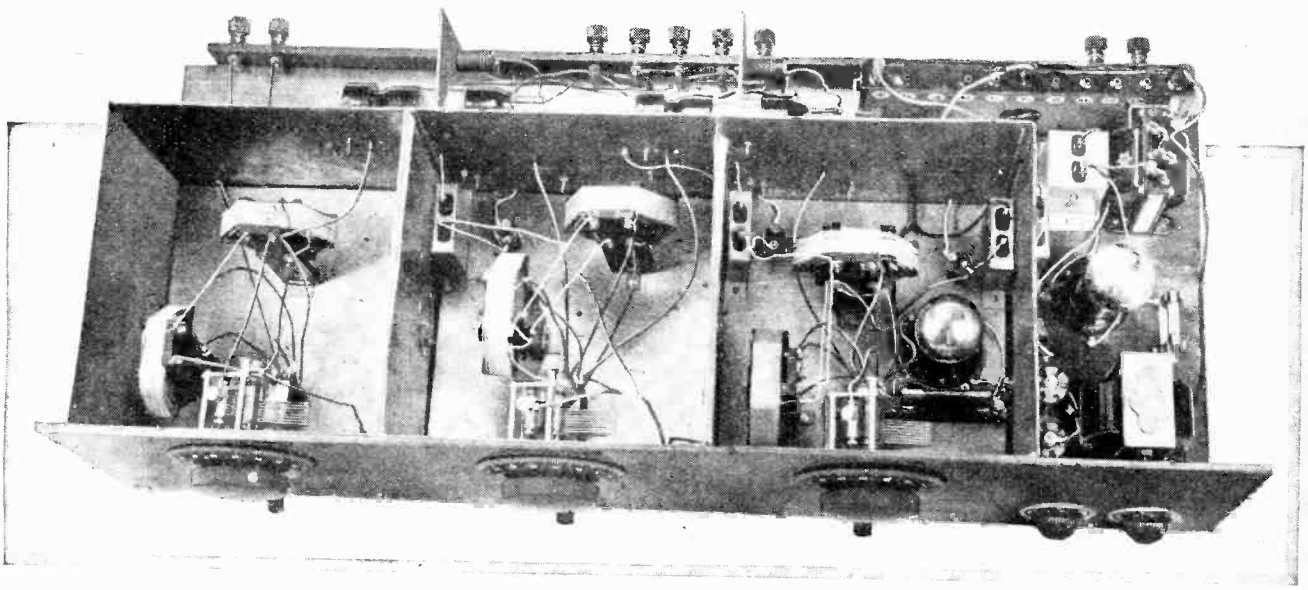
*Approximate cost (excluding screening box), £9 15s. 0d.*

In the "List of Parts" included in the descriptions of *THE WIRELESS WORLD* receivers are detailed the components actually used by the designer and illustrated in the photographs of the instrument. Where the designer considers it necessary that particular components should be used in preference to others, these components are mentioned in the article itself. In all other cases the constructor can use his discretion as to the choice of components, provided they are of equal quality to those listed, and that he takes into consideration in the dimensions and layout of the set any variations in the size of alternative components he may use.

wound in opposite directions in side-by-side slots cut in a short length of ⅝in. ebonite rod. The aerial-grid inductances ($L_1$, $L_2$) are Edison Bell coils, Nos. 75 and 250, stripped of their plugs and bands, and mounted by means of hardwood discs fitted with a screw to ebonite uprights, as shown in Fig. 3. The "inner" and "outer" ends of these coils are marked, respectively, G and F, in the various diagrams, indicating that they are ultimately connected to grid and filament of the first H.F. valve. A tapping (marked A) must be made for the aerial connection; its position will have an influence on the selectivity of the receiver, so it should not be permanently made without a test. As a guide, however, the 5th and 30th turn from the outer end in, respectively, the short wave ($L_1$) and long wave ($L_2$) coils are suggested as suitable points for average conditions.

The H.F. transformers are on the same lines as those described recently[1] in this journal. Edison Bell coils are used as secondaries, with an added single-layer primary winding carried on V-section spacing strips of insulating material which should have a thickness of $\frac{1}{32}$in. The completed transformer is mounted on a vertical ebonite strip measuring 5in. × 1¼in. × ¼in. thick, which carries four double soldering tags for anchoring the ends of the windings. It is also fitted with a small brass bracket for screwing to the baseboard.

For the medium-wave transformers, $T_1$, $T_2$, a No. 60 coil is used as a secondary. The primary, to suit an average valve, should have 35 turns of No. 38 D.C.C. wire, which is wound over the separating pieces with



**Plan view, with lid of screening box removed. In order to prevent interaction, the axes of the coils in each compartment are set at right angles.**

[1] "Building H.F. Transformers," by H. F. Smith: *The Wireless World*, October 3rd.

**The Kilo-Mag Four.—**

a very slight spacing between turns, so that it occupies the same winding length as the outer layer of the secondary.

Those who are experimentally inclined should wind on 40 primary turns—it is easy to remove some of them, but impossible to add any, when the set is wired up—with a view to ascertaining the transformer ratio which gives best results under their own conditions.

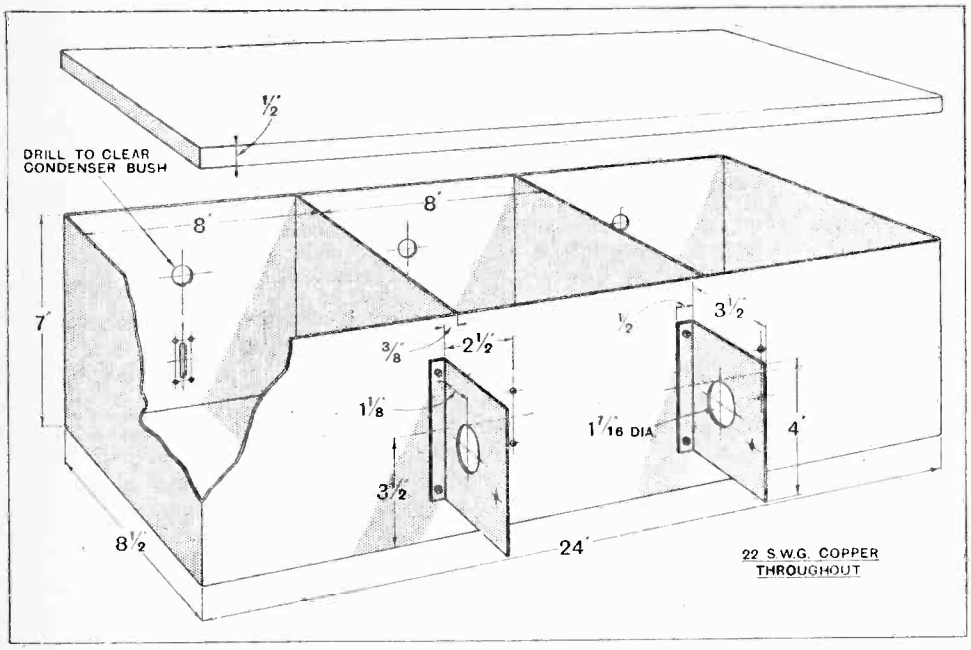



Fig. 4.—Details of the screening box and lid; a corner is cut away to show the slot and holes for the switch.

The long-wave couplings, $T_3$, $T_4$, are made and mounted in exactly the same way, with No. 250 coils as secondaries. The best average primary winding has 100 turns of No. 40 D.S.C. wire; again, this may be altered experimentally, but it is extremely unlikely that a *greater* number of turns will be needed.

It is necessary to observe certain precautions in mounting the panel, screening box, and variable condensers, as the spindles of the latter must be insulated from the metal work. Also, it must not be forgotten that the front surface of the box must be slightly set back from the rear of the panel, or otherwise it would be impossible to fit the lid. A suitable procedure is to drill the panel and screw it to the baseboard, afterwards placing the box in position temporarily and marking off the holes for switch arms and condenser bushes. The box should now be removed, and the condenser holes drilled in it, making them $\frac{1}{16}$in. diameter oversize, in order to provide a clearance. The slots for the switches should also be cut. Three distance pieces, made of sheet fibre, ebonite, or even wood, of $\frac{1}{16}$in. thickness, should be interposed between panel and box. These sheets, which may measure about 6in. × 3in., are also drilled and cut to pass the condenser bushes and switch arms. An insulating washer must also be inserted between each condenser and the metal work before the whole is finally assembled. Of course, these instructions with regard to insulation of the variable condensers do not apply to types in which both stators and rotors are already insulated. (*To be concluded.*)

# EXPERIMENTS ON COMMON-WAVE BROADCASTING IN GERMANY.

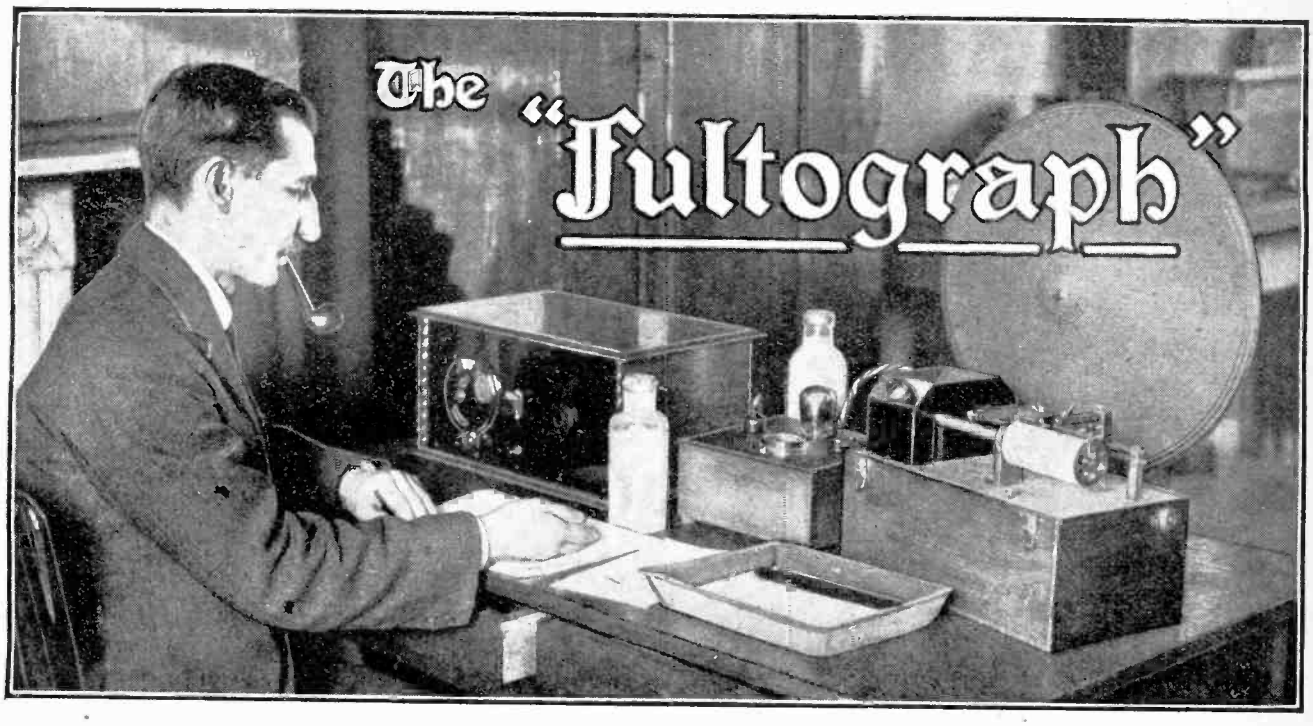
FOR some time past it has been the intention to provide a greater number of the moderate-sized towns in Germany with small transmitters, making use of common-wave broadcasting to enable this to be done without increasing the number of wavelengths occupied. It is planned, for example, to allow the transmitter at Stettin to work on the same wavelength as that at Berlin, and, in addition, to build a station at Magdeburg, some eighty miles from Berlin, and a second station to the east of Berlin, which is to work on the same wavelength as the previous Berlin transmitter. The researches of the State Department of Telegraphy in Berlin have shown that the simultaneous operation of such transmitters is undoubtedly possible.

The Department of Telegraphy has tested two systems, which have been worked out by the firms of Telefunken and Lorenz. Both systems make use of a fundamental frequency which is sent to the different transmitters, and there, by a suitable process of frequency-multiplication, made to provide the necessary wavelength. In this way it is possible to ensure that even a considerable number of transmitters operate on precisely the same wavelength, which can never be guaranteed, even with the most elaborate control apparatus, when each station is independently tuned. The Telefunken system makes use of A.C. of frequency 30,000, which is led to the various stations by overhead wires. Frequency multiplication takes place at each station in four stages; valves, working on the bottom bend of their characteristics, being used for this purpose.

In the Lorenz system a considerably lower fundamental frequency is used, this being about 3,000 cycles per second. This frequency is multiplied in three stages, using choke coils with iron cores, in the ratios 1 : 7, 1 : 9, and 1 : 11. The advantage of this process lies in the fact that the alternating current of comparatively low frequency can be brought to the transmitters along ordinary cables.

In testing common-wave broadcasting in practice, which has been done with several transmitters in Berlin itself, as well as with the transmitters at Berlin and Stettin, it was found that in general reception is completely distortionless. Between each pair of transmitters, however, there are apparently standing electric waves, which give rise to points of bad reception. These points, it could be ascertained, are separated by about half a wavelength from one another, which goes to prove that they are actually caused by standing waves. This "zone of distortion" is not very wide; it extends in the case of two transmitters for about 15 per cent. of the distance separating the two stations, and appears to grow smaller as the number of common-wave stations is increased. It will therefore be necessary so to dispose the various stations that the anticipated "zones of distortion" fall as far as possible in a sparsely populated district

H. K.



# The "Fultograph"

## First Complete Description of the Picture Receiving Machine.

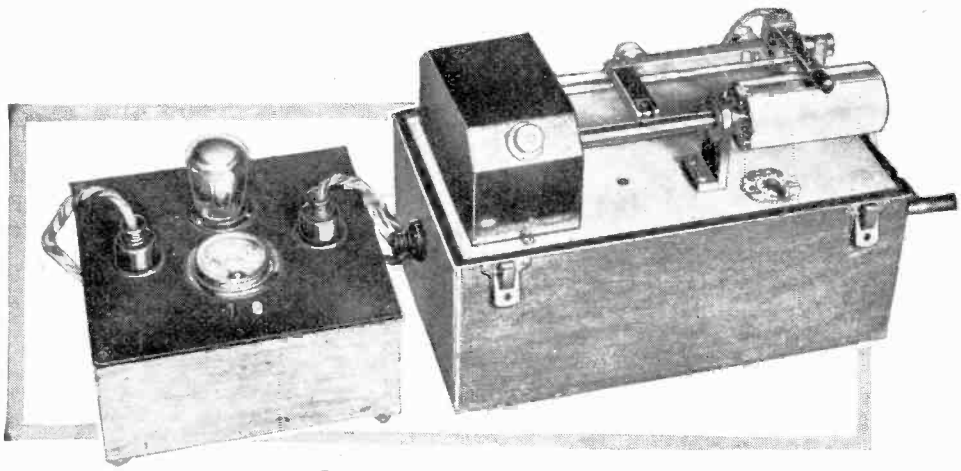
By F. H. HAYNES

PICTURE broadcasting in this country is to commence in a few days. Although only a limited number of receiving machines are at present available, the design has been standardised, so that it is now possible to describe in detail the picture machines as they are to be placed in the hands of listeners.

For more than two years progress in picture transmission and reception as applied to wireless has been closely followed in the pages of this journal. The indication that a picture broadcasting service would ultimately be established has been the trend of the many articles giving technical descriptions of the apparatus. The principal interests involved were those of Mr. T. Thorne Baker in association with Messrs. Watson & Sons, the scientific instrument makers, and later Mr. Otho Fulton, through whose initiative the design has been perfected and arrangements for a service set up. During the development stages no other interests have appeared in the field, so that the difficulties which might arise in the adoption of any one system in the face of rivalry have been avoided.

### "Carrier Frequency" Explained.

The "Fultograph" has been designed so that its pair of input wires take the place of those normally connected to the loud speaker. Before considering the receiver in detail, however, one must first take into account the nature of the transmission sent out by the broadcasting station. There, the picture to be transmitted is prepared as a transparency on a piece of film or as an ordinary black-and-white image, so that when attached to a cylinder a fine pencil of light can be passed through or on to it and analysed point by point by rotation. Light which passes through the trans-

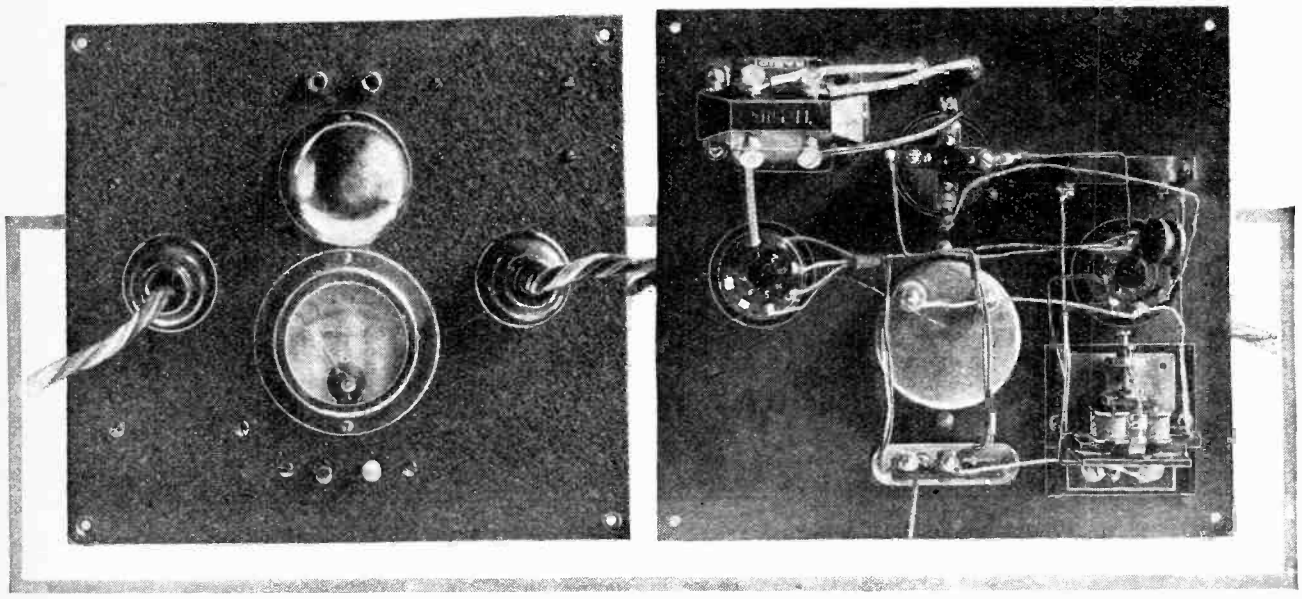


**Complete picture receiving equipment, consisting of rectifying panel and clockwork-driven machine with synchronising equipment.**

**The "Fultograph."—**

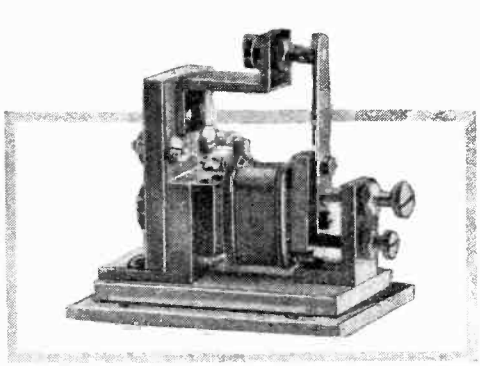
parent portions of the film image or which is dispersed from the white parts of the photographic print is directed to a photoelectric cell which generates current according to the amount of light falling upon it. Thus the varying light and dark portions are transformed into a varying voltage.

for the purpose of recording the image. As an alternative to the use of a photoelectric cell, the "Fultograph" system employs a transmitter in which a negative image in the form of an insulating gum deposit on a sheet of copper foil replaces the transparency or black-and-white photograph. The foil is wrapped around a cylinder and traversed line by line



A milliammeter is fitted on the rectifying panel so that the grid biasing potential can be correctly adjusted. Behind the panel is the input transformer and synchronising relay. Plug-in cable connectors join to the batteries of the receiver and the picture receiving machine.

A transparent or white part of a picture will produce a constant maximum potential and a black portion no potential at all. A varying current such as is thus obtained cannot be amplified by a customary form of L.F. amplifier, neither can it be used to modulate the waves from the broadcasting station. Pulses of current representing areas of white on the image under transmission must be broken up into an audio-frequency so as to be conveyed through amplifiers and modulator, and this is done either by interposing a revolving serrated disc in the beam of light falling upon the image or otherwise interrupting at audio-frequency the current flow which is controlled by the cell. This "carrier frequency," which breaks up the rising and falling current values derived from the changing amount of light falling on the cell converting them to an audio-frequency note of changing intensity will, in the coming transmissions, be of a frequency most suited to L.F. amplification such as 800 to 1,000 cycles. It should be noted that by this process the image at the transmitter must be reversed and in the form of a "negative," so that the cell becomes illuminated and the audio-frequency note sent out when it is desired that a current should be obtained at the receiver under a metal point so that the insulating image is made to interrupt a current. Instead of a direct current, an alternating one of a frequency of 1,000 cycles is applied, thus introducing the necessary carrier frequency. Line illustrations, including no half-tones of light and shade, merely appear on the foil as insulating lines and areas. For the transmission of half-tone or photographic pictures the image is created on the copper through a line screen, so that light and shade effects are produced by a variation in the width of the lines in the same manner as the size of the dots give black, white and half-tone effects in the newspaper reproduction of photographs. This method has already been described at considerable length in these pages.[1]



The relay is of simple yet robust construction. It is actuated by a current of less than 1 mA.

Coming now to the receiving set, it is apparent that the H.F. wave is modulated in the same way as if an instrument were sounding a 1,000 cycle note in front of the microphone, the light and shade portions being variations in its intensity. After passing the detector valve, therefore, the L.F. amplifier of the receiver is dealing with an alternating current of 1,000 cycles varying in amplitude, maximum amplitude resulting in the

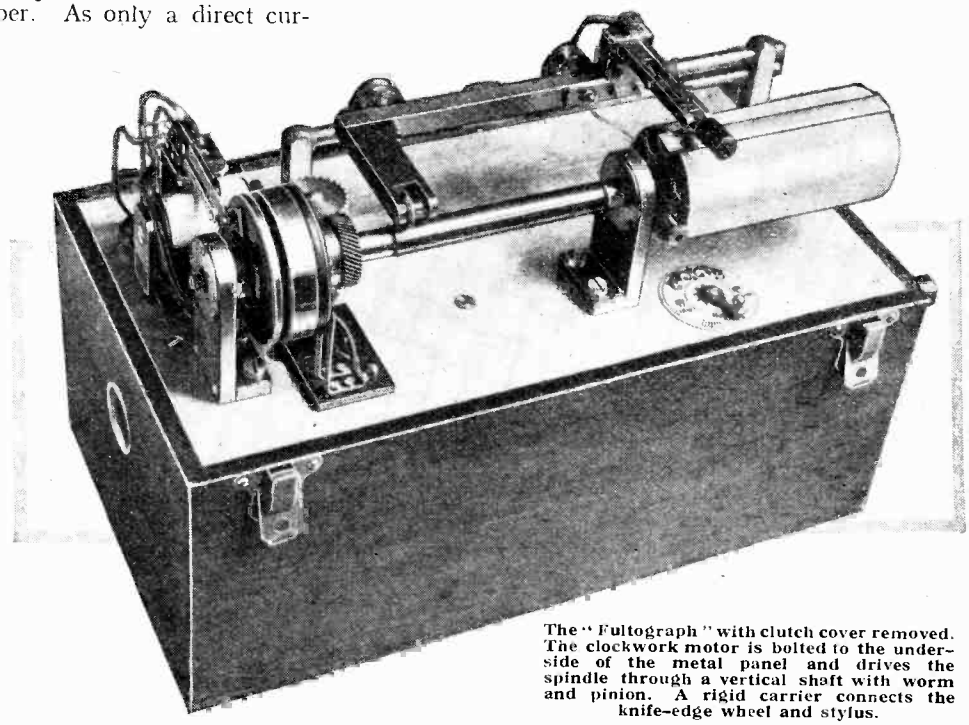
[1] "Picture Broadcasting," p. 377, September 26th, 1923; "Picture Transmission," p. 542, May 23rd, 1928.

**The "Fultograph."—**

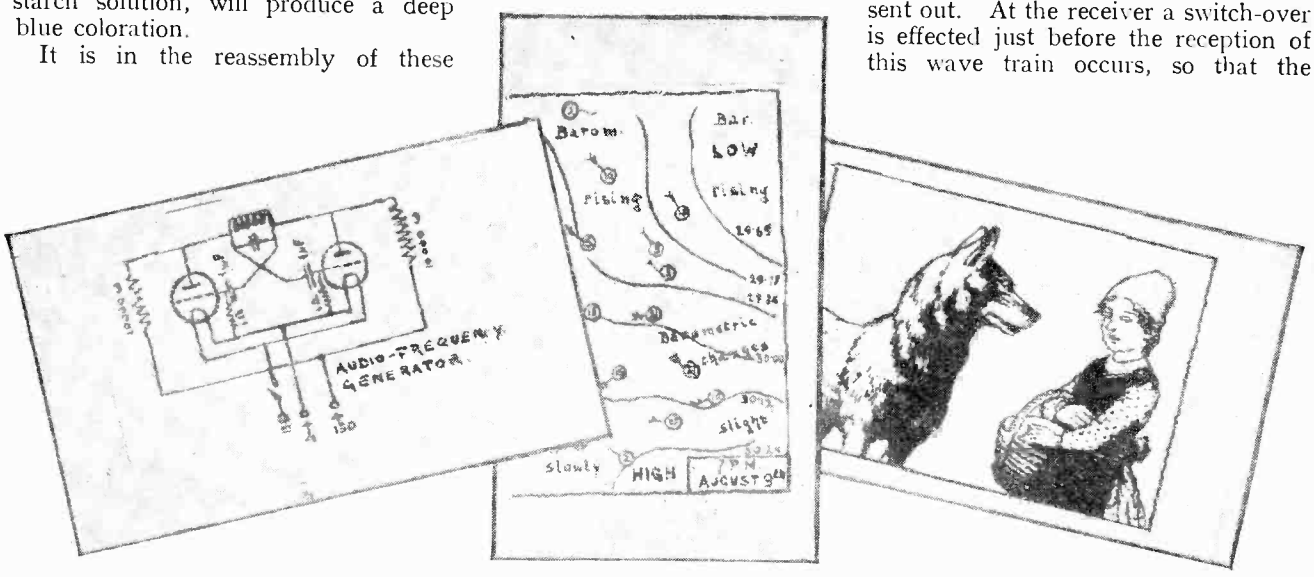
first place, of course, from maximum light falling on the cell at the broadcast transmitter. In the "Fultograph" picture receiving machine the image is formed by the action of this current upon a chemical solution carried on an absorbent paper. As only a direct current can produce the required chemical charge rectification of the 1,000 cycle alternating current accompanied by amplification is obtained by connecting the output terminals of the receiver to an additional rectifying valve. This valve, arranged as an anode-bend rectifier, suppresses half of the wave, so that the current in its anode circuit now rises and falls in accordance with the changing light values occurring at the original picture. A complete cutting off of the anode current of this valve, pending the arrival of the 1,000 cycle note conveying the picture, is obtained by adequate grid bias. In the "Fultograph" a milliammeter is fitted for checking this adjustment, which is normally made by increasing the grid bias up to a point where its reading is practically zero.

As is now well known, the electrolytic solution which is sensitive to the flow of current is mainly potassium iodide. A current of a few milliamperes applied for a very brief interval of time will release sufficient free iodine which, in the presence of a starch solution, will produce a deep blue coloration.

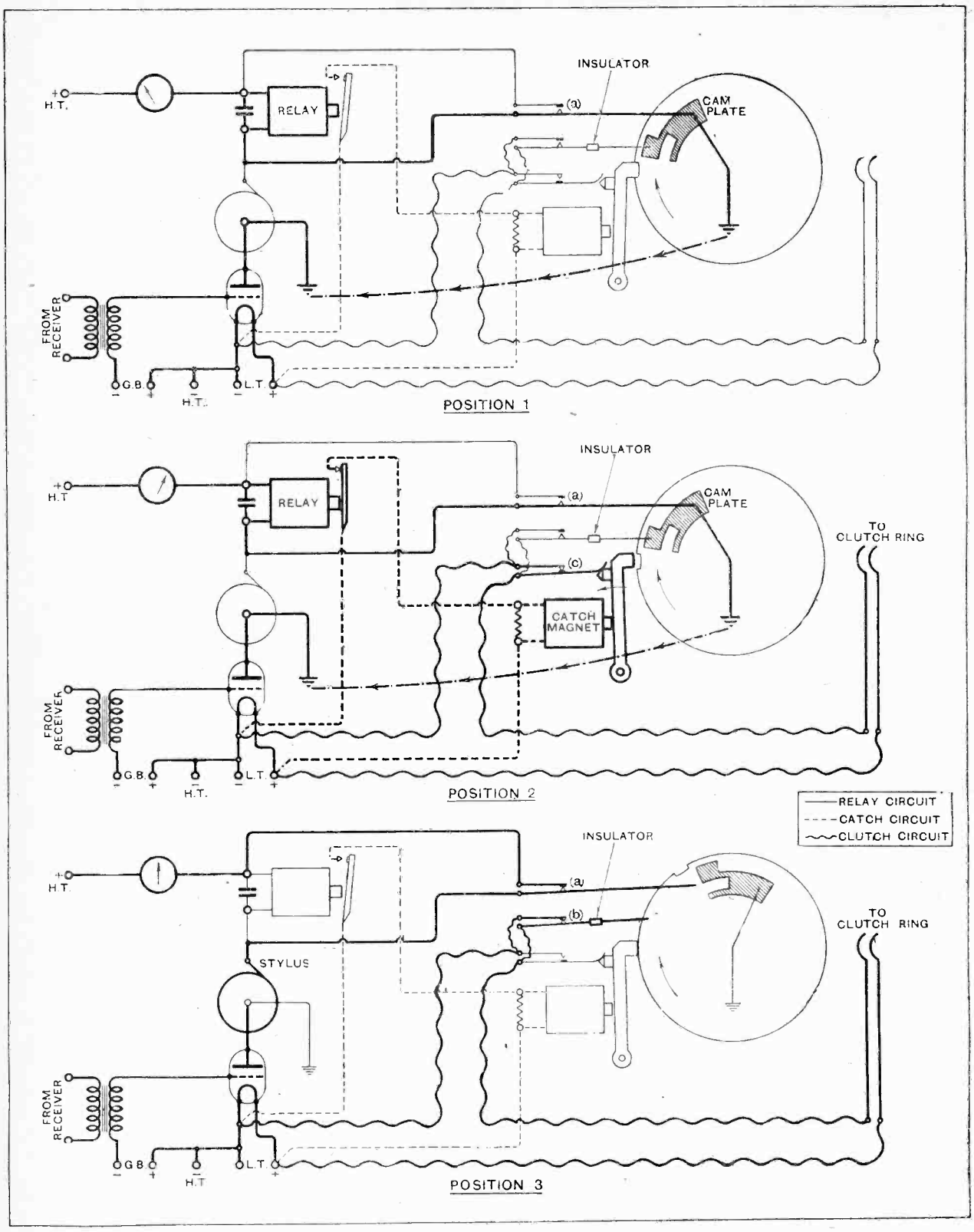
It is in the reassembly of these changing currents in synchrony with the point-by-point analysis of the picture at the transmitter that the characteristic details of the "Fultograph" system are to be found. Similar screw threads give a corresponding traverse of the revolving cylinders at transmitter and receiver, and synchronising mechanism is necessarily included so that the cylinders shall revolve precisely in unison. The particular circuit arrangement used for this purpose in the "Fultograph" is as follows: Each time the join in the picture on the transmitting cylinder is reached a brief modulated wave train is sent out. At the receiver a switch-over is effected just before the reception of this wave train occurs, so that the



The "Fultograph" with clutch cover removed. The clockwork motor is bolted to the underside of the metal panel and drives the spindle through a vertical shaft with worm and pinion. A rigid carrier connects the knife-edge wheel and stylus.




A severe test of the synchronising gear is made in the transmission of "line" illustrations. These three specimens were received by wireless on the "Fultograph" machine. Many pictures transmitted in half-tone have been given from time to time in these pages.



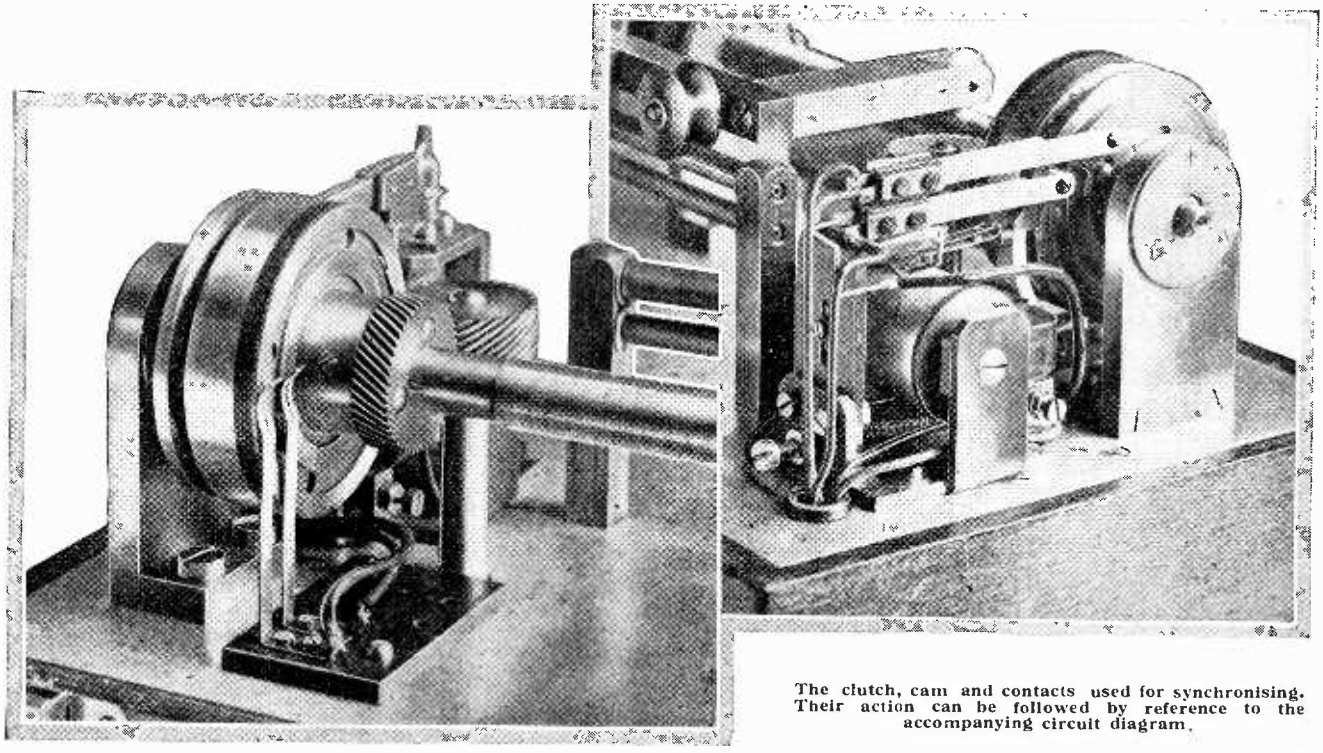

**Position 1 shows the current paths pending the arrival of the synchronising signal. In position 2 the relay is pulled over, the catch has released the cylinder and the clutch is energised. Position 3 shows the synchronising cam out of action and the incoming picture signals applied between stylus and cylinder.**

B 22

current is not applied to the paper, which has now reached the join, but is passed to a sensitive relay. Simultaneously with the switch-over the receiving drum is stopped by a catch falling into place. Now when the brief synchronising signal is received the relay is energised and its contacts close a circuit which, energising an electro magnet, pulls out the catch, thus restoring the rotation of the cylinder.

### The Magnetic Clutch.

By this means the receiving cylinder, which may be very slightly less in diameter than that of the transmitter, and running slightly faster, is briefly stopped once each revolution and released in step with the completion of each revolution of the cylinder at the transmitter. A careful perusal of the three accompanying diagrams shows the circuit arrangement of the cams and switches by which this synchronising effect is obtained. In position 1 the blade of switch A, in making contact with the brass cam on the cylinder, short-circuits the passage of current between the recording stylus and the paper. Opening against the cam plate, this switch does, moreover, remove the short circuit from the relay. It is in this position that the synchronising signal, which is about $\frac{1}{10}$th of a second in duration, is received. It should be noted, also, that this is the stationary position of the cylinder where it has been arrested by the catch falling into place. Position 2 shows the conditions existing immediately on receipt of the synchronising signal. The relay has pulled up, causing the catch to pull away, and the cylinder is released. It is essential that the cylinder shall start at its normal running speed at once. For this purpose the clockwork drive runs continuously and is not subjected to this stopping action. It drives the cylinder, however, through a magnetic clutch. As the catch pulls out, therefore the contacts C are closed and the clutch energised. Almost spontaneous starting of the cylinder, hence results when the synchronising signal is created at the transmitter. Before the synchronising signal has ceased the cam plate has moved away from the blade of switch B, so that it closes as in position 3 and takes charge of the energising of the clutch. The relay now falls open and the catch drops forward ready to engage again, opening the contacts C which are in parallel with B, while the picture-recording circuit of the stylus is again restored by the removal of the short circuit created by the switch blade A rubbing on the cam. The closing of switch A takes the relay out of action by short-circuiting it.



The clutch, cam and contacts used for synchronising. Their action can be followed by reference to the accompanying circuit diagram.

### The Valve Rectifier Panel.

So that the "Fultograph" can be quickly brought into action, all connections are made by multi-wire cables and push-in connectors. A battery cable is supplied which is left permanently connected to the battery terminals of the receiving set. This, of course, is a five-wire cable for conveying L.T., grid bias and the anode current. It does not matter to which side of the L.T. battery the H.T.– is connected in the receiving set. The rectifying equipment, which is built as a separate unit, is connected to the picture receiving machine by a six-wire cable and push-on connectors. A 1 to 6 ratio transformer in the grid circuit of the valve is mounted

**The "Fultograph."—**

under the rectifier panel and isolates the picture receiver from direct contact with the audio-frequency circuits of the receiver. Under the rectifier panel also is the relay. It is of the non-polarised type, and its two bobbins give a total resistance of 4,000 ohms. A press button "on" and "off" switch is fitted on the panel, which is of $\frac{1}{8}$in. aluminium with a black crystalite finish.

A similar type of panel forms an assembly plate for the machine, with a double-spring motor bolted beneath. Drive to the clutch is by a vertical shaft with brass to fibre worm and pinion. Totally enclosed ball bearings support the spindle which, on passing through the clutch, carries the cam plate. For cross traversing a thread of pitch 0.4 mm., or about 60 to the inch, is used. The cylinder, which is readily removable from the spindle, is 4in. in length by $1\frac{5}{16}$in. in diameter. As the total traverse of the screw is $3\frac{13}{16}$in., the maximum size of the picture becomes $5\frac{1}{2}$in. $\times 3\frac{3}{4}$in. At a normal running speed of 50 revolutions per minute, $4\frac{1}{4}$ minutes will be required to receive a picture $3\frac{5}{8} \times 5\frac{1}{2}$in.

When damp the images are of purple colour, and on drying off change to sepia. Line and half-tone images are received with equal success, the former being a severe test of the merit of the synchronising device. Quite a weak signal will record a picture, and a normal receiving set will probably give picture reception from foreign stations. It is likely, also, that modulation for picture broadcasts will be far in excess of the customary 20 per cent. In the hands of the enthusiast, moreover, refinements in receiving and rectifying equipment will permit of the recording of pictures at ranges corresponding with the limits of broadcast reception. Home construction of the rectifying panel to suit the valves, and embodyng possibly refinements in relay design, will no doubt be undertaken while making use of components already to hand. Modifications in the rectifier, although possible, are unnecessary, and the entire equipment, including every detail of the machine itself, has been so carefully developed that changes in design for some while to come would seem unlikely. It is only by careful investigation of the action of the mechanism that the merits of the design of the "Fultograph" are fully appreciated. Readers are aware that the production of the present equipment is the outcome of a slow process of evolution, so that the machine of to-day has undoubtedly passed beyond the stage of being experimental.

# CLUB REPORTS AND TOPICS

**Lecturettes.**

"Lecturettes" by members are a feature of the meetings of the Radio Experimental Society of Manchester. At the last meeting the first lecture was provided by Dr. Hodgson, who demonstrated a *Wireless World* portable set incorporating an extra L.F. stage. The next speaker was Mr. Levy, who described the "Fultograph" receiving apparatus. His remarks were of special ifiterest to those members who intend to work the "Fultograph" apparatus at the Manchester Radio Exhibition now being held in the City Hall.

"Woodworking as Applied to Wireless Purposes" was the title of Mr. Meadowcroft's contribution, in which members were given invaluable hints on the choice of woods and the use of tools. Mr. Fox, discussing R.C. and transformer coupling, deprecated the practice of considering the two systems as rivals, and urged that they should be regarded as complementary.

Joint hon. secretaries: Mr. J. Levy, 19, Lansdowne Road, West Didsbury, Manchester, and Mr. R. M. Kay, B.Sc., 82, Daisy Bank Road, Victoria Park, Manchester.

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**Technical Lectures in Brighton.**

The Brighton and Hove Branch of the Wireless League has formed its technical section, with a course of lectures to be given twice a month on modern wireless technique under the direction of Mr. Arthur W. Privett. Meetings are held at the Union Church Institute, Queen's Square, Brighton.

Hon. secretary: Mr. W. H. Summarsell, 1, Clifton Street, Brighton.

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**Eighteen Years.**

The conclusion of the eighteenth year in the history of the Newcastle-upon-Tyne Radio Society was celebrated at the annual general meeting on October 8. The secretary reported a satisfactory year. The meetings have been largely of an impromptu nature. Several interesting visits were paid to works in the neighbourhood, and an interesting event was a tour round the Newcastle Telephone Exchange. Outdoor meetings included a field day in the Rothbury district, when Mr. Fabian gave a striking demonstration of short-wave reception, and two trips on the Tyne in a motor launch. A notable success of the year had been the beginners' class.

The Society is seeking new members, and offers every inducement to wireless enthusiasts in the neighbourhood. An attractive syllabus has been prepared, and it is hoped to carry out experiments in television.

Hon. secretary: Mr. W. W. Pope, 7, Kimberley Gardens, Jesmond, Newcastle-on-Tyne.

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## FORTHCOMING EVENTS.

**WEDNESDAY, OCTOBER 24th.**

*Tottenham Wireless Society.—At 8 p.m. At 10, Bruce Grove. Lecture: "The Ether," by Mr. R. C. A. Haynes.*

*Muswell Hill and District Radio Society.—At 8 p.m. At Tollington School, Tetherdown. Installation of Moving Coil Loud Speaker.*

*Edinburgh and District Radio Society.—At 8 p.m. At 117, George Street. Lecture: "Transformers," by Mr. P. Butler, B.Sc., A.M.I.E.E.*

**THURSDAY, OCTOBER 25th.**

*Leyton and Leytonstone Radio Society.—At 8 p.m. At Grove House, High Road, Leyton. Lecture and Demonstration: "Mains Eliminators."*

*Slade Radio (Birmingham). At 8.15 p.m. At 8, Victoria Road, Erdington. Members' Night. Fifth Talk on Electricity.*

*Ilford and District Radio Society. At 8 p.m. At the Wesleyan Institute, Ilford. Discussion: "Advance in the Design of Receivers.*

**MONDAY, OCTOBER 29th.**

*Newcastle-upon-Tyne Radio Society.—At 7.30 p.m. At 11, Saville Row. Film of the Annual Field Day.*

*Hackney Radio and Physical Society.—At 8 p.m. At Hackney Electricity Hall, 18-24, Lower Clapton Road. Short Wave Night.*

**Picture Broadcasting.**

Mr. F. H. Haynes, assistant editor of *The Wireless World*, addressed the Wembley Wireless Society on October 12th on the subject of wireless pictures. In opening his lecture Mr. Haynes said that the machine on view was the only one of its kind in the British Isles, and that it had been specially sent over by air from the Continent so as to be in time for the meeting. Specimen pictures on prepared copper foil were exhibited, and the working of the machine was clearly shown by illustrations on the blackboard. The simplicity of operation was emphasised, but attention was drawn to the necessity of exact synchronisation between the speed of the drum in the broadcasting studio and of that in the machine.

On Friday next Capt. Plugge will entertain members with a cinema radio travel talk. All enthusiasts are invited to attend.

Hon. secretary: Mr. H. E. Couben, B.Sc., 24, Park Lane, Wembley.

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**Moving Coil v. Cone.**

Surprising results were obtained at the last meeting of the Ilford and District Radio Society, when a coil-driven loud-speaker was compared with a double-cone type. The instruments were operated from a set embodying a Ferranti push-pull transformer. The excellent performance of the cone astonished everyone present, the reproduction of both high and low notes arousing special comment. It was noticed that the cone gave clearer volume than the moving coil instrument.

Hon. secretary: Mr. C. E. Largen, 16, Clements Road, Ilford.

# CURRENT TOPICS

## Events of the Week in Brief Review.

### WIRELESS "ON TAP."

The Llandudno Urban District Council has sanctioned the proposals of Broadcast Relay Service, Ltd., for a broadcast reception relay station in the town.

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### LISTENERS' LIFE INSURANCE.

German listeners will receive a welcome New Year present in 1929, when, in return for their licence fee, they are to be granted free insurance against death, personal injury, and damage to property arising out of the use of wireless.

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### ANXIOUS DAYS FOR THE CROOKS.

The establishment of a chain of police wireless stations round Britain is to be considered at a Scotland Yard conference early in November. The proposals include the provision of wireless picture transmitters and receivers for the interchange of finger-prints and portraits of criminals.

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### AUSTRIA INAUGURATES PICTURE BROADCASTING.

The first official picture broadcasting service in Europe was opened on Monday, October 15th, by the Austrian Broadcasting Company, using the "Fultograph" system. The inaugural ceremony at the Vienna station was attended by the President of the Austrian Republic and his Ministers. Accompanying his portrait, which was the first to be transmitted, President Hainisch sent the following written message: "All success and widest circulation to Austrian picture broadcasting."

The picture transmissions take place daily between 3.30 and 4.0 p.m. (Central European time) and after 11.30 p.m.

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### PICTURE TRANSMISSIONS AT MANCHESTER SHOW.

Daily picture transmissions, using the "Fultograph" system, are taking place in the City Hall at the Manchester Wireless Exhibition.

The transmitter, which has been lent by the Association of Radio Societies, is situated in the gallery and is working, it is understood, on a wavelength of 70 metres and with an input of approximately 20 watts. The pictures are received on three sets in different parts of the hall.

### A POPULAR CAUSE.

At the inauguration of the new wireless installation in Berrington Hospital, near Shrewsbury, it was stated that the greater part of the £200 required had been publicly subscribed within a fortnight.

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### TOO PORTABLE?

Messrs. The B. and J. Wireless Co., of 2 and 3, Athelstone Mews, Stroud Green Road, London, N.4, would welcome information concerning the whereabouts of an All-British Super-Four portable set, No. C144, taken from their works a few days ago. The number of the Mullard Pentode in the set is 1436.

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### REAL HIDDEN TRANSMITTER HUNT.

The Italian exile, Pertini, whose secret wireless transmitter was discovered by the French police in a forest cottage at Eze, near the Italian frontier, a few days ago, has confessed that he was engaged in transmitting to his political friends the text of anti-Fascist articles which could not be taken across the frontier. He refused to indicate the station with which he had been working.

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### 'PHONING TO CANADA.

The Transatlantic Telephone Service was extended last week to include all parts of the Provinces of Ontario and Quebec. The minimum call fee for a three minutes' conversation varies between £9 and £11 8s., according to district. Subscribers wishing to book a call should ask their local exchange for "Canadian Service."

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### "WHAT'S ITS HORSE-POWER?"

Tired of the careless manner in which Press and public allude to "super power" in broadcasting stations, Mr. O. H. Caldwell, of the U.S. Federal Radio Commission, suggests rating all stations according to their horse-power. This system, he contends, would give uninformed people a truer conception of the comparatively small power used by even big stations. "Sixty-five horse-power stations like WEAF and KDKA, both 50 kW. transmitters," he explains, "are not really formidable when compared with a seven-passenger automobile which consumes almost exactly the same amount of power."

### ONLY INSIPID.

"On the ordinary wavelengths I also found that there was a tendency for insipid oscillation to take place."—Wireless correspondent in a Northern paper.

This gentleman is fortunate. Most of the oscillation we have met with has justified a stronger adjective.

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### NOT PAYING THE PIPER.

The resignation of Mr. Eric Dunstan and other European members of the staff of the Indian Broadcasting Company has followed an uphill battle for many months with inadequate funds and a consequent lack of popular interest in the programmes. At the beginning of this year Mr. Dunstan returned to England for a short time in an endeavour to raise more capital. He obtained promises of £10,000.

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### CABLE *v.* WIRELESS AGAIN.

A rival to the Transatlantic Wireless telephone service is foreshadowed by the announcement of the Bell Telephone Co. of New York that its engineers have perfected a cable which can be used for submarine telephony over long distances. The construction of a Transatlantic telephony cable is now under consideration.

Meanwhile it is interesting to note that the British Post Office and the American Telegraph Co. have decided to build additional wireless transmitters for the Atlantic telephone service. There are at present two channels available, and it is hoped that a further transmitter may be available by July next. The construction of yet another is being considered.

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### SCHOOL FOR HOME CONSTRUCTORS.

Parisian listeners who are anxious to obtain personal tuition in the construction of wireless sets are catered for by a "radio school" which announces the opening of its sixteenth course of instruction. The course lasts two and a half months and is intended to provide students with a practical knowledge of set building and the detection of faults.

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### A ROOF ADVENTURE.

The world is wonderfully quick at suspecting felony, and the fact that the suspect is a wireless enthusiast does not necessarily soften suspicion. Mr. A. G.

Cheetham, who was acquitted at the Greenwich Police Court recently of a charge which might be levelled at many a wireless amateur, can bear testimony to the truth of the above statement. According to his own declaration, on oath, which the magistrate accepted, Cheetham was erecting an aerial on the roof of his house. But his neighbour saw him step on to the roof next door and called a policeman, with the result that the enthusiast was charged with trespassing for an unlawful purpose. Which shows that one cannot be too careful!

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### HOW TO LISTEN.

"One listens best, I think, reclining at one's ease on a divan or in some luxurious armchair. If the room be long and narrow, a divan similarly proportioned and covered with one of the damasks of artificial silk and wool, patterned also with Chinese themes, will fit in admirably."—Mrs. Gordon-Stables in The Woman's Page, *Daily Express*.

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### G.R.C. AMATEUR-BAND WAVEMETER.

In connection with the review of the above instrument in the issue for October 17th, it should be noted that the agents in this country for all G.R.C. products are Messrs. Claude Lyons, Ltd., 76, Old Hall Street, Liverpool.

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### A MYSTERIOUS "RADIO SOCIETY."

Readers in India may be glad to have their attention drawn to a warning which appears in the *Indian Radio Times* concerning advertisements in that journal issued by the "Indian Radio Society." In response to the announcements several people have forwarded the 10s. subscription asked for, but beyond a formal acknowledgment, have heard nothing further. Confidence is not restored by the avowal of the *Indian Radio Times* that the advertisements have not yet been paid for, and that no reply can be obtained from the advertisers!

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### PLEA FOR SLOW ANNOUNCEMENTS.

A tribute is paid to British and Dutch announcers in a letter printed in the *Christian Science Monitor*, Boston, U.S.A. The writer complains that American announcers speak too fast.

"Here, in Bloemfontein," he says, "there are numerous radio enthusiasts who operate short-wave radio sets. We receive radio programmes over the ether fairly consistently as regards volume, but we sometimes find it most difficult to follow your American announcers—they speak so very rapidly. In this respect KDKA is not quite so bad, but WGY and several other stations deliver their announcements too quickly. Chelmsford, England, and PCJJ, Hilversum, Holland, announce so that every word is distinct."

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### NEW TRANSMITTER AT EINDHOVEN.

A new short-waver with the call sign PBF5 is now operating from Eindhoven on a wavelength of 41.3 metres.

The station is intended for communication with amateur stations throughout the world, and already excellent reports have been received from various parts of Europe.

Readers who hear this station are requested to communicate with Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.

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### INTERNATIONAL SIGNALS CODE.

The compilation of a revised International Code of Signals in seven languages, viz., English, French, German, Italian, Japanese, Norwegian, and Spanish, is the task before the international committee now in session under the chairmanship of Mr. Herbert G. Williams, M.P., Parliamentary Secretary of the Board of Trade. The formation of this committee is the outcome of a recommendation made by the British Government last year at the International Radio Conference in Washington.

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### TRANSATLANTIC LUNCHEON SPEECH.

Sir William Joynson-Hicks, the Home Secretary, listened last week to an after-luncheon speech delivered by a speaker who was over three thousand miles away from the luncheon party. The occasion was the inauguration of a new factory at Brentford of the Firestone Tyre and Rubber Co., and the speaker was Mr. Harry S. Firestone, whose address was conveyed *via* the Transatlantic telephone from Akron, U.S.A. Every word was heard clearly on loud speakers distributed round the hall.

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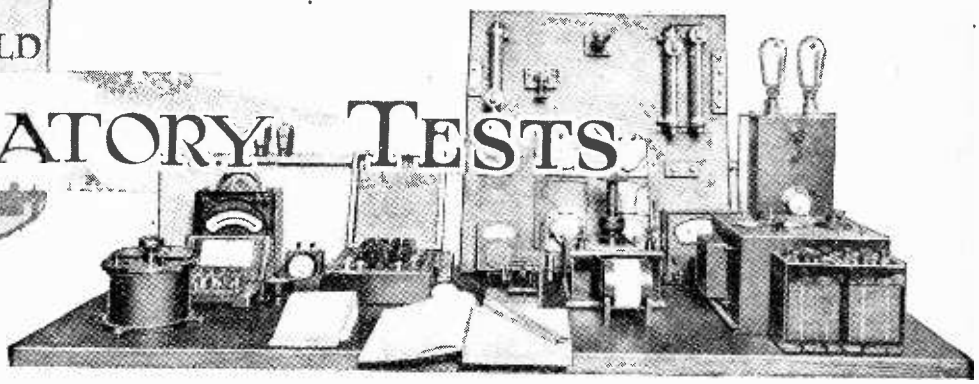
### SUNDAY EVENING CONCERTS FROM HOLLAND.

On Sunday last listeners in Britain were able to hear the first of a series of fortnightly broadcasts from Hilversum, carried out by arrangement with Messrs. Brandes, Ltd., manufacturers of the well-known Brandes radio products. It is stated that the object of these concerts is to help to bridge the gap between 5.30 and 8 o'clock on Sunday evenings, when the B.B.C. stations are closed down. The programmes consist of orchestral selections under the direction of Hugo de Groot. Public views and criticisms on the transmissions, which will be made on 1071 metres, are invited by Messrs. Brandes, Ltd., and should be addressed to Cray Works, Sidcup, Kent.

**AMATEUR TRANSMITTERS IN CONFERENCE. Many well-known transmitters will be recognised in this photograph taken at the Annual Convention of the Radio Society of Great Britain, on September 29th last, at the Institution of Electrical Engineers. Full plate prints of this photograph are obtainable, price 3s. each post free, on application to the Society.**

WIRELESS WORLD

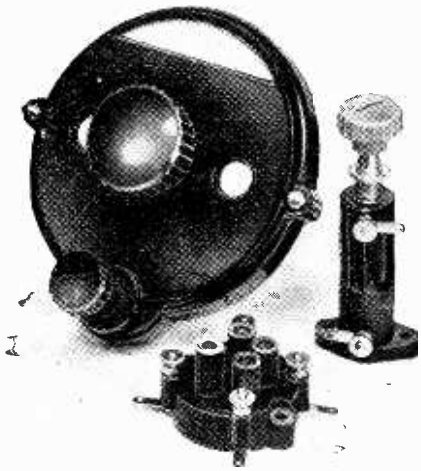
# LABORATORY TESTS



## A Review of Manufacturers' Recent Products.

### NEW HARLIE COMPONENTS.

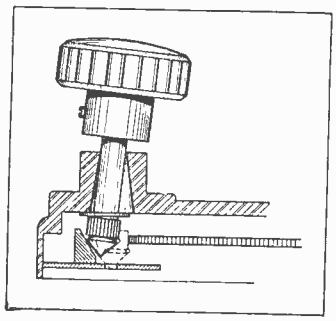
*Slow Motion Dial (Model 15).*—The indicating dial is 3¼in. in diameter, giving an open 100-degree scale, and is enclosed in a moulded shell with circular windows for station logging and a celluloid window at the top carrying a hair line. The paper dial is mounted on a brass disc driven directly by the large central knob. The edge of the disc is serrated and a vernier pinion, operating against spring tension, engages with the edge of the dial when the bottom adjusting knob is pushed forward. This gives



**Harlie slow-motion dial, neutralising condenser and anti-microphonic valve holder.**

a positive gear drive of 16 to 1 when required; normally the slow-motion gear is out of action. A saw-cut is provided in the vernier knob for remote control on short waves, making use of a long insulated screwdriver. The component as a whole is soundly made, and the vernier pinion disengages without altering the dial setting. The price is 4s. 3d.

*Neutralising Condenser.*—This component is notable for its perfectly fitting fast thread adjustment which is entirely free from side play or backlash and enables the neutralising point to be found with rapidity and precision. The electrodes are concentric and short-circuiting is therefore impossible. Capa-



**Slow-motion device in the Harlie dial.**

city measurements show the minimum to be 8 micro-mfds. and the maximum 32 micro-mfds. The price is 3s. 9d.

*Anti-microphonic Valveholder.*—Both the sockets and suspension in this valve holder are made from phosphor-bronze coil springs which are soldered to the terminal tags. Screw terminals are also provided, and the price is 1s. 3d.

All the above components are made by Messrs. Harlie Bros., Balham Road, Lower Edmonton, London, N.9.

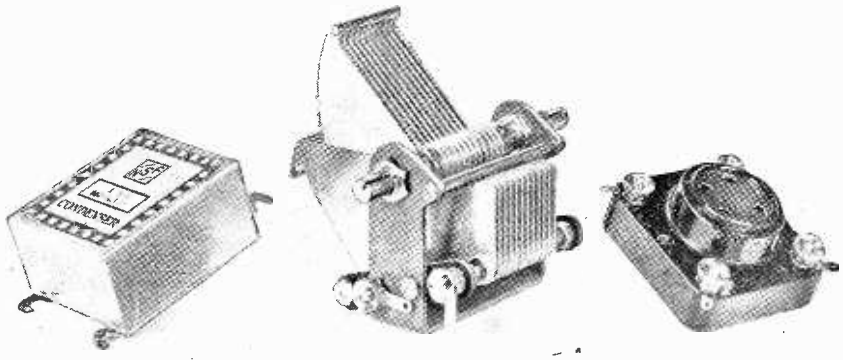
### N.S.F PRODUCTS.

The N.S.F. new type log condenser is probably the most important of this series of components. It is made in two capacities, 0.0005 mfd. at 7s. and 0.0003 mfd. at 6s. 9d. Although low in price, the workmanship is exceptionally good and the condenser is in every way a precision job worthy of the highest class receivers. The bearings are adjustable and the hollow shaft is fitted with an extensible spindle the length of which may be adjusted to suit any make of slow-motion dial. A specimen 0.0005 mfd. condenser was found to have a maximum capacity of 0.000565 mfd. and a minimum of 14 micro-mfd.

The N.S.F. valve holder sells at 1s. 6d. and is of the non-microphonic type. The valve legs fit into holes drilled in the spring-mounted moulded body, contact being made by flat springs recessed into the sides of the holes. The top of the holder is protected by a dust cover with an annular selector ring which prevents incorrect insertion of the valve.

The N.S.F. reservoir condensers are of the paper-dielectric type and are obtainable either with soldering tags or with terminals.

All the above products are handled by Messrs. S. W. Lewis & Co., Ltd., 39, Victoria Street, London, S.W.1, who are also agents for "Weilo" transformers.



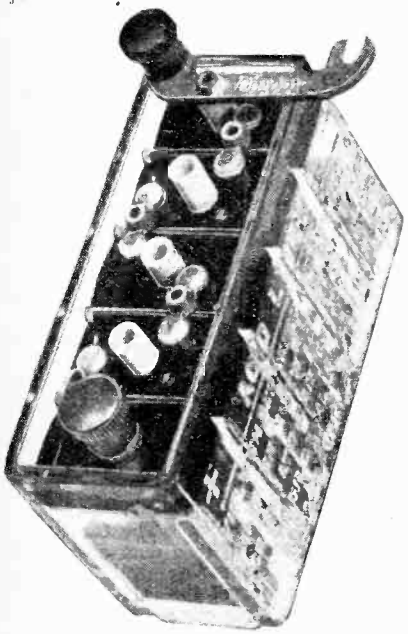
**N.S.F. new type log condenser, spring-mounted valve holder and 2 mfd. fixed condenser.**

## TUDOR H.T. UNITS.

The new type 5 H.T.1 unit is made on the monobloc principle and consists of five cells in a single glass container with moulded glass partitions. The disadvantages of this form of construction have been entirely overcome by the use of external intercell connectors above the surface of the sealing compound. The tops of the glass partitions also protrude above the surface of the wax so that there is no possible chance of leakage between the cells. With the connectors exposed in this way adjustment of the H.T. voltage in 2-volt steps is possible.

To prevent the accumulation of acid on the top of the battery due to spraying, exceptionally long porcelain vents are fitted which effectively trap any spray.

Each unit is supplied with a slotted bridge piece for connection to the adjacent unit in the battery.



**The new Tudor type 5 H.T.1. high tension unit.**

The 5 H.T.1 unit, which costs 7s. 6d., has a capacity of 2,500 mA/hours and will hold its charge for three months. A larger size, type 5 H.T.2, is available at 10s. The makers are Tudor Accumulator Co., Ltd., 2, Norfolk Street, London, W.C.2.

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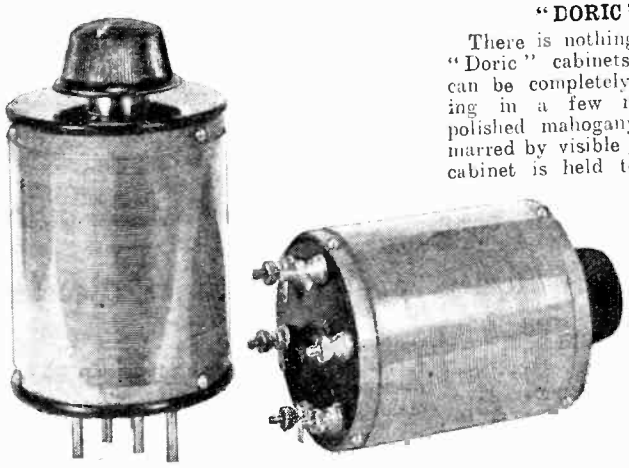
## DAVEX TUNERS.

The Davex tuner units cover wavebands from 200 to 600 and 1,000 to 2,000 metres, and are made in two types, one with terminals and soldering tags for panel mounting, and the other with pins for fitting the standard six-pin baseboard mount. The units are both exceptionally neat and compact, the length being only 3in. and the diameter 2½in. The outer paxolin former carries the short-wave coils, which are protected by sheet celluloid. Aerial and reaction windings are placed at opposite ends of the grid winding, the turns of which are spaced in accordance with the best practice.

Mounted concentrically inside the short-wave former is a 1⅝in. tube carrying the long-wave coils. These are pile-wound, and comprise the usual aerial, grid and reaction windings. A radial type three-contact switch mounted on the underside of the top end plate changes all three coils from long to short waves.



**Davex tuner units for six-pin base and panel mounting.**

The switch is operated by a single knob, and the three contact bushes are insulated from each other.

The spaced turns in the short-wave winding and the pile-wound long-wave coils, as well as the compact construction, raise the Davex unit above the general run of tuner units.

The makers are the St. Mary's Motor Co., St Mary's Road, Market Harborough.

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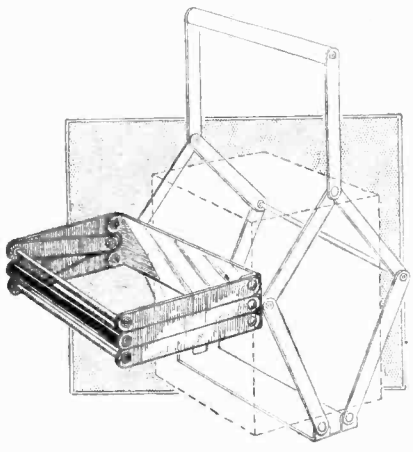
## WESTON ACCUMULATOR CARRIER.

This carrier is built up of aluminium and immediately adjusts itself to the size of the accumulator to be transported. It will accommodate the majority of 2-, 4-, and 6-volt L.T. batteries and the heaviest battery can be carried without discomfort as the handle is fitted with an ebonite roller. Considerable ingenuity has been displayed in the arrangement of the riveted joints, so that the carrier folds together neatly when not in use and can be carried in a coat pocket.

The carrier is made by The Horstmann Gear Co., Ltd., Newbridge Works, Bath, and the price is 2s.



**Weston adjustable accumulator carrier.**

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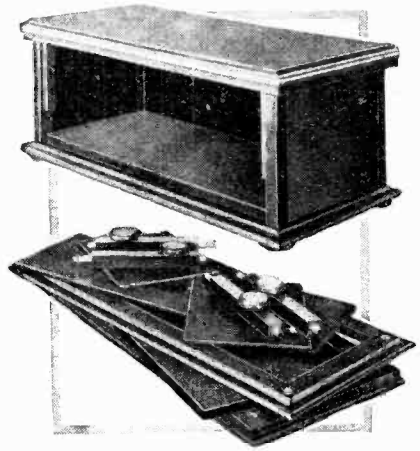
## "DORIC" CABINETS.

There is nothing in the appearance of "Doric" cabinets to indicate that they can be completely dismantled for packing in a few minutes. The french polished mahogany finish is in no way marred by visible jointing devices, as the cabinet is held together by well-fitting internal wood pegs projecting from the corner posts into the baseboard and the top frame carrying the hinged lid. The sides fit into grooves in the corner posts, and, if desired, metal screening plates may also be inserted on the inside.

The sizes range from 12in. × 7in. × 7in. to 24in. × 8in. × 10in. at prices from 21s. to 42s. 6d. The makers are Messrs. Thomas O'Brien, Ltd., 30, Slater Street, Liverpool.



**"Doric" collapsible cabinet, which is obtainable either in french polished mahogany or oak.**

## CATALOGUES RECEIVED.

Hobbies, Ltd., Dereham, Norfolk.—Illustrated 280-page catalogue with Radio Section and other sections of interest to the constructor who builds his own cabinets; price 9d.

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The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, London, E.C.4.—"The Valve Catalogue"—illustrated list of all current Ediswan valves, complete with characteristic curves.

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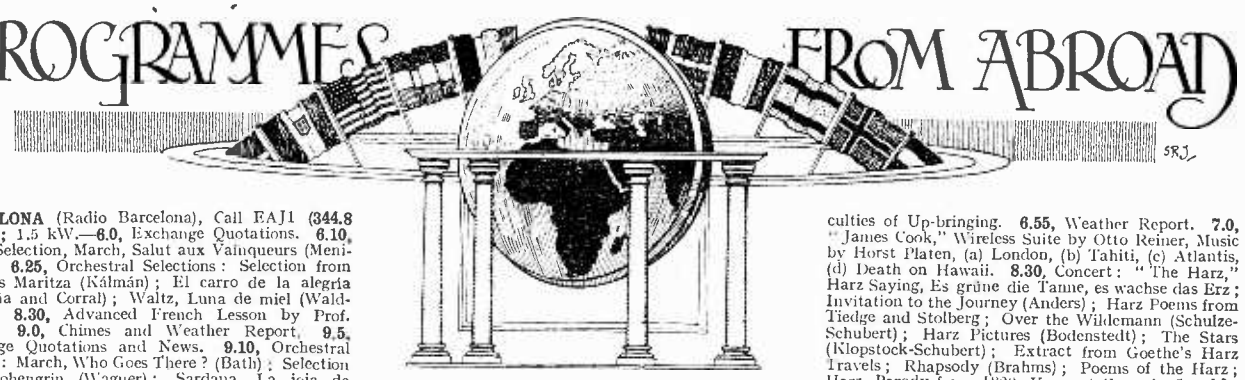
Evershed and Vignores, Ltd., Acton Lane Works, Chiswick, London, W.4.—"Insulation Testing," a handbook showing the applications of the "Megger" to electrical testing.

# PROGRAMMES FROM ABROAD



## SATURDAY, OCTOBER 27th.

All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.

**BARCELONA** (Radio Barcelona), Call EAJ1 **(344.8 metres)**; 1.5 kW.—**6.0,** Exchange Quotations. **6.10,** Sextet Selection, March, Salut aux Vainqueurs (Menichetti). **6.25,** Orchestral Selections: Selection from Countess Maritza (Kálmán); El carro de la alegria (Campiña and Corral); Waltz, Luna de miel (Waldteufel). **8.30,** Advanced French Lesson by Prof. Martin. **9.0,** Chimes and Weather Report. **9.5,** Exchange Quotations and News. **9.10,** Orchestral Concert: March, Who Goes There? (Bath); Selection from Lohengrin (Wagner); Sardana, La joia de l'Empordà (Molas); American Dance, La desposada (Cotó); Waltz, Cheritza (Breau, Ford and Bibó); March, Premières fleurs de printemps (Kockert). **10.0,** Programme relayed from **Madrid,** EAJ7.

**BERGEN (370.4 metres)**; 1.5 kW.—**6.0,** Programme for Children. **6.30,** Talk for Girls. **7.0,** Orchestral Concert. **7.50,** Topical Talk. **8.0,** Talk by Dr. Einar Lexow. **8.30,** Concertina Concert by Mr. Knut and Nils Haga. **9.0,** Weather Report, News and Time Signal. **9.15,** Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) **(1,250 metres)**; 40 kW. —**3.0,** Educational Talk. **3.30,** Talk by Dr. Hertneck. **4.0,** Programme from **Hamburg. 5.0,** Dr. K. Müller, Talk: Difficult Children in the Working Class Family. **5.30,** Elementary Spanish Lesson. **5.55,** Herr Ohrmann, Talk: Bruckner. **6.20,** Dr. Eberhard Preussner, Talk: Modern Literature. **7.0,** Programme from **Voxhaus.**

**BERLIN** (Voxhaus) **(484 metres)**; 4 kW.—**9.10 a.m.,** Market Prices. **9.15 a.m.,** Weather Report, News and Time Signal. **10.0 a.m.,** Programme of Gramophone Records. **10.30 a.m.,** Exchange Quotations. **11.55 a.m.,** Time Signal. **12.30,** Weather Report and News. **1.0,** Programme of Gramophone Records. **2.0,** Exchange Quotations, Agricultural Report and Time Signal. **3.0,** Talk by Prof. C. Fries. **3.30,** Oskar Baum reads from his own Works. **4.0,** Concert: Overture to Si j'étais Roi (Adam); Waltz, Frühlingsstimmen (Joh. Strauss); Selection from Ariadne auf Naxos (R. Strauss); Minuet (Paderewski); Reminiscences of Capri (Becce); Contre-Tanz, No. 1 (Beethoven); Tango, Para Ti (Lichtenstein); followed by Announcements. **5.30,** Dr. Paul Frank, Talk: Medical Hygiene. **6.0,** Herr Wasewitz, Talk: The Manifold Activities of the German Health Insurance. **6.30,** Kurt Lubinski, Talk: In the Coming Lands of the East—Among the Turkish and Mongolian Peoples. **7.0,** "With the Microphone Through Berlin," followed by Weather Report, News, Time Signal, Sports Notes and Dance Music. **11.30** (approx.), Close Down.

**BERN (411 metres)**; 1.5 kW.—**11.43 a.m.,** Time Signal, Weather Report and Exchange Quotations. **11.50 a.m.,** Programme of Gramophone Records. **2.56,** International Time Signal from the **Neuenburg** Observatory. **3.0,** Orchestral Selections. **3.30,** Programme for Children by Fräulein Alice Gsell. **4.0,** Orchestral Concert. **6.29,** Time Signal and Weather Report. **6.30,** Talk by C. von Harten. **7.0,** Symphony Concert, relayed from **Basle** (1,010 metres). **9.0** (approx.), News and Weather Report. **9.15,** Orchestral Selections. **9.35,** Dance Music. **11.0** (approx.), Close Down.

**BRESLAU (322.6 metres)**; 4 kW.—**3.0,** Review of Books by Christa Niesel-Lessenthin. **3.30,** Concert from the Goldene Krone Café. **5.0,** Walter Schubert, Talk: The Chemist and Night Service, relayed from **Gleiwitz** (329.7 metres). **5.25,** Esperanto Lesson by Alfred Hanuschke. **5.35,** Arno Nadel reads from his own Works. **6.25,** Legal Shorthand Lesson. **6.50,** Georg Lichey, Talk: The Treaty of Verdun. **7.15,** "Achtung! Strassenkreuzung!" Revue (Bischoff and Engel), followed by News. **9.30,** Dance Music. **11.0** (approx.), Close Down.

**BRÜNN (441.2 metres)**; 3 kW.—**11.0 a.m.,** Time Signal, News and Agricultural Report. **11.30 a.m.,** Concert. **12.15,** Talk by the Mayor of Brünn. **1.30,** Market Quotations, Weather Report and News. **2.0 to 10.0,** S.B. from **Prague.**

**BRUSSELS (508.5 metres)**; 1.5 kW.—**5.0,** Dance Music from the Armenonville Tea Rooms. **5.30,** Trio Concert: Selection from Mignon (Thomas); Longchamp fleuri (Waldteufel); Promenade sentimentale (Dubois); Bubbly (Bruhar). **6.15.** Elementary English Lesson. **6.25,** Advanced English Lesson. **6.45,** Trio Selections: Idylle passionnelle (Razigade); Serenade (Gaudolfo); Intermezzo (Zilcher). **7.0,** Gramophone Selections. **7.30,** "Radio-Chronique." **8.15,** Concert: Prelude (Rachmaninoff); Schéhérazade (Rimsky-Korsakoff); Air from Prince Igor (Borodine); On the Steppes of Central Asia (Borodine); Romance for Horn (Scriabine); Antar (Rimsky-Korsakoff); Topical Talk; Gopak (Moussorgsky); Songs, (a) Les forçants (Gretchaninoff), (b) Orientale (Cui), (c) Serenade (Glazounoff); Choral Selections, (a) Lac endormi (Pfeil), (b) Ho mon ami (Gretchaninoff), (c) Que les balles sifflent; Military Song; Dances from Kovantchina (Moussorgsky); Prelude (Scriabine); Dances from Prince Igor (Borodine). **10.15,** News and Close Down.

**BUDAPEST (556.6 metres)**; 20 kW.—**4.0,** Literary Programme. **5.0,** Orchestral Concert relayed from the Café Ostende. **6.0,** Talk. **6.30,** Relay of an Opera. In the First Interval at **7.20,** Racing Results. In the Second Interval at **8.25,** Time Signal and News. **9.30,** Weather Report, followed by Concert from the Café Emke.

**CRACOW (566 metres)**; 1.5 kW.—**5.0,** Programme from **Warsaw. 6.0,** Miscellaneous Items. **6.25,** English Talk by Mr. Jean Stanislawski. **7.0,** Time Signal and Agricultural Report. **7.10** News. **7.30,** Programme from **Warsaw. 9.30,** Restaurant Concert. **10.30** (approx.), Close Down.

**DUBLIN,** Call 2RN **(319.1 metres)**; 1.5 kW.—**1.30,** Weather Report and Gramophone Selections. **7.20,** News. **7.30,** Selections by Val Vousden (Entertainer). **7.45,** Irish Lesson by Seamus O'Duirinne. **8.0,** "Sovereign Love": Sketch by Mary Sheridan and Company. **8.30,** "Faust," Opera (Gounod). **10.30,** News, Weather Report and Close Down.

**FRANKFURT (428.6 metres)**; 4 kW.—**2.55,** Hints for the Housewife, by Fini Pfannes. **3.35,** Vocal and Orchestral Concert: Selections from The Circus Princess (Kálmán); Tenor Solo from Der Orlow (Granichstaedten); Romance from Eine Frau von Format (Kraus); Tenor Solo from The Blue Mazurka (Lehár); In the Interval, Club News and other Announcements. **5.10,** Reading by O. W. Studtmann. **5.45,** Conrad Brosswitz, Talk: German Intellectual Life in the first half of the Nineteenth Century. **6.15,** Shorthand Lesson by Georg Kalis. **6.45,** Prof. Max Flesch, Talk: Pasteur, Koch and Behring. **7.15,** Adolf Stoltze Programme by Lene Obermeyer and Hans Nerking of the **Frankfurt** Playhouse. **8.15,** Variety Concert, followed by Dance Music from **Berlin. 11.30** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse) **(394.7 metres)**; 4 kW.—**9.15 a.m.,** News. **10.0 a.m.,** Programme of Gramophone Records. **11.10 a.m.,** Weather Report. **11.15 a.m.,** Exchange Quotations. **11.30 a.m.,** Concert relayed from **Hanover** (297 metres). **11.45 a.m.** (in the Interval), Shipping Forecast. **11.55 a.m.,** Time Signal. **12.10,** News. **1.40,** Exchange Quotations. **2.30,** Review of Books. **3.0,** Labour Exchange Report. **3.15,** Dr. Wilh. Heinitz, Talk: The Works of Kreisler, with Illustrations. **4.0,** Flute and Pianoforte Recital from the Works of Modern Composers. **5.0,** Request Programme. **6.0,** Dr. Köhler, Talk: Handicraft and Culture, relayed from **Kiel** (254.2 metres). **6.25,** Dr. Hodann, Talk: The Years of Adolescence and Difficulties of Up-bringing. **6.55,** Weather Report. **7.0,** "James Cook," Wireless Suite by Otto Reiner, Music by Horst Platen, (a) London, (b) Tahiti, (c) Atlantis, (d) Death on Hawaii. **8.30,** Concert: "The Harz," Harz Saying, Es grüne die Tanne, es wachse das Erz; Invitation to the Journey (Anders); Harz Poems from Tiedge and Stolberg; Over the Wildemann (Schulze-Schubert); Harz Pictures (Bodenstedt); The Stars (Klopstock-Schubert); Extract from Goethe's Harz Travels; Rhapsody (Brahms); Poems of the Harz; Harz Parody from 1829, Knowest thou the Land?; Heinrich Heine travels to the Harz; Der Bergmannsgruss; Princesse Ilse (Roquette); Herr Heinrich sitzt am Vogelherd (Löwe); Buko von Halberstadt (Siemers); Glück auf! From the Visitor's Book on the Brocken; Walpurgisnacht (Mendelssohn). **9.15** (approx.), Weather Report, News, Sports Notes and Announcements. **9.30** (approx.), Cabaret Concert.

**HILVERSUM (1,071 metres)**; 5 kW.—**11.40 a.m.,** Police Announcements. **12.10,** Concert of Trio Music. **1.40,** Programme relayed from the Tuschinski Theatre, Amsterdam. **3.10,** Talk. **3.40,** Italian Lesson. **4.40,** French Lesson. **5.30,** Orchestral Concert: Overture to Das Nachtlager in Granada (Kreutzer); Primavera Serenade (Grit); Waltz, Flattergeister (Joh. Strauss); Selection from Day and Night (Lecocq); 'Cello Solo, Berceuse de Jocelyn (Godard); Spass muss sein (Morena); Finale. **6.30,** German Lesson. **7.25,** Police Announcements. **7.40,** Programme arranged by the Workers' Radio Society; Concert and Talk. **11.15** (approx.), Close Down.

**HUIZEN (340.9 metres)**; 4 kW.—Transmits on 1,870 metres from 5.40.—**12.10,** Concert of Trio Music. **2.40,** Programme for Children. **5.10,** Gramophone Selections. **6.40,** English Lesson. **7.10,** Lesson in Dressmaking. **7.40,** Talk on Economy by Dr. H. A. Kaag. **8.0,** Orchestral Concert with Baritone Solos and Selections by a Mixed Choir.

**JUAN-LES-PINS** (Radio I.L.) **(244 metres)**; 1.5 kW.— **1.0,** Orchestral Concert: Selection from The Count of Luxembourg (Lehár); Serenade (Wagner); Ariadne (Massenet); Je pense (Tosti); Les cent Vierges (Lecocq); Le dernier amour (Gung'l); followed by News, Talk for Women by Mme. la Comtesse de Tremeuge and Concert.

**KALUNDBORG (1,680 metres)**; 7 kW.—Programme also for **Copenhagen** (337 metres).—**6.30 a.m.,** Morning Gymnastics. **10.0 a.m.,** Weather Report. **10.15 a.m.,** Educational Talk. **12.15,** Talk. **2.0,** Programme for Children. **2.30,** Instrumental Concert: Overture to Rosamunde (Schubert); The Morning, from Pastorale, Op. 50 (Selim Palmgreen); Waltz from Thukimo (Palmgreen); La fille aux cheveux de lin (Debussy); Peer Gynt Suite (Grieg), (a) Morning, (b) Anitra's Dance, (c) The Death of Aase, (d) In the Hall of the Mountain King; Knud Lavard (Gade); Holger Danish Songs (Gade); Songs (Bechgaard), (a) In the Twilight, (b) I Asked the Lark, (c) Farewell; Praeludium (Järnefelt); Waltz, Dorfschwalben in Oesterreich (Jos. Strauss); Fantasia of Jutland Melodies (Jos. Strauss); Schön Rosmarin (Kreisler); Selections from Tordenskjold Suite (Halvorsen), (a) Rokoko, Rigaudon, (b) Krigsmarch. **5.20,** Talk by Axel Degenkolv. **6.0,** News and Exchange Quotations. **6.15,** Time Signal. **6.30,** Talk. **7.0,** Chimes from the Town Hall. **7.2,** Concert of Old Dance Music: March, Hoch Wien (Bayer); Waltz, My Dream (Waldteufel); Polka, Off to the Hunt (Fahrbach); Mazurka, La Tzigane (Ganne); Old Dances of North-West Jutland, (a) Hoppen, (b) Engelsk, (c) Vals, (d) Totur. (e) Reel; Spitzentuch Quadrille (Joh. Strauss); Waltz, Hesperusklänge (Gung'l); Camilla Polka (Lumbye); Gallop, Express (Waldteufel), followed by News. **8.15,** Reading by Dr. Egill Rostrup. **8.45,** Programme of Pictures of Folk Life. **9.45,** Dance Music from the Industri Restaurant. **11.0,** Chimes from the Town Hall. **11.15** (approx.), Close Down.

**KATTOWITZ (422 metres)**; 10 kW.—**3.0,** Programme of Gramophone Records. **4.10,** Music Lesson by F. Sachse. **4.35,** Children's Letter Box. **5.0,** Programme for Children. **6.0,** Announcements. **6.30,** Talk by Mr. K. Zienkiewicz. **7.30,** Programme from **Warsaw. 9.0,** Weather Report and News. **9.30,** Dance Music.

**KAUNAS (2,000 metres)**; 7 kW.—**3.0,** Concert: Pesther Waltz (Lanner); Potpourri, Für meine Freunde (Komzak); Serenade (Drigo); Pizzicatto

## Programmes from Abroad.—

(Poppy); La Cumparsita (Rodriguez); The Warrior's Farewell (Lindsay); La Chanson d'Hamid (Salabert); New Life March (Heinecke); Selection from I Pagliacci (Leoncavallo). **4.0,** Talk by Zigmas Kuzmickis. **4.30,** Musical Interlude. **4.45,** Talk. **5.30,** Announcements. **6.0.** Weather Report and News. **6.15,** Programme Announcements. **6.30,** "Faust," Opera (Gounod) from the National Theatre.

**LAHTI** (1,522.8 metres); 35 kW.—**4.0,** Orchestral Concert: March (Teike); Overture to Light Cavalry (Suppé); Selection from Der Zarewitsch (Lehár); Minuet (Kastal); Crescendo (Lassen); Waltz (Yoshitomo). **5.15,** Programme of Talks. **6.0,** Violin Recital. **6.40,** Orchestral Selections. **7.0,** Recital of Finnish Songs. **7.20,** Orchestral Selections. **7.45,** News in Finnish and Swedish. **8.15,** Dance Music. **10.0** (approx.), Close Down.

**LANGENBERG** (468.8 metres); 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**11.10 a.m.,** Gramophone Selections. **12.5,** Vocal and Orchestral Concert: Waltz, Wo die Zitronen Blüh'n (Strauss); Overture to Hamlet (Gade); Kol Nidrei (Bruch); Selections from The Huguenots (Meyerbeer); Tenor Solos, (a) Der letzte Gruss (Levi), (b) Herzensfrühling (Wickede); Suite No. 2 from L'Arlésienne (Bizet); Toscanetta (Becce); Erotica (Grieg); Potpourri from Die Puppenfee (Bayer). **1.30,** Wireless Announcements. **2.40,** Herr A. Wurbs, Talk: Wireless Technology. **3.0,** Anecdotes of the Lower Rhine by Hermann Jung. **3.30,** Programme from **Königswusterhausen.** **4.0,** Hilde Hirsch-Stern, Talk: Gymnastics for the Professional Woman. **4.20,** English Lesson by Prof. F. Hase. **4.45,** Orchestral Concert: March, Mit Eichenlaub und Schwerten (Blon); Overture to The Black Domino (Auber); Waltz, Ein Abend in Sevilla (Ohlsen); Selections from Coppelia (Delibes); Engelreigen (Wolf-Ferrari), (b) Moment Musical (Schubert). **5.30,** Prof. Ebermayer, Talk: Doctor and Patient from a Legal Standpoint. **6.15,** Herr W. Stern, Talk for Workers—Social Problems—Building and Architecture in Great Cities. **6.40,** Dr. Otto Förster, Talk: German Cathedrals. **7.0,** Variety Concert: "Der Säugling"; Intermezzo, Kindtaufe (Hans Müller-Schlösser). **9.30,** News, Sports Notes, Announcements and Dance Music. **12.0 Midnight** (approx.), Close Down.

**LEIPZIG** (365.8 metres); 4 kW.—**4.45,** Wireless News and Talk. **5.20,** Weather Forecast, Time Signal and Labour Exchange Report. **5.30,** Programme from **Königswusterhausen.** **6.0,** Rektor Josef Greff, Talk: Psychology. **6.30,** Dr. Hans Mayer, Talk: James Cook. **7.0,** Jacob Schaffner reads from his own Works. **7.30,** Cabaret Concert; in the Interval at **9,** News, Sunday Programme Announcements and Sports Notes. **9.30** (approx.), Dance Music from **Voxhaus.**

**MADRID** (Union Radio), Call EAJ1 (**375 metres**); 3 kW.—**7.0,** Chimes and Concert by the Station Sextet: Selection from La reina mora (Serrano); Selection from Le cheminean (Leroux); Selection from Los sobrinos del Capitán Grant (Caballero); Interlude by Luis Medina. **8.0,** Dance Music. **8.25,** News and Announcements. **9.45,** Weekly Market Report. **10.0,** Time Signal, followed by Selection from "The Dollar Princess"—Operetta (Fall); News and Announcements. **12.30 a.m.** (approx.) (Sunday), Close Down.

**MILAN,** Call 1MI (**549 metres**); 7 kW.—**3.30,** Time Signal, followed by Concert of Quintet Selections: Slavonic Dances, Nos. 3 and 6 (Dvorák); Selections from Vecchia Milano (Vittadini); Selection from Lohengrin (Wagner); Le Syrène (Waldteufel); Canzone di calendimaggio (Lattuada). **4.0,** Exchange Quotations. **4.20,** Programme for Children. **4.45,** Agricultural Report and News. **7.15,** Time Signal. **7.17,** Wireless Notes and Announcements. **7.35,** Time Signal and Talk. **7.45,** News. **7.50,** Concert: G. M. Ciampelli, Talk: The E.I.A.R. Madrical Society, and its Artistic Aims; Recital by the Madrigal Society; Reading by Angelo Sodini; Pianoforte Solos, (a) The Butterfly (Schumann), (b) Gagliarda (Respighi), (c) Olaf's Dance (Mangiagalli); Soprano Solos, Venetian Songs (Tirindelli), (a) El Sogno, (b) El pensier, (c) Serenata, (d) I colombi di S. Marco, (e) Filippi, El bi; Orchestral Selections, (a) The Secret Marriage (Cimarosa), (b) Scherzo from L'apprenti sorcier (Dukas), (c) España (Chabrier). **9.55,** News. **10.0,** Selection of Tzigane Music from the Fiaschetteria Toscana. **10.45** (approx.), Close Down.

**MOTALA** (1,380 metres); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Böden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres), **Sundsvall** (545.6 metres).—**6.30,** Reading from **Göteborg.** **6.45,** Pianoforte Recital: Arabesque in C Major (Schumann); Des Abends (Schumann); Consolation No. 2 (Liszt); Etude in D Sharp Major (Liszt). **7.0,** Talk: Professions and Professional Men. **7.15,** Cabaret Concert. **8.0,** Topical Talk. **8.15,** News and Weather Report. **8.45,** Dance Music. **12.30 a.m.** (approx.) (Sunday), Close Down.

# Saturday, October 27th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**NAPLES,** Call 1NA (**333.3 metres**); 1.5 kW.—**4.0,** Concert: Orchestral Selections, (a) Old Dance (Pizzi), (b) Eastern Night (Piovano); Baritone Solo, Non t'amo più (Tosti); Orchestral Selection, Intermezzo, Improvvisata (Masserini); Baritone Solo, E canta il grillo (Billi); Orchestral Selection, Potpourri, La danse des libellules (Lehár); Baritone Solo, Mattinata (Leoncavallo); Orchestral Selection, Ninna nanna (Sagaria); Baritone Solo from L'Africaine (Meyerbeer); Orchestral Selection, Intermezzo, Sul Palatino (Montanari). **4.30,** Time Signal. **4.35,** Foreign Report. **7.20,** Wireless Notes. **7.50,** Concert: Overture to Le Corsaire (Berlioz); Poem Recital; Hungarian Rhapsody No. 14 (Bizet); "Natale"—Comedy (Dario Niccodemi); Banditten streiche (Suppé), Recitation, Nparaviso (F. Russo); Ballet Suite from La Source (Delibes); "The Riding School"—Comedy (Emilio Pohl). **9.50,** News. **9.55,** Calendar and Programme Announcements. **10.0,** Dance Music from the Trocadero. **10.30** (approx.), Close Down.

**OSLO** (**461.5 metres**); 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), and **Rjukan** (448 metres).—**6.0,** Programme for Children. **6.15,** Weather Report, News and Agricultural Report. **6.30,** M. Randolf Arnesen, Talk: House Building Co-operative Societies. **7.0,** Time Signal. **7.2,** Orchestral Concert: Marche orientale (Nielsen); 'Cello Solo, Comme cette fois (Popper); Cavatine from Kontschakowna (Borodine); Ballet Intermezzo (Bayer); Barcarolle (Tchaikovsky); Rose Marie (Königsberger); Bonne nuit (Abt); Serenade (Grönfeldt); Pierrette (Brase); Romance (Tscherepnine); Puszta Legends (Lindsay-Theimer). **8.30,** Weather Report and News. **8.45,** Topical Talk. **9.0,** Revue of the Week and Recital of Songs. **9.30,** Dance Music from the Grand Hotel. **10.30** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT (**458 metres**); 0.5 kW.—**6.30,** "Radio Journal de France." **8.0,** Sports Notes. **8.30,** Concert, followed by News, Time Signal, Weather Report and Dance Music from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL (**2,650 metres**); 5 kW.—**5.45,** "Le Journal Parlé." **7.10,** Weather Report. **7.30,** Pasdeloup Concert.

**PARIS** (Petit Parisien) (**340.9 metres**); 0.5 kW.—**8.45,** Gramophone Selections, Talk, News and Announcements. **9.0,** Concert: Introduction to Eugen Onegin (Tchaikovsky); Selection from A Midsummer Night's Dream (Thomas); Scherzo and Finale from the Fifth Symphony in C Minor (Beethoven); First Suite from La Farandole (Dubois); Romance (Rubinstein); Hungarian March (Liszt). News in the Interval.

**PARIS** (Radio-Paris), Call CFR (**1,750 metres**); 6 kW.—**12.30,** Concert of Gramophone Selections: The St. John Passion (Bach); Unfinished Symphony (Schubert), by the Orchestra of the Queen's Hall, conducted by Sir Henry Wood; Preludes Nos. 7, 8 and 9 (Chopin); Toccata (Gigout); Old Song, Les Cloches de Nantes; Negro Spiritual, Ev'ry time I feel the Spirit, by Layton and Johnstone; My Ohio Home, by the Singing Sophomores; Constantinople, by Paul Whiteman and his Orchestra; Waltz, Ramona, by Ben Selvin and his Orchestra; Chirp Chirp from That's a Good Girl, by Fred Rich and his Orchestra; News in the Interval. **1.50,** Market Prices and Religious Information. **3.45,** Dance Music; News in the Interval. **7.0,** Agricultural Report. **7.45,** Talk arranged by the Union des Grandes Associations Françaises, Exchange Quotations and News. **8.0,** Concert: "Le Théâtre du Petit Monde" and Dance Music; News in the Intervals.

**POSEN** (**344.8 metres**); 1.5 kW.—**6.0,** English Lesson by Dr. Arend. **6.25,** Literary Talk by Mr. Janusz Stepowski. **7.15,** Talk for Women by Mme Swidzinska. **7.30,** Programme from **Warsaw.** **9.0,** Time Signal, News and Weather Report. **9.15,** Miscellaneous Items by Mr. Janusz Warnecki. **9.30,** Cabaret Programme. **11.0,** Concert arranged by Maison Philipps. **1.0 a.m.** (approx.) (Sunday), Close Down.

**PRAGUE** (**348.9 metres**); 5 kW.—**12.55,** Market Quotations. **1.0** (approx.), Celebration of the Tenth Anniversary of the Czecho-Slovakian Republic. **2.0,** Welcome to the President of the Republic by the School Children in the Quadrangle of the Castle. **4.0,** Ceremony at the Tomb of the Unknown Soldier. **6.0,** Gala Programme. **9.0,** Time Signal and News. **9.25,** Selections of Popular Music.

**ROME,** Call 1RO (**447.8 metres**); 3 kW.—**4.30,** Concert: Pianoforte Solo, Oriental Fantasy (Balakirew Islamey); Tenor Solo from Louise Miller (Verdi); Tenor Solo from Werther (Massenet); Mezzo Soprano Solos, (a) The Pater Noster from Nerone (Boito), (b) Canzone (Morpurgo); Pianoforte Solos, (a) The Dancer of Jodpur (Gasco), (b) Toccata (Bajardi) Tenor Solos, (a) Air from Turandot (Puccini), (b) Serenata (Mascagni); Mezzo-Soprano Solos, (a) Barcarolle (Ganz), (b) Perchè mai (Filippi), (c) Stornello toscano. **6.50,** Time Signal, Wireless Notes, and Announcements. **7.10,** Sports Notes, News, Exchange Quotations and Weather Report. **7.26,** Topical Talk and Time Signal. **7.45,** "Cendrillon," Opera (Massenet); In the Intervals: Review of Art and Literature and Topical Talk. **9.50,** News and Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF (**21.96 and 31.4 metres**); 30 kW.—**12.0 Midnight,** Statler's Pennsylvanians, directed by Johnny Johnson, from **New York.** **12.30 a.m.** (Sunday), Concert from the Hotel Sagamore, **Rochester. 1.0 to 4.0 a.m., New York** relay. **1.0 a.m.,** Musical Programme. **1.30 a.m.,** "The Park Bench." **2.0 a.m.,** Variety Programme. **3.0 a.m.,** American Tobacco (Lucky Strike) Programme. **4.0 a.m.,** Time Signal and Dance Music from **Buffalo.** **5.0 a.m.** (approx.), Close Down.

**STUTTGART** (**379.7 metres**); 4 kW.—**5.15,** Talk by Herr Baumeister, relayed from **Freiburg** (577 metres).—**5.45,** Herr Schwaebsch, Talk: Patents. **6.15,** Prof. Hans Tietze, Talk: Vienna—a Character Sketch. **6.45,** Time Signal, Weather Report and Sports Announcements. **7.15,** Concert: Songs to the Lute by Peter Bach; Night for Night (Dehmel); Half One's Life (Hölderlin); Nights of Spring (Münchhausen); Letzter Bereich (Rilke); Rehleu (Ringelnatz); Nicht doch (Dehmel); Maikaterlied (Bierbaum); Ich und du (Morgenstern); Ninon (Münchhausen); Slumber Song for Miriam (Beer-Hoffmann); Daphne is Sad (Holz); The Water (Morgenstern); Ants' Travels (Ringelnatz); Bombardill (Dehmel), followed by Variety Concert: Overture to Zampa (Hérold); Wenn schöne Frauen nicht lieben (Sobotka); Songs to the Lute (Peter Bach); Blues, Only Blues! (Kutscher); Little Girl's Dream (Egen); The Flower Parade (Egen); My Dear German Homeland (May); "Märchen im Schnee," Operetta (Stolz); Only Once Kissed (Rose); Songs to the Lute (Peter Bach); Im Wirtshaus zum goldnen Weinstöckl (Sobotka); Babillage (Gillet); "Das Salzfass," Sketch (Gabor); Waltz, Die Schönbrunner (Lanner); Viennese Music from The Countess of Chicago (Kálmán); Ich bin die Marie from Die Haller-revue (Devis); On Thy Lips (Kollo); To Thee Alone I Am Not True (Geiger); Die deutschen Mädels sind die schönsten (May), followed by News and Dance Music from the Pavillon Excelsior.

**TOULOUSE** (Radiophonie du Midi) (**391 metres**); 3 kW.—**12.45,** Instrumental Concert. **8.0,** Exchange Quotations and News. **8.30,** Concert: Xylophone Selection from Carmen (Bizet); Accordion Selection from La Traviata (Verdi); Mandoline Selection from La Vie Heureuse (Schraminel); Guitar Solo, Prelude (Rachmaninoff); Harmonica Solo, Overture to Poet and Peasant (Suppé). **8.48,** Recital of Songs: Clair de Lune (Fauré); L'Automne (Fauré); Berceuse de Jocelyn (Godard); C'est l'amour from Les Saltimbanques (Ganne). **9.0,** Dance Music. **9.12,** "Werther." Opera Selection (Massenet). **9.30,** Military Music Selections, followed by Dance Music. **10.15,** North African News. **10.30** (approx.), Close Down.

**VIENNA** (**577 and 517.2 metres**); 1.5 and 15 kW.—**3.0,** Programme for Children. **5.0,** Chamber Music: Sonata sopra il Sogetto in C Minor (Bach); Sonata for Violin, Flute and Clavicembalo (Gluck). **5.50,** Prof. Gustav Turba, Talk: The History of the Austrian Constitution. **6.20,** "From the Happy Vintage Time," Recitative, by Käthe Ehren and Philipp Zeska. **7.20,** "Der lachende Ehemann," Operetta (Eysler), followed by Phototelegraphy Transmission.

**WARSAW** (**1,111 metres**); 10 kW.—**2.0,** News, Weather Forecast and Finance Report. **3.0,** Programme of Gramophone Records. **4.10,** Programme of Talks. **5.0,** Programme for Children. **6.0,** Miscellaneous Items, followed by Announcements by the Polish Horse-breeding Association. **6.30,** "Radio-Chronique," by Prof. M. Stepowski. **6.55,** Time Signal from the **Warsaw** Observatory, followed by Agricultural Report. **7.10,** News. **7.30,** "The Wirepuller," Operetta (Lehár). **9.0,** Aviation Notes, Weather Report, News, Police Announcements and Sports Notes. **9.30,** Dance Music from the Oaza Restaurant. **10.30** (approx.), Close Down.

## Programmes from Abroad.—

**BARCELONA** (Radio Barcelona), Call EAJ1 (**344.8 metres**) ; 1.5 kW.—**11.0 a.m.,** Cathedral Chimes and Weather Report of the Provincial Meteorological Service. **1.30,** Musical Selections by the Iberia Trio with Gramophone Records in the Intervals. **2.45 to 6.0,** No Transmission. **6.0,** Opening Signal and Exchange Quotations. **6.10,** Light Music by the Station Orchestra and Songs. **8.0,** Selections by the Station Orchestra : Nocturne from the Second Quartet in D Major (Borodine). **8.40,** Talk on Sport. **9.0** (approx.), Close Down.

**BASLE** (**1,010 metres**) ; 1.5 kW.—**6.30 to 7.0,** Programme relayed from **Bern.** **7.30,** Programme relayed from **Zurich.** Chamber Music by the Station Orchestra. **9.0,** Sports News, late News Bulletin, and Weather Report. **9.15** (approx.), Close Down.

**BERGEN** (**370.4 metres**) ; 1.5 kW.—**9.30 a.m.,** Relay of Divine Service. **11.30 a.m.,** Weather Report and Forecast and General News Bulletin. **4.0,** Relay of Evening Service. **7.0,** Concert of Orchestral Music. **7.20,** Mr. Boris Borisoff, Talk with Illustrations : Russian Folk Music. **7.50,** Topical Talk. **9.0,** Weather Report and Forecast, Late News Bulletin and Time Signal. **9.15,** Selections of Dance Music. **11.0** (approx.) Close Down.

**BERLIN** (Königswusterhausen) (**1,250 metres**) ; 40 kW.—**7.55 a.m.,** Garrison Church Chimes. **8.0 a.m.,** Morning Concert and Address, relayed from **Voxhaus** followed by Berlin Cathedral Chimes. **10.30 a.m.** (approx.), Musical Programme relayed from **Voxhaus. 1.0,** Children's Corner. **2.30** (approx.), Three Talks for Farmers relayed from **Voxhaus. 3.30,** Orchestral Concert relayed from **Voxhaus. 4.0,** Concert by the Vienna Boys' Choir. **5.0 to 7.0,** Programme of Talks followed by relay of another German programme. **9.15,** Late News Bulletin. **9.30,** Selections of Dance Music. **11.30** (approx.), Close Down.

**BERLIN** (Voxhaus) (**484 metres**) ; 4 kW.—**7.55 a.m.,** Relay of Chimes from the Garrison Church at Potsdam. **8.0 a.m.,** Morning Recital of Sacred and Secular Music, with Religious Address, followed by Cathedral Chimes. **10.30 a.m.** (approx.), Popular Concert. **1.0,** Programme for Children. **2.30** (approx.), Three Agricultural Talks on Farming Methods, the Weekly Markets and Veterinary Hints. **3.30,** Concert of Light Music. **4.0,** Concert followed by Trade Talk. **6.0,** Talk. **6.30,** Talk. **7.0,** Popular Entertainment. **9.15,** Weather Report and Forecast, Time Signal, Sports News and Late News Bulletin. **9.30,** Orchestral Concert of Dance Music. **11.30** (approx.), Close Down.

**BERN** (**411 metres**) ; 1.5 kW.—**9.30 a.m. to 10.30 a.m.,** Religious Address. **12.0 Noon,** Time Signal and Weather Forecast. **12.5,** Concert of Orchestral Music. **2.30,** Concert by the Station Orchestra. **6.29,** Time Signal and Weather Report. **6.30,** Talk. **7.0,** Results of Elections to the National Council. **8.45,** Sports News. Late News Bulletin and Weather Report. **9.0,** Concert by the Kursaal Orchestra. **9.35** (approx.), Close Down.

**BRESLAU** (**322.6 metres**) ; 4 kW.—Programme relayed by **Gleiwitz** (329.7 metres). **10.0 a.m.** (approx.), Evangelical, Vocal and Instrumental Recital and Address. **11.0 a.m.,** Concert. **1.0,** Hints for the Amateur Gardener. **1.35,** Talk for Chess Players. **2.0,** Tales for Children by Friedrich Reinicke. **2.30,** Agricultural Talk. **7.30,** Variety Programme. **10.0** (approx.), Dance Music. **11.0** (approx.), Close Down.

**BRUSSELS** (**508.5 metres**) ; 1.5 kW.—**5.0** Dance Music, relayed from the Tea Room of the Palace Hotel, Brussels. **6.0,** Bonzo and Sylvia in their Entertainment for Children. **6.30,** Concert of Trio Selections with Soloists. **7.30,** "La Radio-Chronique." **8.15,** Concert by the Station Orchestra, conducted by M. René Tellier. **10.15,** News from the Evening Press. **10.30** (approx.), Close Down.

**BUDAPEST** (**556.6 metres**) ; 20 kW.—**8.0 am.,** Press. Review and Beauty Hints. **9.0 a.m.,** Relay of Morning Service. **11.30 a.m.** (approx.). Orchestral Concert. **2.30,** Agricultural Talk. **6.40** (approx.), Concert or Operatic Relay. **9.30,** Relay of Dance Music. **10.30** (approx.), Close Down.

**COLOGNE** (**283 metres**) ; 4 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Langenberg** (468.8 metres) and **Münster** (250 metres).—**7.15 a.m.,** Lute and Guitar Lesson by Olly Wirtz-Koort. **7.35 a.m. to 7.55 a.m.,** Esperanto Talk by Alfred Dormanns. **8.5 a.m.,** Catholic Recital of Choral and Instrumental Music with Address. **10.0 a.m.,** Talk by Fritz Worm. **12.0 Noon,** Concert of Orchestral Music, under the direction of Herr Eysoldt, followed by Literary Talk and Hints for Chess Players, by Dr. van

# SUNDAY, OCTOBER 28th.

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Nüss. **4.0,** Concert by the Vienna Boys' Choir relayed from **Königswusterhausen. 7.0,** Operatic Programme, followed by Late News Bulletin, Sports Notes and Dance Music. **11.0** (approx.), Close Down.

**CORK,** Call 6CK (**400 metres**) ; 1.5 kW.—**8.30,** Concert by the Station Sextet, with Selections by the Grossi Trio. **11.0,** Weather Report and Forecast and National Anthem. **11.15** (approx.), Close Down.

**CRACOW** (**566 metres**) ; 1.5 kW.—**9.15 a.m. to 10.45 a.m.,** Divine Service. **11.0 a.m. to 11.5 a.m.,** Relay of Fanfare from the Church of Notre Dame in Cracow, followed by Time Signal and Weather Report and Forecast. **11.15 a.m.,** Programme relayed from **Warsaw. 1.0 and 1.20,** Two Talks on Agriculture. **1.40,** "La Chronique Agricole," by Dr. St. Wasniewski. **2.15,** Programme relayed from **Warsaw. 5.0,** Programme relayed from **Warsaw. 6.0 to 6.15,** Variety Items. **7.0,** Fanfare, relayed from Notre Dame and Time Signal. **7.15,** Sports Notes. **7.30,** Concert devoted to the Works of Polish Composers ; Viola Solos by Dr. Etienne Schwarzenberg-Czerny. **9.0,** Programme relayed from **Warsaw,** Time Signal, Aviation Route Conditions, Weather Report, Late News Bulletin and Police and Sports News. **9.30,** Relay of Concert by the Pavillon Restaurant Orchestra. **10.30** (approx.), Close Down.

**DUBLIN,** Call 2RN (**319.1 metres**) ; 1.5 kW.—**8.30 to 11.15** (approx.), Programme relayed from **Cork** ; Selections by the Station Sextet and Soprano Solos by Doreen Thornton. **11.0,** Weather Report and National Anthem. **11.15** (approx.), Close Down.

**FRANKFURT** (**428.6 metres**) ; 4 kW.—Programme relayed by **Cassel** (252.1 metres).—**7.30 a.m.** (approx.), Instrumental and Choral Sacred Music and Address. **10.0 a.m.,** Programme of Talks. **12.0 Noon,** Report of the Agricultural Institute at Wiesbaden. **3.30** (approx.), Musical Programme. **7.30,** Musical or Dramatic Selections. **8.30,** Popular Concert. **9.30** (approx.), Dance Music Programme. **11.0** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse) (**394.7 metres**) ; 4 kW.—Programme relayed by **Bremen** (272.7 metres), **Hanover** (297 metres) and **Kiel** (254.2 metres).—**7.25 a.m.,** Time Signal. **7.30 a.m.,** Weather Report and Forecast and General News Bulletin. **8.0 a.m.,** Legal Talk. **8.15 a.m.,** Concert. **9.55 a.m.** (for **Kiel** only), Morning Service. **11.55 a.m.,** Time Signal, relayed from **Nauen. 12.5** (for **Hamburg** and **Kiel**), Orchestral Concert. **12.5** (for **Bremen**), Musical Selections. **12.5** (for **Hanover**), Gramophone Records. **1.0,** Programme for Children. **2.0,** Concert of Instrumental Music. **6.0,** Talk. **6.30,** Talk under the auspices of the School of Physical Culture in Hamburg. **6.40,** Sports Notes. **6.55,** Weather Report and Forecast. **7.0** (approx.), Concert or Play. **8.30** (approx.), Late News Bulletin and North Sea and Baltic Weather Forecast, followed by Music. **10.0** (approx.), Close Down.

**HILVERSUM** (**1,071 metres**) ; 5 kW.—**12.40 to 2.10,** Selections by the Station Trio. **2.10,** Light Music and Selections by the Hilversum Wireless Orchestra, conducted by Nico Treep. **7.40,** Weather Report and General News Bulletin. **7.55,** Concert relayed from the "Concertgebouw," at Amsterdam, under the direction of Pierre Monteux. **11.0** (approx.), Close Down.

**HUIZEN** (**340.9 metres**) ; 4 kW.—Transmits on 1,870 metres from 5.40.—**8.10 a.m.,** Relay of Sacred Service and Address. **9.30,** Relay of Church Service. **12.10,** Concert by the K.R.O. Trio. **4.40,** Evening Service relayed from **Rotterdam.** Sermon by the Minister, the Rev. C. B. Schoemakers. **1.10,** Talk. **2.10,** Concert. **10.25,** Epilogue by the Choir, under the direction of Mr. Jos. H. Pickkers. **10.40** (approx.), Close Down.

**JUAN-LES-PINS** (Radio LL) (**244 metres**) ; 1.5 kW. —**1.0 to 2.0,** Orchestral Concert and Talk for Children, by Marcel Laporte. **9.0,** General News Bulletin, Sports Notes and Weather Report. **9.15,** Concert of Orchestral Music. **10.30** (approx.), Close Down.

**KALUNDBORG** (**1,680 metres**) ; 7 kW.—Programme also for **Copenhagen** (337 metres). **9.0 a.m.,** Divine Service relayed from **Copenhagen. 10.30 a.m. to 10.40 a.m.,** (**Kalundborg** only), Weather Report of the Meteorological Institute. **12 Noon to 12.25,** Lesson in German, arranged by "Radiolytteren." **12.30 to 12.55,** Lesson in French, arranged by "Radiolytteren." **2.30,** Orchestral Concert : The Station Orchestra, conducted by Emil Reesen : Overture to "The Merry Wives of Windsor" (Nicolai). **5.50** (**Kalundborg** only), Weather Report of the Meteorogical Institute. **6.0,** Press News. **6.15,** Time Signal. **6.30,** Talk. **7.0,** Chimes from the Copenhagen Town Hall. **7.05,** Vocal and Instrumental Concert. **8.15,** General News Bulletin. **8.30,** Concert. **10.0** (approx.), Dance Music relayed from the Palace Hotel : The Orchestra under the direction of Teddy Petersen : In the Interval at **11.0,** Chimes relayed from the Town Hall, **Copenhagen. 11.30** (approx.), Close Down.

**KATTOWITZ** (**422 metres**) ; 10 kW.—**9.15 a.m.,** Morning Service. **11.0, a.m.,** Time Signal and Weather Report and Forecast. **11.15 a.m.,** Popular Concert by the Kattowitz Station Quartet. **1.0,** Religious Talk. **1.20,** Gardening Talk. **1.40,** Agricultural Talk. **2.0,** Weather Report and Forecast. **2.15,** Relay of Concert from **Warsaw. 5.0,** Instrumental Concert. **6.0,** Announcements. **6.20,** Humorous Selections by St. Ligon. **6.45,** Talk. **7.30,** Concert relayed from **Warsaw.** The Polskie Radio Orchestra, conducted by J. Ozieminski. Violin Solos by S. Frydberg. **9.0,** Weather Report and Forecast, Press News and Sports Notes. **9.30,** Dance Music. **10.30** (approx.), Close Down.

**KAUNAS** (**2,000 metres**) ; 7 kW.—**11.0 a.m.,** Weather Report and Forecast and Press Review. **11.15 a.m.,** Orchestral Concert. **12.0 Noon,** Programme for Children. **12.30,** Physical Culture. **4.0,** Talk. **4.25,** Musical Selections. **4.35,** Industrial News. **6.0,** Weather Report and Press News. **6.15,** Programme in Celebrtation of the Tenth Year of Czechoslovakian Independence. **9.30** (approx.), Close Down.

**KÖNIGSBERG** (**303 metres**) ; 4 kW.—Programme, relayed by **Danzig** (272.7 metres).—**8.0 a.m.,** Choral and Instrumental Recital, with Address. **10.0 a.m.,** (**Königsberg** only), Weather Report and Forecast. **10.15 a.m.,** Concert of Orchestral Music. **11.55 a.m.,** Time Signal relayed from **Nauen,** followed by Weather Report. **1.50,** Chess Problems by P. S. Leonhardt. **2.20,** Elementary, Spanish Lesson by Kurt Metze, Spanish Lecturer at the Königsberg Technical Institute. **4.0,** Concert. **6.30,** Talk. **7.0,** Concert by the Königsberg Station Orchestra, conducted by Erich Seidler : Baritone Solos by Albert Tostini ; At the Piano : Enna Feige. **9.15,** Late News Bulletin and Sports News. **9.30** (approx.), Relay of Dance Music. **11.30** (approx.), Close Down.

**LAHTI** (**1,522.8 metres**) ; 35 kW.—Programme also for **Helsingfors** (375 metres).—**7.0 a.m.** (approx.), Relay of Divine Service. **9.50 a.m.,** General News Bulletin. **10.5 a.m.,** Recital of Music. **10.50 a.m.** Weather Report and Forecast, followed by Time Signal. **11.0, a.m.,** Relay of Divine Service in Swedish. **3.0,** Orchestral Concert under the direction of Erkki Linko. **4.0,** Talk. **4.25,** Programme by the Station Orchestra. **4.57,** Time Signal and Weather Report. **5.10,** History Talk. **5.40,** Talk. **6.0,** Concert. **7.45,** Late News Bulletin given in Finnish and Swedish. **9.0** (approx.), Close Down.

**LANGENBERG** (**468.8 metres**) ; 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**7.15 a.m.,** Musical Selections. **7.35 a.m. to 7.55 a.m.,** Talk in Esperanto. **8.5 a.m.,** Catholic Recital of Music and Address. **10.0 a.m.,** Talk on the German Language. **12.0 Noon,** Orchestral Concert, followed by Talks on Literature and Chess. **4.0,** See **Cologne. 7.0,** "The Czarevitch," Operetta in Three Acts by Franz Lehár. Musical Director : Herr Kühn. Choral items by the Zimmermann Choir. Followed by Late News Bulletin, Sports Notes and Selections of Dance Music. **11.0** (approx.), Close Down.

**LEIPZIG** (**365.8 metres**) ; 4 kW.—Programme relayed by **Dresden** (275.2 metres).—**7.30 a.m.,** Organ Recital relayed from the Leipzig University Church, Selections by Professor Ernst Müller. **8.0 a.m.,** Morning Recital with Vocal and Instrumental Solos. **12.0 Noon,** Two Talks for Farmers. **1.0,** Foreign Press Review and Happenings abroad, followed by Notes from the German Speaking Union. **4.30,** Orchestral Concert. **5.30,** Talk. **6.0,** Schubert Festival of the Dresden Academy of Singing, relayed from the Vereinshaussaal. Soprano Solos by Lisel von Schuch and Contralto Solos by Helene Jung of the Dresden Opera House. **9.0,** Sports Notes. **9.30,** Dance Music relayed from **Berlin. 11.30** (approx.), Close Down.

**LYONS** (Radio Lyon) (**291 metres**) ; 1.5 kW.—**7.45,** "Le Journal Parlé de Radio-Lyon," Press Review and Notes on Current Events. **8.0,** Instrumental Concert : Artistes, Madame Ducharne (pianoforte) ; M. Camand

## Programmes from Abroad.—

(violin); M. Testanière ('cello); L'Invitation au Voyage (Charpentier). **9.0** (approx.), Close Down.

**MADRID** (Union Radio), Call EAJ7 **(375 metres)**; 3 kW.—Programme relayed by **Salamanca** EAJ22 (405 metres).—**11.30 a.m.**, Concert by the Municipal Band, conducted by Señor Villa, relayed from "El Retiro" (weather permitting). **2.0**, Chimes and Time Signal. **2.5**, The Station Orchestra in a programme of Light Music. Interlude by Luis Medina. **3.30 to 7.0**, No Transmission. **7.0**, Instrumental Selections by the Station Sextet and Interlude by Luis Medina. **8.30 to 10.0**, No Transmission. **10.0**, Chimes and Time Signal. **10.5**, Military Band Concert. **12.0 Midnight**, Outside Relay of Dance Music. **12.30 a.m.** (approx.) (Monday), Close Down.

**MILAN**, 1MI **(549 metres)**; 7 kW.—**9.30 a.m. to 10.0 a.m.**, Sacred Recital with Vocalists. **11.30 a.m.**, Time Signal and Concert, by the Milan Wireless Quartet. **12.20 to 3.0**, No Transmission. **3.0**, Opening Signal and programme by the Radio Quintet: Signora A. Armagni Gennari, Soprano Solo, Serenata e Ninna nanna (Mariotti). **4.15**, Talk for Farmers. **5.0, to 7.25**, No Transmission. **7.25**, Opening Signal and Current Topics. **7.35**, Time Signal and Talk. **7.45**, Sports Notes. **7.50**, Relay of an opera from the Teatro dal Verme. Late News Bulletin and Sports Notes at the end of Act 2. **10.45** (approx.), Close Down.

**MOTALA (1,380 metres)**; 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres) and **Sundsvall** (545.6 metres).—**10.0 a.m.**, Relay of Morning Service, from **Stockholm. 11.45 a.m.**, Weather Report and Forecast. **4.55**, Relay of Carillon from the Stockholm Town Hall. **5.0**, Relay of Divine Service from **Stockholm. 6.15**, "The Merry Widow," operetta by Lehár. **8.15**, Late News Bulletin. **8.30**, Weather Report. **8.40**, Concert. **10.0** (approx.), Close Down.

**MUNICH (535.7 metres)**; 4 kW.—Programme relayed by **Augsberg** (566 metres), **Kaiserslautern** (277.8 metres) and **Nuremburg** (241.9 metres).—**10.0 a.m.**, Relay of Chimes from the Town Hall. **12.5**, Time Signal, Weather Report and Announcements on Forthcoming Programmes. **2.0**, Programme of Music. **3.0**, Reading. **3.30**, Concert. **5.0**, Talk. **6.30**, Wireless Review. **7.0**, Concert or Opera. **7.45**, Concert by the Station Orchestra, under the direction of Hans Winter. **9.5**, General News Bulletin. **9.30**, Relay of an outside Concert. **10.30** (approx.), Close Down.

**NAPLES**, Call 1NA **(333.3 metres)**; 1.5 kW.—**9.0 a.m.**, Morning Recital of Vocal and Instrumental Music. **3.45**, Programme for Children. **4.0**, Concert of Popular Music with Soprano Solos. **4.30**, Time Signal. **7.20**, News Bulletin. **7.40**, Time Signal. **7.45**, Report of the Naples Harbour Authorities. **7.50**, Concert by the Station Orchestra with Soprano Solos by Elvira Alfano and Baritone Solos by Raffaele Aulicino. **9.0**, Sports News. **9.55**, Calendar and Programme Announcements. **10.0** (approx), Close Down.

**OSLO (461.5 metres)**; 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres). **Porsgrund** (500 metres), **Rjukan** (448 metres).—**9.0 a.m.** (approx.), Morning Service relayed from St. Saviour's Church. **6.15**, Weather Report and Forecast and News from the Press, followed by Talk or Musical Selections. **7.0**, Concert. **8.30**, Weather Report and News from the Press. **8.45**, Current Events. **9.0**, Dance Music relayed from the Hotel Bristol. **10.45** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT **(458 metres)**; 0.5 k.W.—Programme relayed at Intervals by the following stations:—**Bordeaux** PTT (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille** PTT (264 metres), **Limoges** (285 metres), **Lyons** PTT (480 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse** PTT (260 metres).—**8.0 a.m.**, General News Bulletin and Time Signal. **10.25 a.m.**, International Time Signal and Weather Forecast. **12.0 Noon**, Concert. **1.0**, Economic Report. **2.0**, Concert organised by the General Association of Wireless Listeners, Ballet Music from "Le Cid" (Massenet). **2.30**, Symphony Concert arranged by "Le Journal." **4.0**, Pasdeloup Symphony Concert relayed from Théâtre des Champs Elysées. **6.0**, Le Radio Journal de France. **8.0**, Talk arranged by the General Union of French Associations. **8.30**, Vocal and Orchestral Concert, followed by Late News Bulletin, Time Signal and Weather Report. **10.30** (approx.), Dance Music relayed from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL **(2,650 metres)**; 5 kW.—**7.58 a.m.**, Time Signal on 32.5 metres. **9.26 a.m.**, Time Signal on 2,650 metres. **7.10 to 7.20**, Weather Report. **7.30**, Le Journal Parlé par T.S.F. with talks

# Sunday, October 28th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

by its regular contributors: Doctor Pierre Vachet, Portez-vous bien; Detective Ashelbé: Police Anecdotes. **7.56**, Time Signal on **32.5 metres. 8.0 to 9.0**, Concert by Mario Cazes and his Orchestra. **10.26**, Time Signal on 2,650 metres. **11.15** (approx.), Close Down.

**PARIS** (Radio L.L.) **(370 and 60 metres)**; 1 kW.—**12.30**, General News Bulletin and Talk on Current Events, followed by Concert, arranged by "Radio Liberté"; Selections by the Séringes Trio: M. Charles Séringes (Violin); Madame Mendes Guasco ('Cello); M. Edouard Flament (Piano), of the Paris Conservatoire. **1.0**, Carillon de Fontenay. **3.0**, Programme of Dance Music, organised by "Les Etablissements Radio LL."

**PARIS** (Petit Parisien) **(340.9 metres)**; 0.5 kW.—**8.45**, Gramophone Records. **8.50**, Talk. **8.55**, News from the Press. **9.0**, Instrumental Selections. **9.30**, Symphony Concert, under the direction of M. Estyle, of the Paris Conservatoire: Second Hungarian Rhapsody by Liszt. **10.0**, Late News Bulletin. **10.15**, Concert of Instrumental Music. **11.0** (approx.), Close Down.

**PARIS** (Radio-Paris), Call CFR **(1,750 metres)**; 6 kW.—**8.0 a.m.**, General News Bulletin and Press Review. **12.0 Noon**, Religious Address by Father Lhande: "Le Christ dans la banlieue," followed by Concert of Sacred Music and Choral Selections, arranged by "La Vie Catholique." **12.30**, Press News. **12.45**, Programme by the Albert Locatelli Orchestra. **4.30**, Popular Gramophone Records, arranged by "l'Industrie Musicale"; in the Interval, News from the Press. **8.30**, Czechoslovakian Festival: Introductory Speech by M. Osusky, Czechoslovakian Plenipotentiary: "The Bartered Bride," by Smetana; between the Acts: Press Review and Late News Bulletin.

**PITTSBURGH**, Call KDKA **(63 and 27 metres)**; 25 kW.—**4.0**, Divine Service. **7.0**, Roxy's Stroll Programme. **9.45**, Relay of Divine Service. **11.0**, Musical Programme. **11.30**, Concert relayed from WJZ, **New York. 1.0 a.m.** (Monday), Programme relayed from WJZ, **New York. 1.15 a.m.**, Collier's Radio Hour. **2.15 a.m.**, Concert. **3.15 a.m.**, Time Signal. **3.30 a.m.** (approx.), Close Down.

**POSEN (344.8 metres)**; 1.5 kW.—**9.15 a.m. to 10.45 a.m.**, Relay of Morning Service from a Cathedral. **11.0 a.m.**, Time Signal. **11.5 a.m.**, Two Talks for Farmers. **11.55 a.m.**, Talk by Mr. Winiewicz. **2.15**, Concert relayed from **Warsaw. 4.20**, Programme for Children. **5.15**, "Silva Rerum," by Mr. B. Busiakiewicz. **6.20**, Talk relayed from **Warsaw. 7.15**, Concert: Festival Programme in Celebration of the Tenth Anniversary of the Independence of Czechoslovakia; Address by the Czechoslovakian Consul at Posen. **9.0**, Time Signal, Weather Report and Sports News. **9.20**, Twenty Minutes' Variety. **9.40**, Outside Relay of Dance Music. **11.0** (approx.), Close Down.

**PRAGUE (348.9 metres)**; 5 kW.—**8.0 a.m.**, Concert of Sacred Music. **10.15 a.m.** (approx.), Programme of Music. **12.5**, Trade Notes. **12.20**, Announcements. **5.0**, Programme for German Listeners. **6.15** (approx.), Concert or Play. **9.0**, Time Signal and Late News Bulletin. **10.15**, Concert.

**RIGA (526.3 metres)**; 4 kW.—**8.0 a.m.**, Relay of Church Service (in German). **9.15 a.m.**, Relay of Divine Service (in Latvian) from the Mara Church. **12.0 Noon**, Stories and Music for Children. **3.0**, Concert of Popular Items, conducted by Arved Parups. **4.0 to 6.0**, Four Talks. **6.0**, Concert of Orchestral Music with Soloists. **8.0**, Weather Report and Late News Bulletin. **8.30**, The Orchestra of the Café de l'Opéra in a Programme of Light Music. **10.0** (approx.), Close Down.

**ROME**, Call 1RO **(447.8 metres)**; 3 kW.—**9.0 a.m.**, Opening Signal. **9.5 a.m.**, Vocal and Instrumental Recital of Sacred Music. **9.45 a.m. to 12.0 Noon**, No Transmission. **12.0 Noon**, Opening Signal. **12.5 to 1.0**, Concert by the Wireless Trio. **1.0 to 4.0**, No Transmission. **4.0**, Opening Signal. **4.5**, Dance Music by the Orchestra at the Casinetta. **5.0 to 6.40**, No Transmission. **6.40**, Opening Signal. **6.45**, Topical Talk. **7.0**, Agricultural Talk, followed by Sports News and General News Bulletin. **7.45**, Concert by the Grand Symphony Orchestra on the occasion of the National Festival; at the beginning of the Programme: The Italian National Anthem. **9.50**, Late News Bulletin. **10.15** (approx.), Close Down.

**SCHENECTADY**, Call 2XAD and 2XAF **(21.96 and 31.4 metres)**; 30 kW.—**3.30**, Relay of Church Service. **6.30 to 7.0**, Programme arranged by the United Radio Corporation. **9.0**, Talk for Men, by Dr. S. Parkes Cadman, under the auspices of the Bedford Branch of the Y.M.C.A., relayed from **Brooklyn, N.Y. 10.30**, Acousticon Programme from **New York. 11.0**, The Stetson Parade Half-hour, relayed from **Boston, Mass. 12.0 Midnight**, Lehigh Programme, relayed from **New York. 12.30 a.m.** (Monday), Relay from the Capitol Theatre, **New York. 2.0 a.m.**, David Lawrence: Talk on "Our Government," relayed from **Washington, D.C. 2.15 a.m.**, Atwater Kent Hour, relayed from **New York. 3.17 a.m.**, Experimental Transmission of Television Signals. **3.30 a.m.** (approx.), Close Down.

**STUTTGART (379.7 metres)**; 4 kW.—Programme relayed by **Freiburg** (577 metres).—**10.10 a.m.** (approx.), Morning Recital of Music. **11.0 a.m.** (approx.), Orchestral Concert followed by Gramophone Records. **1.0**, Children's Corner. **7.30** (approx.), Concert or Play followed by Variety Programme and Late News Bulletin and Sports News.

**TOULOUSE** (Radiophonic du Midi) **(391 metres)**; 3 kW.—**12.20**, Weather Report and Forecast and Local Stock Market Report. **12.45**, Instrumental Music. **1.0**, Carillon. **1.45**, News from "Le Télégramme," "L'Express," and "Le Midi Socialiste." **8.0**, Stock Exchange Quotations from Paris and Prices of Cereals followed by News from the Fournier Agency. **8.15**, Press News. **8.55**, Concert arranged by L'Association des Commerçants Radio-Electriciens du Midi: Orchestral Selection, Triumphal March from "Sigurd Jorsalfar" (Grieg). **9.0**, Carillon. **9.5**, Instrumental Concert. **10.15**, "Le Journal sans papier" with News from North Africa followed by Late News Bulletin. **10.30** (approx.), Close Down.

**VIENNA (577 and 517.2 metres)**; 1.5 and 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres), and **Linz** (254.2 metres).—**9.20 a.m.**, Organ Recital. **10.0 a.m.**, Concert by the Vienna Symphony Orchestra. **3.15** (approx.), Orchestral Concert. **6.15**, Instrumental Selections. **7.5**, "Twelfth Night," Play in Five Acts by Shakespeare, translated by Herr Schlegel. Producer: Dr. Hans Nüchtern, followed by Programme of Light Music. **10.0** (approx.), Close Down.

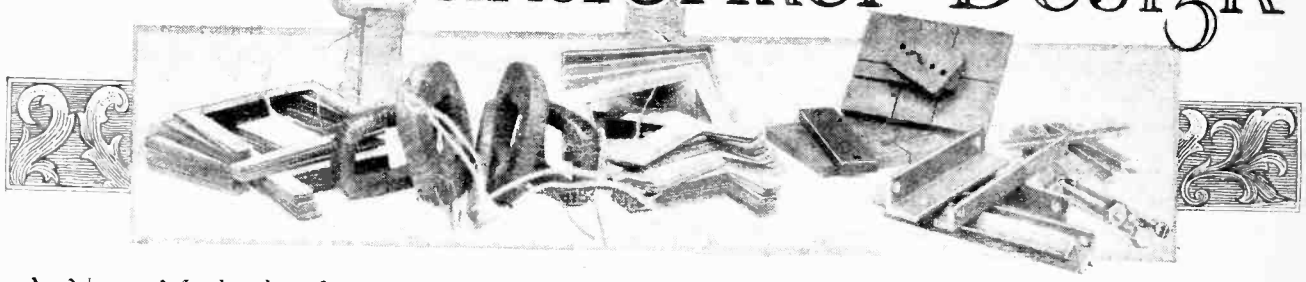
**VILNA (435 metres)**; 1.5 kW.—**9.15 a.m.**, Relay of Service from the Vilna Cathedral. **10.56 a.m.**, Time Signal and General News Bulletin relayed from **Warsaw. 11.5 a.m. to 6.0**, Programme relayed from **Warsaw. 11.5 a.m.**, Concert. **1.0 to 2.0**, Agricultural Talks. **2.15**, International Concert: Pianoforte Recital by Marie Karklin of the Riga Conservatoire. **4.20**, Talk. **4.45**, Talk. **5.0**, Concert. **6.20**, Talk. **7.30**, Concert relayed from **Warsaw. 9.0**, Time Signal, Aviation Route Conditions, Weather Report and Late News Bulletin, followed by Sports and Police News relayed from **Warsaw. 9.30**, Dance Music from the "Oaza" Retaurant, **Warsaw. 10.30** (approx.), Close Down.

**WARSAW (1,111 metres)**; 10 kW. **9.15 a.m. to 10.45 a.m.**, Cathedral Service. **10.56 a.m.**, Time Signal, Aviation Report and Weather Report and Forecast. **11.5 a.m.**, Orchestral Concert. **1.0**, Three Agricultural Talks. **2.0**, Weather Report. **2.15**, The First of a Series of International Concerts arranged by the Establishments for Advanced Musical Education in Poland in collaboration with similar institutions abroad. This week: Pianoforte Recital by Marie Karklin of the Riga Conservatoire. **4.20**, Talk. **4.45**, Aviation Talk by G. Osinski. **5.0**, Orchestral Concert. **6.0**, Notes by the Polish Horse-Breeding Association. **6.20**, Talk. **7.30**, Vocal and Orchestral Concert. **9.0**, Aviation Route Conditions and Weather Report, **9.5**, Late News Bulletin. **9.20**, Police and Sports News. **9.30**, Relay of Dance Music from the Oaza Restaurant. **10.30** (approx.), Close Down.

**ZAGREB (309.2 metres)**; 0.7 kW.—**10.30; a.m.**, Instrumental Concert. **4.0**, Relay from the "Club-Bar." Programme of Dance Music. **6.45**, Wireless Notes. **7.0**, Relay from the Zagreb National Theatre, "Nikola Subio Zrinjski," opera by Zajo.

**ZURICH (588 metres)**; 1 kW.—**10.0 a.m.**, Concert relayed from the Capitol Theatre. **11.0 a.m.**, Weather Report and Forecast. **11.30 a.m.**, Selections by the Station Orchestra. **3.0**, Concert by the Castellano Orchestra relayed from the Carlton Elite Hotel. **6.30**, Time Signal. **6.35**, Religious Address. **7.0**, Orchestral Concert. **7.30**, "Request" Concert by the Station Orchestra including German Folk Songs to the Lute rendered by Hugo Fröhlin of Basle. **9.0**, Weather Report, and Late News Bulletin. **9.30** (approx.), Close Down.

# Mains Transformer Design



## A New Method of Design Based on Assumed Dimensions of the Iron Core.

By H. B. DENT.

ONE of the most important, or perhaps it would be nearer the mark to say essential, components in an A.C. battery eliminator, or charger, is the mains transformer. The function of this device is to step-up, or step-down, the supply voltage to a pressure suitable for the immediate requirements. For example, in the case of H.T. battery substitutes, a voltage of 500 is often required to enable a smooth D.C. output at about 200 volts to be available for operating the receiver. For charging L.T. accumulators it is obviously much more economical to step-down the supply voltage to about 20, or less, than rectify the high voltage and waste energy in heating a resistance, the only function of which is to prevent an excess of current passing through the accumulator. If the transformer is designed reasonably well, the energy lost in transformation will be comparatively small. The power taken from the supply mains will always equal the watts taken from the secondary plus the losses in the transformer; therefore, if the losses are kept down to the lowest possible figure, the bulk of the power taken from the mains will do useful work, and payment will not have to be made to the supply company for the mere pleasure of heating the transformer.

### Eliminator Transformers.

The transformers used in H.T. battery eliminators are provided generally with two secondary windings. One supplies the high voltage, which, after being rectified and smoothed, is used as the anode potential on the receiving valves, and the other provides the filament current, at a suitable voltage, for the rectifiers. In designing transformers for this purpose, certain liberties can be taken with the accepted principles of transformer design, but in place of a theoretical treatment of each governing factor, the writer considers that the explanation would be more readily followed by taking a practical case and showing, step by step, how a transformer can be designed to meet the requirements of wireless users. Although A.C. systems vary widely as regards voltage and frequency, the trend is towards a standardisation of 240 volts at 50 cycles, so this will be taken as being the nature of the supply in the present example. For lower voltages the number of turns on the primary winding will require adjusting.

The device will be required to deliver an output of 250 volts at 100 milliamps. (0.1 amp.) for the anode supply, and 6 volts at 3 amps. for lighting the filaments of the rectifying valves. The full output load in this case will, therefore, amount to 43 watts: $(250 \times 0.1) + (6 \times 3)$. Transformers of this output do not require an elaborate magnetic circuit, and it is permissible, and, moreover, very convenient, to employ a standard size of transformer lamination, which can be procured cut to the required size, at a moderate cost. In the present case the design will be weaved round one of the standard sizes of stampings made by Messrs. Jos. Sankey and Sons, Ltd., and listed in their catalogue as "No. 4 Transformer Stampings."

### The Magnetic Circuit.

In every transformer the relationship between total flux, frequency, and the number of turns per volt is represented by:—

$$4.44 \times F \times f \times t = 10^{10} \quad \ldots \quad \ldots \quad (1)$$

where $f$ = the frequency of the supply in cycles per second, $t$ = the number of turns per volt, and $F$ = the total magnetic flux in the core.

This includes two unknown quantities, namely, the total flux and the number of turns per volt. However, one can be disposed of without much difficulty by adopting six turns per volt in the present case. This figure is not taken at random, but has been chosen as the result of some experiments conducted with various transformers having a similar size of iron core, but with different windings.

The total flux can now be found by substituting known values in (1) and transposing, which gives:—

$$F = \frac{10^{10}}{4.44 \times 50 \times 6} = 75.75 \text{ kilo-lines} \quad \ldots \quad (2)$$

Before the cross-sectional area of iron core can be found, a decision must be made with regard to the number of lines of magnetic force which it is safe to crowd into one square inch of iron in the core without approaching too near to the saturation point. The number of lines in one square inch of iron is generally referred to as the flux density. In small transformers a reasonably high flux density can be adopted, but if this is too high it will affect other factors than the size

**Mains Transformer Design.—**

of the core, and it is, therefore, unwise to work the iron too near saturation solely for the purpose of reducing the dimensions of the magnetic circuit. Transformer iron is reasonably cheap, and it will be found well worth while to be generous in its use. A curve showing the relationship between the magnetising force H and the flux density B is shown in Fig. 1, and from this it will be seen that if the cross-sectional area of the core, in the present case, was restricted to one square inch, the magnetic circuit would be practically saturated. A safe rule to adopt is to decide on a flux density, which, from the B/H curve of the sample of iron employed, shows a reasonably large change in the number of lines for a small alteration in the magnetising force.

### Correction for Insulation in Core.

In the present case this condition will be met anywhere between 30 and 60 kilo-lines per square inch. Taking 50 kilo-lines as a safe figure, the cross-sectional area of the core is found by dividing the total flux by the flux density per square inch: $\frac{75 \cdot 75}{50} = 1.5$ square inches. As the whole of this space will not be occupied by iron, due to each lamination being insulated from adjacent stampings, it will be necessary to introduce a correction factor, generally referred to as the "iron space factor." In a carefully built-up core, about 9/10ths of the gross area consists of iron, so that the "iron space factor" can be considered as being 0.9. Therefore, as we require 1.5 square inches of iron, the gross area becomes $1.5 \times 1.1 = 1.65$, or approximately $1\frac{3}{4}$ square inches. At this stage it would be advisable to make a scale drawing of the core; this is shown in Fig. 2, and from this can be obtained the approximate length of one turn, assuming that the wire will occupy the full depth of the winding space, and the mean length of the magnetic circuit. This information will be required at a later stage.

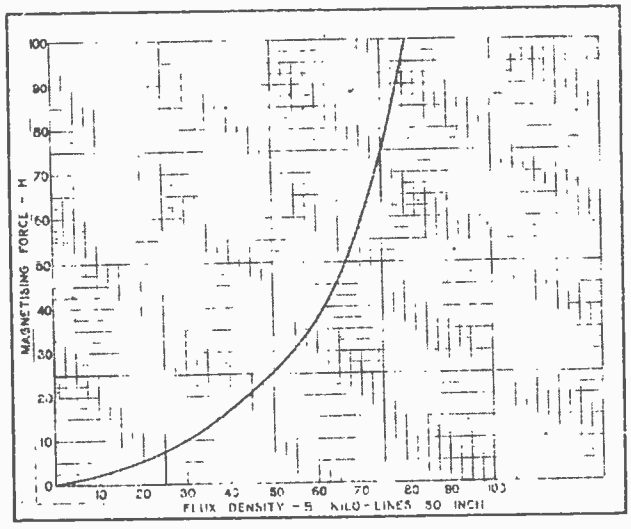



**Fig. 1.—B H curve for "Stalloy" showing relationship between Magnetising Force "H" and flux density "B."**
*(Courtesy Jos. Sankey & Sons, Ltd.)*

The number of turns required for the primary winding is found by multiplying the turns per volt by the voltage of the supply mains, *i.e.*, $6 \times 240 = 1,440$ turns. Similarly, the high voltage secondary winding will require $(6 \times 250) + (6 \times 250) = 3,000$ turns. The reason that double the required number of turns are used is that full-wave rectification is legislated for, and to achieve this 250 volts must be applied to each anode of the rectifier, or to each rectifying valve if two half-wave rectifiers are used. The filament winding is found to require 36 turns.

The next point requiring consideration is the disposition of the coils on the core. In the case of an eliminator, this will contribute largely to the ease of smoothing the output after rectification. The coils should be arranged symmetrically round the primary whenever possible, and a good policy to adopt is to divide the primary and high-voltage secondary each into two coils of equal turns and arrange these either side of the filament coil, making this the centre of the assembly. Fig. 3 shows this diametrically, and the photographs illustrate the practical application of the theoretical arrangement.

Attention can now be given to the choice of suitable sizes of wire for the coils, but first it will be necessary to ascertain the magnitude of the current which will probably pass through each. We know the maximum current required from the two secondary coils, as this forms one of the factors in the design, but the primary current is an unknown quantity. It is not possible at this stage to determine accurately the current in the primary, but a sufficiently close approximation can be reached by assuming a reasonable efficiency factor for the transformer and calculate the primary current from this. Measurements taken with a number of transformers built up on similar cores show that unless the construction has been carried out carelessly it is possible always to obtain at least 75 per cent. efficiency. Taking this as a safe estimate in the present case, the primary watts can be determined by multiplying the output watts by $\frac{100}{75}$, thus $\frac{100}{75} \times 43 = 57$ watts.

As watts are the product of voltage and current, the latter works out at 0.24 amperes $\frac{(57)}{(240)}$. The size of the conductor chosen for the primary must carry this current without introducing unnecessary resistance, and the wire table has been prepared to facilitate this, also as a guide for those who have not access to this information. It will be seen that No. 26 S.W.G. will answer our purpose.

### Allocation of Winding Space.

The insulation must not be overlooked, but whether D.C.C. or D.S.C. is to be used cannot be decided until some idea is gained of the available space that can be allotted to the primary. A sound policy to adopt is to divide the winding space equally between the primary and secondaries. Now by referring to the scale drawing of the core [Fig. 2 (a)] it will be seen that about two square inches are available for the accommodation of all coils. Half of this, or one square inch, can be allotted to the primary, and the remainder suitably pro-

**Mains Transformer Design.—**

portioned between the two secondaries. Measurement taken from hand-wound coils—and it is highly improbable that the home constructor will have any other

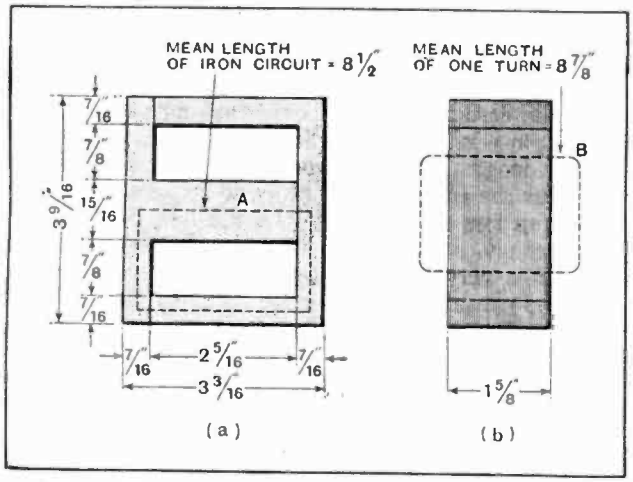


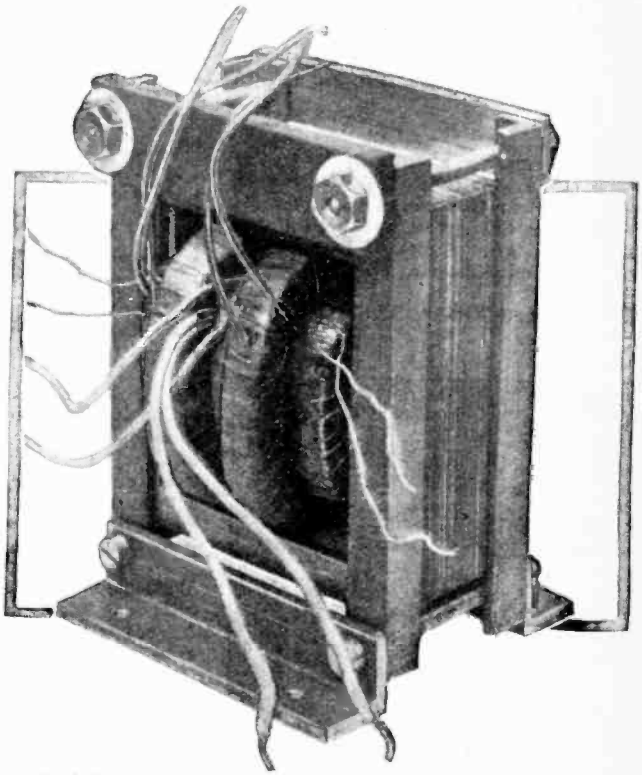

Fig. 2.—Dimensional drawings of an iron core built up from Sankey No. "4" transformer stampings.

means at his disposal for winding—show that if double silk-covered wire is used and the finished coil bound with thin linen tape, the copper will occupy about ⅖ths of the total space taken up by the coils. If D.C.C. wire is employed it would be advisable to regard the "copper space factor" as being 0.3.

The area occupied by the conductor itself, ignoring for the moment covering on the wire and other incidental insulation, can be found by multiplying the cross-sectional area of the wire by the total number of turns comprising the primary winding. The second column in the table gives the area of various standard gauges of wire likely to be used for small transformers, and we find from this that the copper in the primary winding will require $0.00025 \times 1,440 = 0.36$ of a square inch. To find the gross space, this figure must be multiplied by $\frac{5}{2}$; therefore, the primary will take up $0.36 \times \frac{5}{2}$, or 0.9 square inch. This falls just within the allotted space, and attention can now be given to the two secondary windings. As regards the low-voltage secondary, it has been decided that 36 turns will be required, and as a current of 3 amperes has been allowed it will be seen from the table that No. 16 S.W.G. must be employed. By adopting the same procedure as in the case of the primary, we find that the space required for this coil will be $0.0032 \times 36 \times \frac{5}{2} = 0.3$ square inch approximately. This leaves just over half a square inch in which to accommodate the high-voltage secondary.

TABLE I.

| S.W.G. | Sectional area in sq. ins. | Turns 1 sq. in D.C.C. | Turns 1 sq. in. D.S.C. | Resistance in ohms per 1,000 yds. at 60 °F. | Current density 1,200 amps. sq. in. |
|---|---|---|---|---|---|
| 38 | 0.000028 | 5,110 | 13,900 | 819.1 | 0.0336 |
| 36 | 0.000045 | 4,010 | 8,120 | 529.2 | 0.054 |
| 34 | 0.0000665 | 3,020 | 7,310 | 361.2 | 0.0792 |
| 32 | 0.00009 | 2,550 | 5,650 | 261.1 | 1.1093 |
| 30 | 0.00012 | 2,210 | 4,500 | 198.8 | 0.144 |
| 28 | 0.00017 | 1,790 | 3,340 | 139.55 | 0.204 |
| 26 | 0.00025 | 1,400 | 2,380 | 94.4 | 0.306 |
| 24 | 0.00038 | 1,015 | 1,600 | 62.2 | 0.456 |
| 22 | 0.0006 | 692 | 1,040 | 39 | 0.744 |
| 20 | 0.001 | 473 | 655 | 23.6 | 1.2 |
| 18 | 0.0018 | 299 | 384 | 13.27 | 2.16 |
| 16 | 0.0032 | 177 | 216 | 7.46 | 3.8 |
| 14 | 0.005 | 115 | — | 4.77 | 6.0 |



Partially assembled transformer designed for an L.T. battery charger adopting the method discussed in this article.

The data on which the design was based allowed for a possible output in this case of 0.1 ampere, but a little thought will show that a current of this magnitude will not flow through the whole coil. For all practical purposes, we can consider the two halves of the secondary as being in parallel, so that each coil will carry only half the total current. From our table we find that No. 36 S.W.G. wire will answer the purpose in this case, and the 3,000 turns will require a winding space of $3,000 \times 0.000045 \times \frac{5}{2} = 0.34$ sq. in. Having decided on what would appear to be suitable windings for all coils,

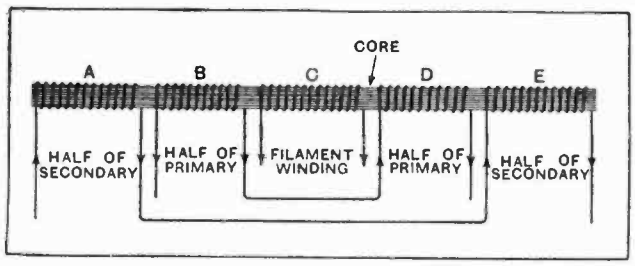



Fig. 3.—Schematic arrangement of coils on the core.

**Mains Transformer Design.—**

attention can now be given to the calculation of the probable losses in the transformer, thereby arriving at a more accurate idea of the efficiency of the device. The losses which have any bearing on this fall naturally under two headings, that which occurs in the copper and those associated with the magnetic circuit. The copper loss, which is often referred to as the $I^2R$ loss, because, owing to the resistance of the conductor heat is generated when a current flows, is found by calculating the resistance of each coil and multiplying by the square of the current (in amperes).

### Why Laminated Cores are Used.

The losses due to the magnetic circuit arise from two causes, namely, eddy currents and hysteresis. Since iron is a conductor of electricity, and the core is interlinked with the flux, voltages will be generated within the core, but these can be minimised by laminating the core and inserting layers of insulation. It is for this reason that the cores of transformers are not built up from solid castings. The hysteresis loss is due to the wasted energy in rearranging the molecules in the iron when a reversal of magnetism, which accompanies every change in the direction of current flow, takes place. This loss depends largely upon the quality of the iron, hence the material used is always chosen with a view to reducing this loss to a minimum. It follows naturally from the above that the practice of passing a bolt through holes in the four corners of the core, to hold the laminations together, is highly undesirable in power transformers, although this method of assembly is permissible in certain iron-cored coils used for various other purposes in wireless. End plates should be used if possible, or lengths of angle iron cut so that the holding bolts clear the core and do not short-circuit the edges.

The iron loss will increase with the flux density, also the frequency, and depends also upon the weight of the core. It is very convenient to lump together the iron losses and consider them as being so many watts per lb. of iron in the core. All that is necessary in the present case is to find the volume of iron in cubic inches and multiply this by 0.28 to find the weight in lbs. ; the iron loss is then, the weight of iron multiplied by the appropriate value of " watts lost per lb."

(*To be concluded.*)

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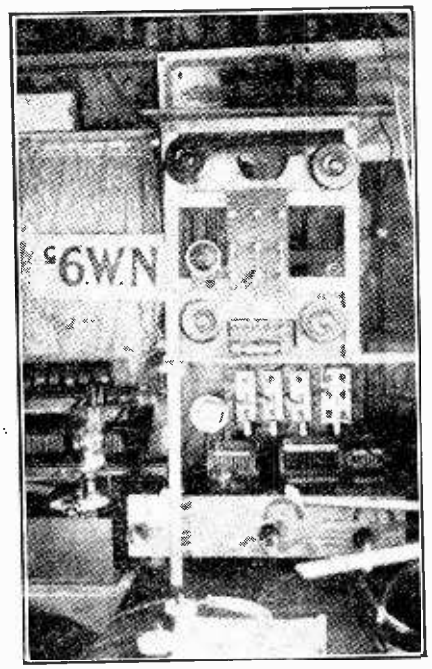
**General Notes.**

Mr. I. A. G. Cole, 174, Broomwood Road, Clapham Common, S.W.11, notifies us that he has given up the call-sign 2AXA, but will be pleased to stand by and report on tests, etc., at the following times :—

Monday and Friday, 8.30-10.0 p.m. on 41-43 metres.




**G 6WN. Owned and operated by Mr. H. V. Wilkins at 81, Studland Road, Hanwell, W.7. The circuit is of the T.P.–T.G. type with an LS 5 valve. The station has been in two-way communication with amateurs in all parts of the world on 8 watts or less.**

## TRANSMITTERS' NOTES AND QUERIES.

Saturday, 2.0-4.30 p.m. and 7.45-11.0 p.m. on 41-45 and 150-160 metres.

Sundays, 6.0 a.m.-10.0 p.m. on 20-50 metres.

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**Reception of the Airship " Graf Zeppelin."**

Conditions on the night of October 15th were exceptionally favourable for transatlantic reception, and many listeners in this country were able to pick up the signals direct from the *Graf Zeppelin* while flying to her moorings at Lakehurst, New Jersey.

**Wavemeters for Transmitting Stations.**

The question of suitable wavemeters for use under the new regulations is still awaiting a definite answer and is arousing considerable discussion among amateur transmitters. The Postmaster-General states that wavemeters of the absorption and heterodyne types generally cannot be regarded as satisfactory unless used constantly in conjunction with an oscillator embodying a suitable crystal. At the time of writing there seems much uncertainty anent the " other approved type," as an alternative to the somewhat costly piezo-electric crystal, which will satisfy the Post Office requirements.

Transmitters are anxiously awaiting the solution of the present difficulty.

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**New Call-signs and Stations Identified.**

| | |
|---|---|
| **5WB** | C. A. Webb, Wilton Rd., West Hounslow, Middlesex. (Change of address). |
| **6WZ** | (ex 2BQK), J. McKenzie Wilkie, 102, Stanley St., Aberdeen. |
| **6XB** | (ex 2ACG), G. E. Jones, Tregarth, Redruth, Cornwall. |
| **2AFB** | S. West, 33, Regent St., Great Yarmouth, wishes to co-operate as far as possible with experimenters on the 10-metre waveband. |

**New Zealand Amateurs.**

(Supplementing and correcting the list in the *R.S.G.B. Annual* for 1928.)

| | |
|---|---|
| **1BA** | E. Taylor, 2, Fremont St., Parnell, Auckland. |
| **1BC** | F. Mickleborough, 204, Great North Rd., Grey Lynn, Auckland. |
| **2BH** | W. Hall, 65 Wright St., Wellington (Correction). |
| **2BI** | C. Liddell, 43, Puru Crescent, Lyall Bay, Wellington (Correction). |
| **2BO** | R. Dixon, 36, Devon St., Wellington. |

## BOOKS RECEIVED.

" The Children's Hour Annual." Stories and poems related in the B.B.C. Children's Hour, by G. F. Benson, Desmond MacCarthy, J. C. Stobart, L. du G., and many others, with illustrations in colour and in black-and-white by C. T. Nightingale, A. H. Watson, and other artists. Pp. 128. Issued by the British Broadcasting Corporation and published by Partridge, London.

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" Handbook for Wireless Telegraph Operators " (revised in accordance with the Radiotelegraph Convention of Washington, 1927). Including the new " Q " code, abbreviations authorised, and the five figures to be used to indicate the strength of signals which will supersede the present " R " code. Published by H.M. Stationery Office, price 6d. net.

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" The Chronicle Wireless Guide " (sixth edition), containing constructional details of various sets, ranging from the simple crystal set to the multi-valve receiver, with articles on moving-coil loud speakers, amplification, H.T. supply from D.C. mains, and other subjects, including two reprints from the *Manchester Evening Chronicle*. Published by Allied Newspapers, Ltd., Manchester, price 6d.


*By Our Special Correspondent.*

***De-controlling the Music.—"Fultograph" Transmissions.—At the Queen's Hall.—The Zeppelin Relay.—Sir James Barrie and Modern Loud Speakers.—Broadcasting on Armistice Day.***

**"Music Control" To Go.**

The growing flood of opinion against "over-control" in the musical broadcasts of the B.B.C. has not been ineffectual, for I learn, from a most reliable source, that "music control" is shortly to be abandoned. When this comes about (and there seems no reason for delaying the inevitable), we shall have the satisfaction of knowing that there is only one middleman instead of two.

Somebody, of course, must be in charge in the control room, if only to prevent blasting.

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**A Two Years' Experiment.**

"Music control" came in about two years ago; before then the engineers reigned supreme over everything that got as far as the microphone, and it is safe to say that they were not over-pleased when an intermediary appeared. Since then the work of music control has been under the direction of that polished musician, Mr. Stanton Jeffries, whose talents, according to a number of people inside, as well as outside, Savoy Hill, could have been better employed in activities of a more constructive nature. It is fair to say, however, that Mr. Stanton Jeffries is not always in charge of "control"; he has assistants!

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**A Fade-Out.**

It is unlikely that the B.B.C. decision on the control question will be proclaimed from the housetops. More probably "music control" will emulate old military veterans, and we shall note the change only *via* the receiver.

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**Ether Pictures.**

Picture broadcasting is to begin on Tuesday next, October 30th. On and after that date, owners of picture receivers will receive their daily thrill from 2 to 2.15 p.m. except on Sundays and Mondays. Only Daventry 5XX will provide the service. The B.B.C. is not concerned with the subjects of the pictures to be sent, the choice lying with the "Fultograph" Company, who, I understand, will probably enter into special agreements with the newspaper and news agencies for pictures of topical interest.

Scotland Yard may provide some "Old Masters" of the criminal variety.

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**An Evening with Sir Thomas.**

Those of us who have looked upon the fugue form as pretty strong meat, digestible only by pleasure-shunning ascetics, must have been agreeably awakened on October 12th, when, at the Queen's Hall, Sir Thomas Beecham conducted the B.B.C. Symphony Orchestra through Lord Berner's C Minor Fugue. A jolly affair, full of slashings and tearing and trumpetings; not to mention the spectacle (for those of us in the Hall) of Sir Thomas himself, in bâtonless fury, mounting on wings like an eagle.

There were times during the evening when the conductor's mannerisms distracted rather than helped. Not so with the Fugue; no sooner had the boisterous theme been given out than we realised that Sir Thomas was the theme incarnate. He was *It*.

**FUTURE FEATURES.**

**London and Daventry (5XX).**

OCTOBER 28TH.—Service from Manchester Cathedral.
OCTOBER 29TH.—"X," a play.
OCTOBER 31ST.—"Pelleas and Melisande," libretto opera.
NOVEMBER 2ND.—Old Fellows Concert, relayed from the Queen's Hall.
NOVEMBER 3RD.—"Saturdayitis," a revue by Ernest Longstaffe.

**Daventry Experimental (5GB).**

OCTOBER 29TH.—"Pelleas and Melisande," libretto opera.
OCTOBER 30TH.—"Evening Dress Indispensable," by Roland Pertwee.
NOVEMBER 1ST.—An East Midlands Hour.

**Cardiff.**

NOVEMBER 1ST.—A Canadian Programme.
NOVEMBER 2ND.—An Australian Programme.

**Manchester.**

NOVEMBER 3RD.—Community Songs from the Manchester Radio Exhibition.

**Glasgow.**

NOVEMBER 1ST.—A Shakespeare, Shelley and Keats Programme.

**Aberdeen.**

NOVEMBER 1ST.—Hallowe'en Concert.

**Belfast.**

OCTOBER 28TH.—"The Shepherds of the Delectable Mountains," founded upon Bunyan's "Pilgrim's Progress" (R. Vaughan Williams).
OCTOBER 29TH.—"The First Voyage of Captain Cook," written specially for broadcasting by Mungo M. Dewar.

**The Zeppelin Relay.**

No one seems more astonished than the B.B.C. at the tremendous success of the Zeppelin relay from Lakehurst last week. As readers are aware, Keston took a back seat on this occasion in favour of the spaced aerial system at Chelmsford. At the moment this arrangement consists of two groups of half-wave aerials, one group being two miles distant from the other. The receiving hut is midway between each and is linked up by subterranean cables.

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**Chelmsford.**

Experiments with the spaced aerial system have been in progress for over a year, and during the whole of that time the engineers have concentrated on 2XAD, which works on 21.6 metres. The tuning cannot be varied more than about 1.5 metres either way! Whether we shall have more relays *via* Chelmsford is an open question, for I hear that Monday of last week gave exceptionally favourable conditions for the spaced aerial system.

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**Affairs at Keston.**

At all events, there is no likelihood that the Keston receiving post will disappear. Mr. J. A. Partridge, the amateur veteran who runs this little show, is busy on an anti-fading scheme which will employ a number of differently tuned short-wave receivers united to a common output. These will pick up the various American short-wavers which send the same programme on different wavelengths. It is hoped that while fading is occurring on some of the wavelengths, powerful signals will be coming in on the others. Too good to be true? Well, we shall see.

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**Hats Off to Sir James!**

The most graceful compliment ever paid to the loud speaker came from the

lips of Sir James Barrie in his maiden broadcast speech at Jedburgh last week. Referring to the "two little policemen"—the microphones on the table before him—he said: "I don't know how they work, although I have listened once or twice in houses to the results, but was never quite sure it was not really people through the wall."

This must be very cheering to Dr. McLachlan and others who, if rumour be correct, have been wandering about in a state of chronic melancholia ever since Sir Thomas Beecham made his celebrated 'hog speech."

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**The Passing of the Hoggery.**

There is no doubt that the *dilettanti* who have always endeavoured to belittle wireless are beginning to feel the present situation very keenly. If we are honest we must agree that the loud speaker of, say, 1923, had certain points in common with Sir Thomas's "hoggery." The squeals were there, though I doubt whether it was possible then to reproduce the rich, full, porcine diapason which descends to frequencies of the order of forty cycles. On the programme side, too, we sometimes had garbage not inappropriate to the sty.

But to-day things really are different. The reproduction can no longer be sneered at, and most of the critics with pretensions have to listen carefully to pick holes in the programmes.

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**Last Stronghold of the Dilettanti.**

The *dilettanti*, however, are not yet beaten. They can still take you by the arm, haul you round to a local wireless shop, and say: "Listen to that, my lad!" and rub their hands at the result. What can you do in a case like that? If you say the reproduction is good (when you know a hoggery could give it points) you lose your self respect; you cease to matter; to the *intelligentsia* you are dead.

To-day the solution is simple. You merely haul your companion to the next wireless shop and stupefy him. Fifty per cent. of the wireless shops now give good demonstrations, either with coil-driven speakers or really good cones. But there remain 50 per cent. who damn wireless to every passer-by. They give a last foothold to the *dilettanti*.

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**A New Journal.**

I hear that that well-known publishing firm, the British Broadcasting Corporation, will launch another journal before the end of November. The probable name of the debutante will be *The Listener*, and it will be devoted to the cause of adult education *via* the microphone. The Editor will be Mr. R. S. Lambert, who has been in control of this phase of broadcasting for some time past.

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**Mr. Percy Scholes.**

Mr. Percy Scholes is "retiring" from the B.B.C. only in the sense that he is yielding up his staff appointment as musical advisor owing to the pressure of other work. He will continue his fortnightly criticisms of current music.

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**Churches and Broadcast Copyright.**

At first sight there is something extravagant and absurd in the idea of connecting copyright law with the sacred service at the Cenotaph on November 11th. Yet the question has arisen in consequence of the desire of many Church ministers to introduce wireless reception into their services on Armistice Day to enable congregations to follow the proceedings at the Cenotaph.

It happens that the music will include more than one copyright hymn. Several ministers observing this fact, have approached the B.B.C. for advice. The official answer is that the Corporation cannot accept responsibility.

Need the ministers worry? A copyright prosecution as a result of reproducing the Cenotaph hymns in church seems about the least likely thing that could happen.

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**The Cenotaph Broadcast.**

The following times will be observed in the Cenotaph transmission on Armistice Day:—

10.27 a.m.—Announcement from the studio.

10.30 a.m.—Stations will be switched through to the Cenotaph. Music by military bands.

10.50 a.m.—The King lays a wreath on the Cenotaph. Band music follows until 11 o'clock.

11.0 a.m.—Chimes of Big Ben, followed by two minutes' silence.

11.2 a.m.—Service at the Cenotaph, concluding with a procession at 11.12 a.m.

Church congregations who intend to participate in the service by wireless are advised to be in their places not later than 10.30 a.m.

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**The Microphones.**

The technical arrangements at the Cenotaph have already been described in these columns. The principal microphone, which will be concealed in a lectern, will be connected by underground wires to the O.B. car in a neighbouring mews. Additional microphones will be concealed in nearby trees.

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**Remembrance Festival Broadcast.**

On the evening of Armistice Day a Remembrance Festival will be relayed from the Albert Hall to 2LO, 5XX and all stations except 5GB, from 9.5 to 11 p.m. Dr. Malcolm Sargent will conduct and the bands of the Coldstream and Welsh Guards will take part.

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**Dissecting a Laugh.**

What is it that makes people laugh—hysteria, or a genuine sense of humour? Mr. G. E. Wilkinson, of the English speech training and dramatic work at the City of Leeds Training College, will describe the various attributes of a laugh in a broadcast on November 3 to the Northern Group.

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**No, We Must Draw the Line Somewhere.**

The very energetic "Press relations department" of the National Broadcasting Company of America have sent me a little poem. I fancy that others have had it, too, because it's printed. Never mind, I won't carp about that. What I do carp about is this:—

"You can bother us with questions, And heckle us with glee—
But please don't put those periods
'Tween the letters NBC."

Why, even if I were willing (which I'm not) to defy English usage for the sake of the N.B.C., the printers wouldn't allow it! Next poem, please.

THE INVISIBLE BAND IN MOSCOW. Wireless and gramophone equipment was carried in this Ford van which took part in a recent procession of young Soviet enthusiasts in Moscow.

# A TERRITORIAL SIGNAL UNIT.

## 47th (2nd London) Divisional Signals T.A.

BEFORE introducing ourselves, our interests and activities to the readers of *The Wireless World*, we wish to thank the Editor for this opportunity of "self expression." A Territorial Signal Unit is partly a club of wireless and electrical enthusiasts and partly a school for teaching everything about electrical means of communication in portable form, and, of course, a voluntary military body.

### "Divisional Signals" Defined.

Before pursuing the subject of ourselves further many of you will ask "What are Divisional Signals?" You will most of you have heard of a division as a body of troops of all arms—Infantry, Artillery, Royal Engineers, Army Service Corps, and from time to time attached troops—Tanks, R.A.F. Squadrons, etc. This composite body is commanded and controlled by a general and his staff. As is the case with all bodies, the brain requires a nervous system, through which it can receive information from, and send orders to, any member of that body. The nervous system of a division is provided by divisional signals, who operate and control every means of communication between the "brain" and the commander of every unit in the division.

As will be seen from the analogy employed, this is a very important function, and, under the moving conditions of war, no easy one to carry out with complete reliability; hence the great interest it has for those of us who have made a study of it.

Every possible means of communication has to be employed, as any one method may break down in

Under canvas.

peculiar circumstances. We are therefore organised for rapid cable laying for telegraphy and telephony, lamp signalling with a lamp rather like a miniature searchlight, motor cycle despatch riding, and lastly, and most important of all, with the rapid mechanisation of the Army—wireless telegraphy and telephony in various forms.

We exist as a military unit to make ourselves efficient in the use of these various means of communication, and as a club for social intercourse and exchange of

Operating a field W T set.

ideas on the subjects which interest us. There is unlimited scope for "brains" and experiment, especially on the wireless side, and this constitutes an important part of our activities. Research on wireless problems (and army wireless problems have quite peculiar features) is always proceeding, and we are encouraged to assist with ideas and designs and to try our new models. The rebuilding of our headquarters at Fulham House, Putney Bridge, is just beginning, and the new buildings will include an excellent wireless workshop and facilities for constructing sets to approved designs.

### Courses of Instruction.

Officers and non-commissioned officers are experts. Organised courses of instruction are run, which provide members with a very complete education in wireless telegraphy and telephony, and, of course, every other subject connected with military signalling. Our members already include amateur transmitters, whose call signs, 5MD, 5WB, 5TV, may be familiar to you. They have obtained their radio knowledge in the classes organised at our headquarters. The radio amateur has done so much to help forward the advance of wireless, especially in short-wave working, that we feel certain that he would be interested to join us in the solution of some of the Army radio problems on which we are engaged.

During our annual camp this year a mimic battle including all arms, Tanks, and R.A.F. was fought, the communications of which were largely carried out by wireless with sets designed and made by members of the

**A Territorial Signal Unit.—**

unit. We received great praise for our efforts, both from commanders and from the Press representatives who were present.

From the above you will probably have assumed that there are entrance fees, subscriptions, etc., to be paid. Nothing could be further from the truth. Everything is provided free by the Government in return for the fact that you devote a proportion of your spare time to the service of your country in the practice of a very interesting hobby. During the annual fortnight in camp (usually at the seaside) and during other training at Easter, etc., members are paid at varying rates according to proficiency and rank. This pay amply covers your expenditure in travelling to and from headquarters during the remainder of the year, and in refreshing yourself and your friends, unless you are unduly lavish, after the evening's work. You are asked to pay for one item only, and that item is peculiar to 47th divisional signals. We consider ourselves something rather out of the ordinary among Territorial signals, and we have, in consequence, a smart uniform (in addition to the khaki, which is provided free). Everyone who joins is asked to buy this uniform within twelve months. The cost of the uniform is not high—£4—and payments may be spread to suit the individual.

Not everyone is accepted, we are rather particular about our membership, and preference is given to those with real technical interest and education. On joining the candidate is asked to sign on for a period of four years, a contract from which he can be released if unforeseen circumstances arise. After enlistment he is fitted with uniform, equipment, etc., and embarks on a carefully planned course of instructions, designed to teach him the elements of soldering, riding, rifle shooting, drill and signalling. Having passed the course he specialises in whichever branch interests him most.

**A Spare Time Occupation.**

None of this interferes in any way with your normal occupation, and it will only occupy a part of your spare time. We only ask new members to treat their Territorial service as their principal hobby.

With the rebuilding of our headquarters about to begin we are looking forward to a rather chaotic period, but from the plans which have been approved the new buildings when completed will fully justify the temporary inconvenience. They will include excellent club rooms, miniature rifle range, lecture rooms, wireless demonstration room and workshops. We already have an excellent drill hall, in which we hold dances, smokers, boxing, and play badminton, in addition to putting it to its legitimate use. Altogether we shall have the finest headquarters in London.

We shall be very glad to see anyone who is interested and who would like further information at our headquarters at Fulham House, Fulham High Street, S.W.6 (within fifty yards of Putney Bridge Station).

Those who join may be assured of a hearty welcome to a cheery club of kindred spirits.

# 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, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.**

*"WHAT DO THEY KNOW OF RADIO . . ?"*

Sir,—May I cordially endorse the wish expressed by Mr. D'Orsay Bell in his article entitled "What do they know of Radio, who only Radio know?" which appeared in your issue of the 3rd inst? Namely, that you open the columns of your valuable journal to all matters radiographic. As your contributor states, "wireless" is only a fraction of the subject, and its application, and I feel sure that there are many, like myself, who, while interested in this branch, are so chiefly, because they recognise the unlimited scope of the science generally.

Hoping to see more such articles in the future, whether treated in humorous vein or otherwise.

Beddgelert, Wales. V. DU BÉDAT SMYTHE.

*5GB.*

Sir,—What is the matter with the transmission from 5GB? All my friends are unanimous in complaining that it is muffled, distorted, and altogether unsatisfactory. It is indeed a fact that stations like Cologne and Hilversum come through with astounding power and clarity, whereas our "Experimental" station continues to behave very much like an experiment.

Sackville Street, W.1. E. BAYNES.

*"WHOA, MONSTER!"*

Sir,—My flippant remarks under *your* title of "Whoa, Monster!" in your issue of August 15, have raised a very useful point to those who are interested in reproduction of a good type for the small room, i.e., the question of overloading what is known to the trade as a "power valve."

I am sorry that one correspondent appears to have been hurt, but surely that is the great charm of your correspondence columns, you allow most divergent opinions to be published. I know of no other correspondence columns in which such fairness to both sides is shown. I hope this impartiality on your part may long continue. I was pleased to see, although I suffered for a day or two, that when on holiday my specially ordered copy of *Wireless World* was snapped up, because I was a few minutes late, by a chance customer.

Could you not give an article for the type of listener who has a small room, and perhaps smaller purse? He certainly needs hints about overloading the last valve, although your correspondent errs in assuming that I have not discovered how to avoid it. WM. B. WEST.

Deal, Kent.

*LOUD SPEAKER "ATTACK."*

Sir,—Captain Round's letter published in your issue of October 10th was read with interest.

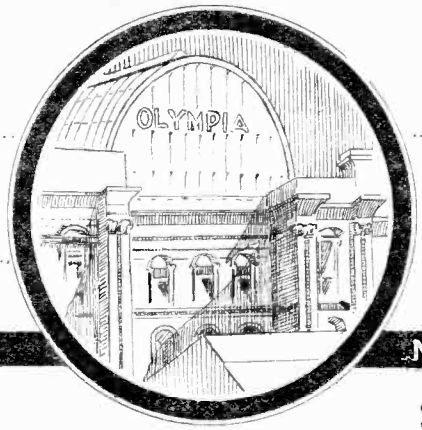
He appears to have said sufficient to establish that no loud speaker can truthfully reproduce transients or attack on account of inevitable deviations from an ideal.

Captain Round did not deal with all the factors governing the situation, but his letter at least makes clear the absolute necessity of some such expedient as has been adopted in the "Amplion Lion" to which no doubt he referred in his opening paragraph.

We may look forward to great improvement in such compensating means now that the attention of experienced research workers is directed to this quarter.

While not quarrelling with Captain Round's doctrine that perfection is unattainable, I confidently predict even better results than have yet been achieved. M. TROUTON.

Pall Mall, S.W.1.




# Lessons from LYMPIA

1928 NATIONAL RADIO EXHIBITION 1928

## Some Hints for the Amateur.

By "RADIOPHARE."

LOOKING back on the Show, it seems certain that never before have there been so many new ideas to intrigue the amateur constructor. Apart from the array of components spread for his approval, complete receivers, which in former years generally appealed only to non-technical listeners, now have in many cases points of interest that may well give food for thought to everyone.

It is difficult to pick out any one detail as being of first importance, but the wide adoption of the plan of mounting edgewise condenser drums in pairs is certainly worthy of attention, although the idea is admittedly not perfectly new; at least one example was shown in 1927. From the fact that so few manufacturers favour complete ganging of controls, the amateur may glean a warning that "single-knob tuning" still presents very real difficulties. By setting the condenser dials so that two of them may be rotated together by a single finger, we obtain the advantages of ganging over a narrow waveband. In operating a set of the popular type, with one H.F. stage and an "aperiodic" aerial coupling, fitted with controls of this kind, the correct procedure is to calibrate it on a few stations of known wavelength spread over the tuning scale, and, when it is desired to search for a transmission of which the corresponding adjustments are unknown, to set the scales at the nearest recorded setting, and then to rotate the two drums "in step." In spite of the observance of the usual precautions, it will almost invariably be found that perfect synchrony is only maintained over some 30 or 40 metres, so individual dials must be reset —by referring to the calibration chart—after passing this limit. This may at first seem rather complicated, but with an evening's practice the necessary knack is easily acquired; one even learns subconsciously to give the necessary "lead" or "lag" to one of the drums without consulting the chart.

### Pitfalls to be Avoided.

The almost complete disappearance of the neutralised triode H.F. amplifier must not lead those who have succeeded in constructing the more highly developed sets of this type to rush blindly into modifying their receivers for the screened valve; in any case, it is not at present an easy matter to make the conversion in such a way that both selectivity and sensitivity will be noticeably improved, while the result of a haphazard adaption is likely to be disappointing.

The tendency towards the abolition of the multi-stage L.F. amplifier is significant; admittedly it is very often due solely to the use of the pentode, but examples were not lacking of comparatively ambitious receivers, in which an ordinary triode output valve is fed direct from the detector; this arrangement is always attractive, more particularly when anode current is to be supplied from an H.T. eliminator, in view of the fact that a single-stage L.F. amplifier can be practically immune from troubles brought about by low-frequency reaction. An arrangement of this kind naturally requires a large high-frequency input to the detector, but this is easily obtained nowadays, by virtue of improved H.F. amplifiers. While on this subject, it might be mentioned that the growing use of a metal framework in the construction of a receiver might well be copied by amateurs with some ability in the use of tools; the metal "chassis," if correctly designed, will automatically provide at least a part of the screening which is so essential with modern H.F. circuits.

### Modern Wave-changing Methods.

Except for purposes of volume control, the filament rheostat has almost disappeared from commercial receivers. This is probably for psychological reasons; the simplification of controls by the removal of non-essentials is likely to appeal to those who take no interest in technicalities. Another case in point is the provision of non-calibrated reaction condenser knobs. In matters of this kind the amateur can safely be left to follow his own desires and inclinations; it may be pointed out, however, that there can be no great objection to the fitting of controls which, while not absolutely essential, will on occasion confer some benefit, always provided that their operation is properly understood.

In the matter of wave-range switching, the common and very natural fear that this aid to easy operation may result in an audible decrease of overall magnification seems to be finally dispelled. Many of the new sets which include this refinement are capable of putting up an extremely fine performance; its application is by no means confined to "local station" sets.

# MANCHESTER RADIO SHOW

## Monday, October 22nd, to Saturday, November 3rd, at the City Hall.

IT might seem that coming, as it does, so soon after Olympia, the Radio Show at Manchester would not provide a great attraction nor be much more than a repetition of the London Exhibition. This, however, is not the experience of former years, for the Manchester Show is in several respects distinct in character, and attracts a number of new exhibitors.

### Apparatus Seen for the First Time.

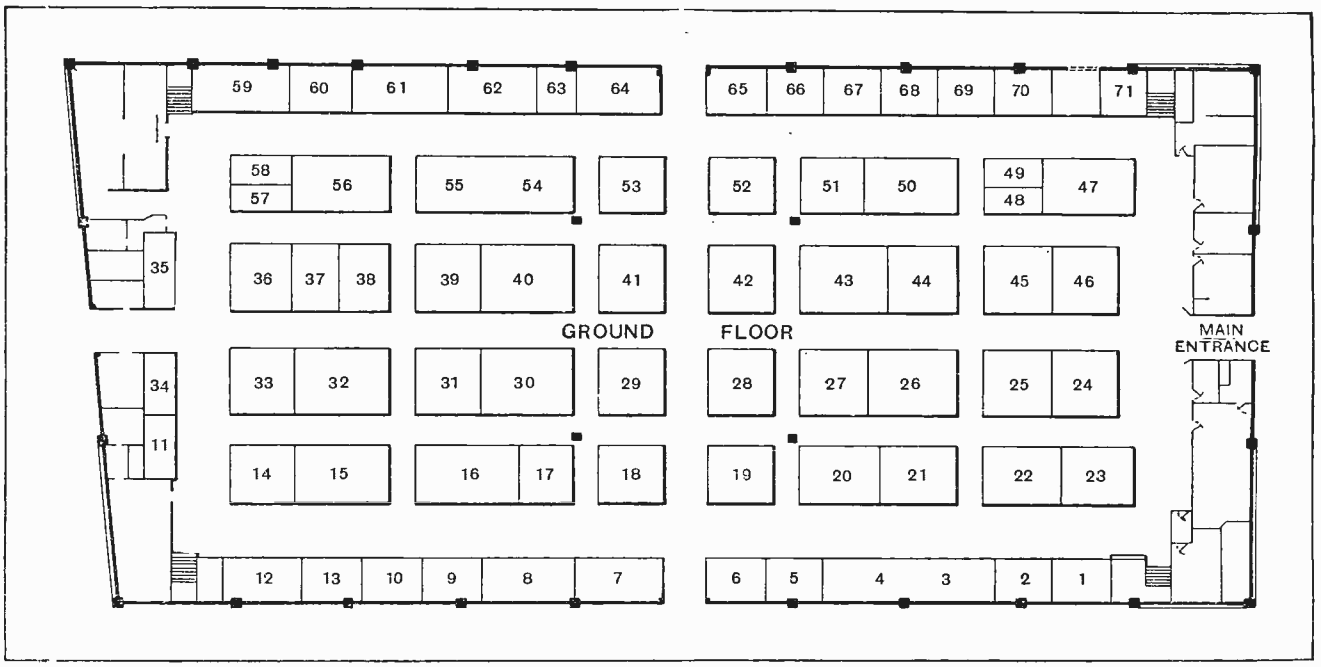
It will be remembered that the London Exhibition is organised by the Radio Manufacturers' Association of this country, and does not invite participation by exhibitors other than those whose products are British. In connection with the Olympia Show we mentioned that certain firms well known to our readers would not be showing at Olympia, and that they should not be blamed for lack of enterprise as their absence was probably due to the ban on non-British exhibits. No such stipulation is made by the organisers at Manchester, so that here we have the opportunity of seeing British products alongside apparatus imported from abroad, and the comparison is naturally instructive and of great interest.

Many of the exhibitors at Olympia are, of course, also taking stands at Manchester, but in addition there are some thirty-seven firms of importance, of which a list is published on the next page, who show their new season's products at Manchester for the first time, whilst experience of past years has indicated that other manufacturers usually make a point of reserving at least some new lines for Manchester instead of disclosing them all at Olympia first. Manchester Radio Show is organised by the *Manchester Evening Chronicle,* and has the support of the Radio Manufacturers' Association, as in previous years.

A feature of interest in connection with the Show is that the exhibitors are not severely handicapped by restrictions, and can demonstrate loud speakers on their stands in the hall. It is expected that considerable interest will centre around the exhibit of Wireless Pictures, Ltd., as apparatus is being provided by the company so that a demonstration can be carried out at the Exhibition under the control of the Association of British Radio Societies, acting as technical advisers to the Exhibition authorities. This will be one of the first occasions on which the public has had an opportunity of seeing the transmission of pictures by the Fultograph system carried out, and the demonstrations will indicate to visitors to the Exhibition what may be expected when Fultograph picture receivers are installed in the home.

### Gramophone Demonstrations.

Opportunity is also being given to various leading firms to give half-hourly demonstrations of gramophone reproduction by means of their own pick-up devices, with amplifiers and loud speakers, and this will give an opportunity for the public to make a comparison between the many different types.



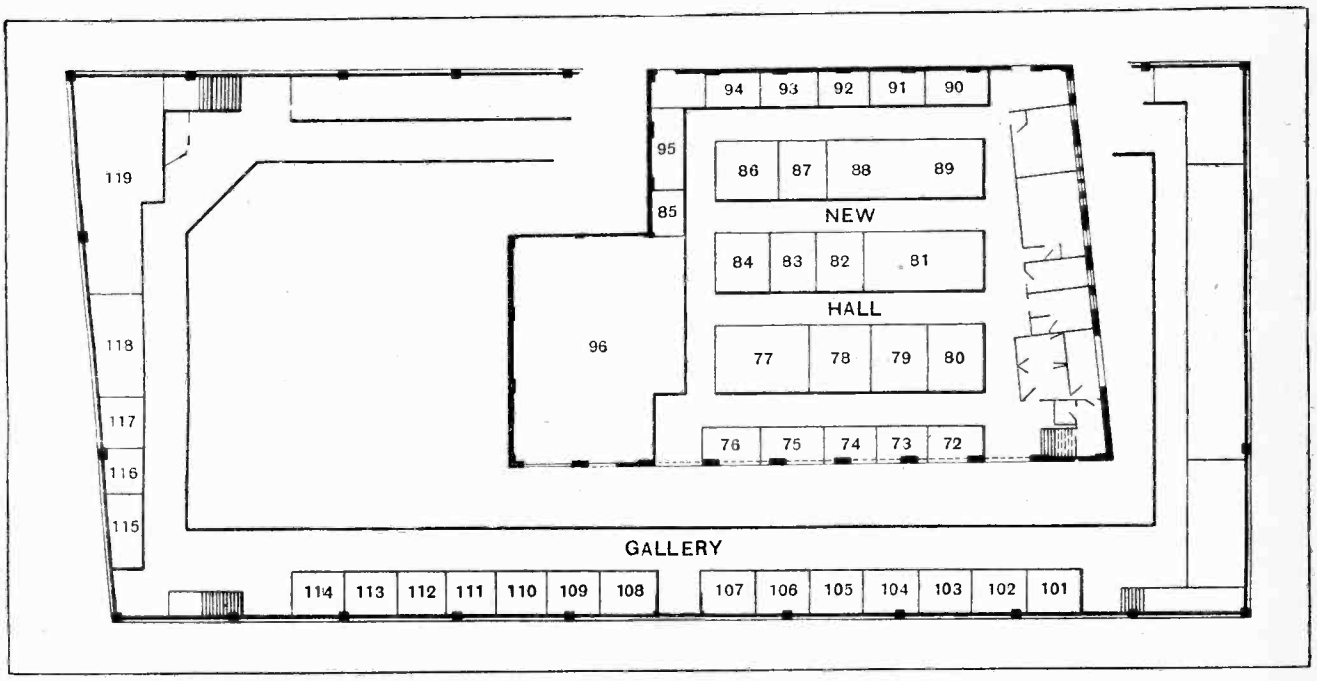

Plan of the ground floor, City Hall, Manchester.

**Manchester Radio Show.—**

On *The Wireless World* stand, which is No. 24, just inside the main entrance, visitors will have an opportunity of inspecting some of *The Wireless World* receivers recently produced, such as the "Megavox Three," "Everyman's Pentode Two," "New All-wave Four," "Four-valve Change-over Receiver," and the "Kilo-Mag Four," which is described in this issue.

The British Broadcasting Corporation, we understand, are arranging an exhibit much on the lines of that which they gave at Olympia, consisting principally of a series of tableaux illustrating music through the ages, and called "From B.C. to B.B.C."

The Exhibition remains open until Saturday, November 3rd. In our issue next week we shall review the Exhibition as a whole, but with special reference to new exhibits not previously dealt with in our Olympia Show numbers.




**Arrangement of stands in the new hall and the gallery.**

## The Following Firms Showing at Manchester were Not Exhibitors at Olympia:—

A.F.A. Accumulators, Ltd., (37)
120, Tottenham Court Rd., London, W.1.

Alphian Wireless, Ltd., (51)
Mortimer St., London, W.1.

Association of British Radio Societies. (115)

Barraclough, G. D., (19)
16-18, Moult St., Cross St., Manchester.

Burgoyne Manfg. Co., Ltd., (92)
34a, York Rd., King's Cross, London, N.1.

Bush House Radio, (81)
40, Deansgate, Manchester.

Coranto Cabinet Co., (63)
51, Naylor St., Hulme, Manchester.

Crauford-Frost Wireless Products, Ltd., 32, Alma Rd., Windsor, Berks. (113)

Electrical Machine & Apparatus Co., (73)
Cromford Court, Corporation St., Manchester.

Epoch Radio Manufacturing Co., (103)
53, Gracechurch St., London. E.C.3.

Green & Co., (110)
94-95, Hurst St., Birmingham.

Hardies (Manchester), Ltd., (22)
Bull's Head Yard, Corporation St., Manchester.

Harlie Bros., (111)
Balham Rd., Edmonton, London, N.9.

Hirst, Ibbotson & Taylor, Ltd., (66)
7a, Blackfriars St., Manchester.

Holzman, Louis, (60)
34, Kingsway, Holborn, London, W.C.2.

Hughes & Co., Ltd., F. A., (28)
204-206, Gt. Portland St., London, W.

Kay, Ltd., P., (83)
183, Old St., London, E.C.1.

K.N. Electrical Products, Ltd., (107)
87, Wardour St., London, W.1.

Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester. (64)

Lichtenburg & Jones, Ltd., (86)
40-44, Holborn Viaduct, London, E.C.1.

Lyons, Ltd., Claude, (13)
76, Old Hall St., Liverpool.

Makerimport Co., (49)
50a, Lord St., Liverpool.

Moores & Co., John, (8)
Ravald St. Works, Salford.

Partridge & Wilson, (118)
217a, Loughborough Rd., Leicester.

Potter & Co., Ltd., H. B., (65)
Station Buildings, Rochdale.

Radiovim, Ltd., (93)
24, The Elms, Liverpool.

Ritherdon & Co., Ltd., (108)
North Bridge Mills, Deansgate, Bolton.

Rothermel Corporation, Ltd., (34)
24-26, Maddox St., London, W.1.

Scott & Co., Ltd., G. L., (102)
Morris House, 60-66, Rochester Row, London, S.W.1.

Sheffield Magnet Co., (117)
116-126, Broad Lane, Sheffield.

Sifam Electrical Instrument Co., Ltd., Bush House, Aldwych, (85)
London, W.C.2.

Standard Insulator Co., Ltd., (58)
Winsley House, Wells St., Oxford St., London, W.1.

Tutills, Ltd., (16)
7-9, Swan St., Manchester.

Ward & Goldstone, Ltd., (18)
Frederick Rd., Pendleton, Manchester.

Wellworth Wireless Co., Ltd., (48)
8, Withy Grove, Manchester.

Wilkinson & Co., C. B., (90)
Junction Chambers, 5a, Oldham Rd., Rochdale.

Wireless Pictures (1928), Ltd., (119)
14-16, Regent St., London, S.W.1.

# USEFUL DATA CHARTS. (No. 13.)

## The Relation between Volts, Ohms and Amperes.

IT is just over a century ago that Georg Simon Ohm, in the seclusion of the Jesuits' College in the ancient city of Cologne, pondered over the way in which a current of electricity passes through a metal wire and wrote down the results of his thought in the form which has ever since been known as Ohm's law, which states that the difference of potential between two points on a wire is proportional to the current flowing along the wire.

Science moved slowly in those days, though current electricity had sprung to life from Galvani's dead frog forty years before, and Volta's high tension batteries were no novelty, yet the ideas of electromotive force and potential were still unborn. Current was supposed to have two qualities, "quantity" and "intensity" — the same "quantity" of current had greater "intensity" in a thin wire than in a thick one, since it made the thin one hotter. Ohm showed that the idea of intensity could be replaced by *electromotive force*, and that every wire possessed a property of *resistance*; he left three terms where he had found but one: he made the electrical trinity complete.

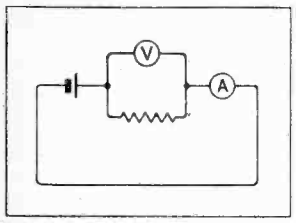



Fig. 1. An arrangement in which the ratio of volts to amperes remains the same however many cells are in circuit.

### Proof of Ohm's Law.

It might be thought that the experiment shown in Fig. 1 is a proof of Ohm's law. A voltmeter and ammeter are connected as shown, and it is, of course, found that the ratio of volts to amperes (which gives the resistance R in ohms) remains the same, however many cells are in circuit. But in reading off the volts we have actually assumed the very law which we are trying to prove—for a voltmeter is really an ammeter with a large concealed series resistance, and the deflection of the needle is due to the current which passes: when we engrave the scale in volts we are assuming Ohm's law.

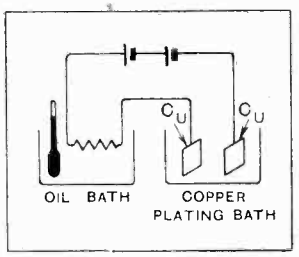



Fig. 2. An experiment which proves Ohm's law.

A proof can be obtained by the experiment shown in Fig. 2, no ammeter or voltmeter being involved. The difference of potential between two points is defined as the work done when unit charge is brought from one to the other point, so that when a current C flows down a difference of potential V the work done per second is VC and appears as heat: accordingly it can be measured by the rate at which the thermometer reading rises. The current C is proportional to the weight of copper deposited on the right-hand plate per second. Thus VC and C are measured, and it is found that, whatever the separate values of V and C, their ratio is unaltered so long as the same heater wire is used.

### Value of a Filament Resistor.

A 2-volt 0.1-ampere valve is to be used on a 6-volt circuit: what size of resistor should be inserted? On joining the points corresponding to 2-volt and 0.1 ampere on the abac we find that the filament resistance is 20 ohms. To get the same current with 6 volts the abac indicates that 60 ohms are required. Hence the resistor should be $60 - 20 = 40$ ohms.

An example involving resistance-capacity amplification is the following. From a valve characteristic curve a suitable working point is found to be 60 volts on the plate, giving 1 mA plate current; what plate resistance should be used when a H.T. of 150 volts is applied? On joining the points corresponding to 60 volts and 1 mA the valve resistance is read as 60,000 ohms: on joining 150 volts to 1mA we find that the total resistance must be 150,000 ohms; hence the correct value of plate resistance is $150,000 - 60,000 = 90,000$ ohms.

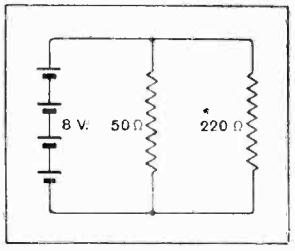



Fig. 3. Circuit in which two resistances in parallel are shunted across a battery of 8 volts. The abac shows that the total current flowing is 0.196 amperes.

### Current Through Resistances in Parallel.

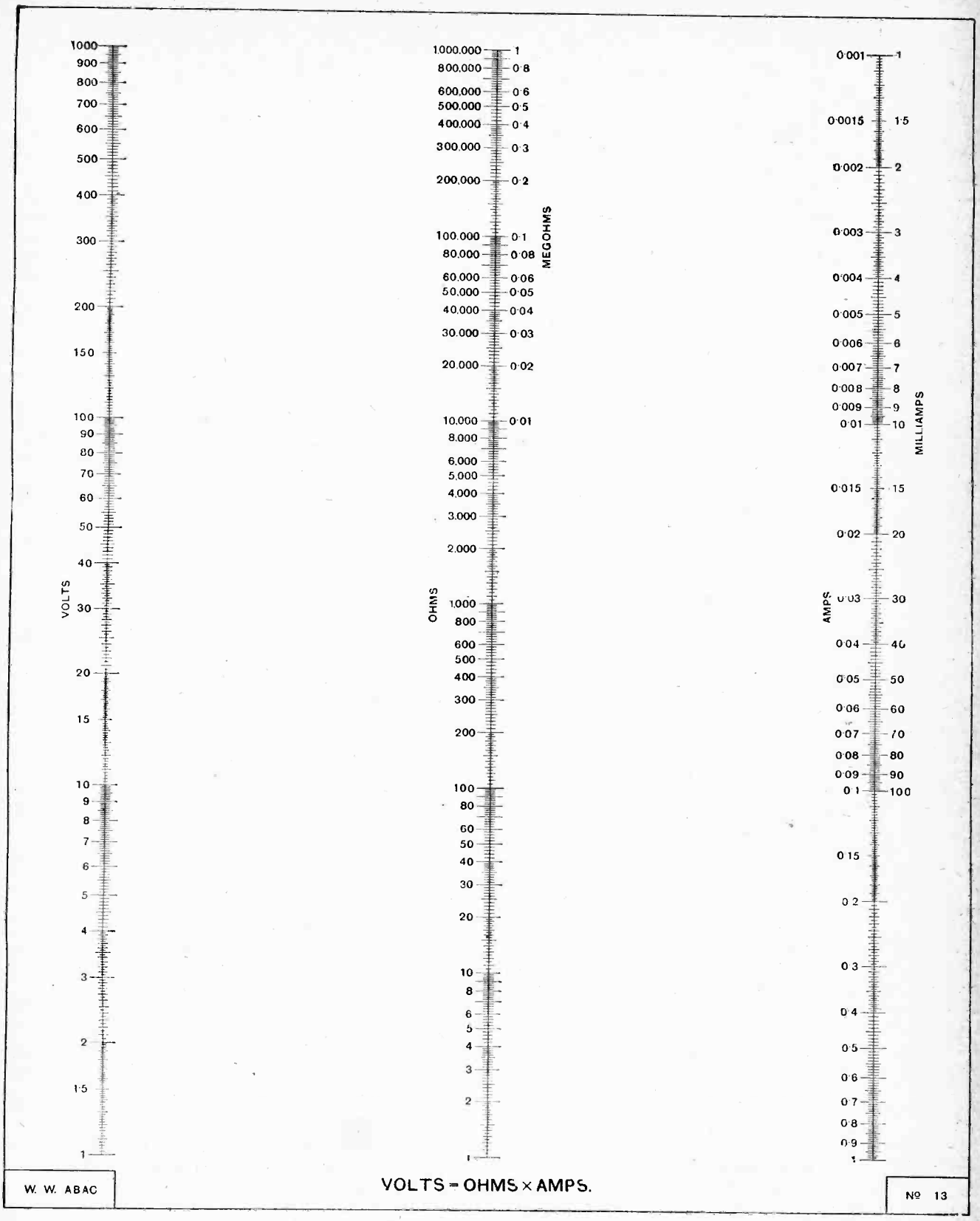
Fig. 3 represents an 8-volt battery applied to resistances of 50 and 220 ohms in parallel. The abac gives the current through the first resistance as 0.160 amperes and 0.0364 amperes through the second. Hence the total current flowing is the sum of these, namely, 0.196 amperes.

It should be noted that Ohm's law also applies to A.C. If the R.M.S. volts are given the abac gives the answer in R.M.S. amps.; if peak volts are given the result comes out in peak values of current: the resistance may be due to a coil or a condenser without altering the law, and the impedance of a coil or condenser at any frequency may be found from previous abacs published in this journal.

The next chart (No. 14) will show the relationship between watts, volts, and amperes in D.C. circuits, and an explanation will be given of how a coil containing resistance and reactance when interposed in an A.C. circuit causes the current to resolve itself into two components, namely, that which is in phase and that which is 90° out of phase with the voltage.

R. T. B.

B 50




W. W. ABAC

VOLTS = OHMS × AMPS.

Nº 13

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# READERS' PROBLEMS

"The Wireless World" Supplies a Free Service of Technical Information.

*The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below in some cases at greater length than would be possible in a letter*

### Reaction Condenser Capacity.

*With reference to the article, "Building H.F. Transformers," in your issue for October 3rd, I should like to know if the reaction windings specified are suitable for a control condenser of the conventional maximum capacity of 0.0001 mfd. If not, what capacity do you recommend?* M. L. S.

Yes; assuming that the damping in the circuits is normal, a condenser of 0.0001 mfd. capacity will give sufficient control. There is no reason, however, why you should not use a larger size, and indeed, by doing so the rectification efficiency of the detector will be improved. If you adopt this plan, your best course is to remove turns from the reaction coil (a few at a time); your aim should be to have sufficient coupling for the production of oscillation over the whole of the wave-band.

○○○○

### Reduced H.T. Voltage.

*With reference to the "Megavox Three," I should be glad to know if reasonably good results can be expected with a maximum H.T. voltage of 120, and if so, what alteration would be necessary in the values of the various decoupling resistances?* C. F. G.

The receiver will function well with a maximum anode voltage of 120, and indeed with this pressure will yield sufficient output for most requirements. The values assigned to the various feed resistances are the lowest that can be used without running the risk of introducing undesirable couplings, and we would not recommend any alterations in this direction.

○○○○

### Volume Control.

*If you consider that it would be an advantage, will you give me a diagram showing how the method of volume control used in the "Megavox Three" may be applied to my receiver, which consists of a reacting detector (capacity controlled) with resistance and transformer-coupled L.F. amplifying stages.* E. S. E.

A volume control device is less necessary in detector-L.F. sets than in those with H.F. amplification, for the reason that adjustment of reaction will generally cause sufficient variation in signal strength, except when receiving from a near-by station. However, the addition you propose is a refinement which is by no means without value, and the use of an H.F. potentiometer in the manner you suggest is very suitable for the receiver described. A skeleton diagram showing how it may be applied is given in Fig. 1.

○○○○

### Mains or Accumulators?

*Would you recommend me to modify the circuit of the "Everyman Four" receiver so that H.T. and L.T. current could be obtained direct from D.C. mains; or, alternatively, would it be better to use accumulator batteries for both purposes?* C. B. C.

The modifications necessary for converting this receiver for "all-mains" operation would be so extensive that we cannot recommend you to adopt this plan. It would be better to use accumulators, which as far as the H.T. battery is concerned, could easily be charged from your D.C. mains.

○○○○

### Wood or Ebonite?

*Is there any reason why a wooden panel should not be used in the construction of the "Megavox" receiver in place of ebonite, which is specified? I realise that it would be necessary carefully to dry the wood and to varnish it with shellac on both sides.* W. G. S.

Provided the wooden panel is carefully prepared, there is no objection to using it in place of ebonite, although we should perhaps point out that the "one-hole fixing" components do not lend themselves particularly well to mounting on wood without additional support.

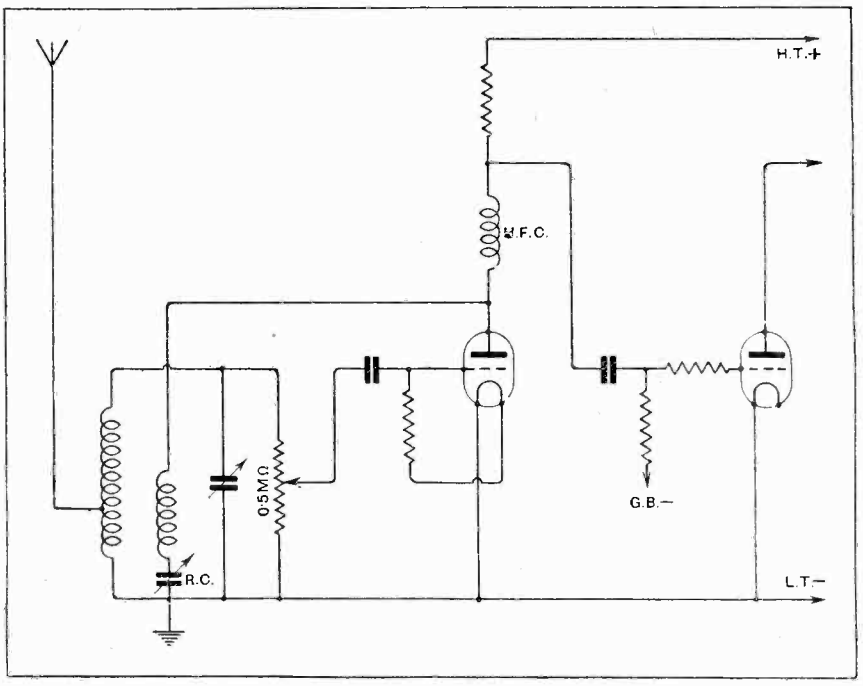


**Fig. 1. Controlling detector input by means of an H.F. potentiometer.**

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*RULES.*

(1.) *Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."*

(2.) *Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.*

(3.) *Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.*

(4.) *Practical wiring plans cannot be supplied or considered.*

(5.) *Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.*

(6.) *Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.*

*Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.*

# The Wireless World AND RADIO REVIEW (16th Year of Publication)

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Editor: HUGH S. POCOCK.
Assistant Editor: F. H. HAYNES.
Editorial Offices: 116-117, FLEET STREET, LONDON, E.C.4.
Editorial Telephone: City 9472 (5 lines).
Advertising and Publishing Offices:
DORSET HOUSE, TUDOR STREET, LONDON, E.C.4.
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## 5SW EXPERIMENTAL.

IT is now eighteen months since *The Wireless World* commenced a campaign having as its object the establishment of a short-wave Empire broadcasting station; and it is just twelve months since, after much procrastination, the B.B.C. arranged with the Marconi Company for experimental short-wave transmissions to commence through the station 5SW at Chelmsford. We think it time that an Empire short-wave-station should be established on a more permanent and satisfactory basis, and that by now the station should show signs of outgrowing its name of "experimental," which is, after all, little more than a cover under which to shelter from any accusations of deficiencies of the station or lack of permanency of policy as regards the programmes. The programmes which have been put out during the period that 5SW has operated have been composed of material useful for experimental purposes, but we think the time has come when the station should become a service station rather than a purely experimental one. We do not want to be accused of adopting an unreasonable attitude, but we would, in common, we believe, with many thousands of listeners in remote parts of the British Empire, welcome a statement from the B.B.C. as to what are their intentions with regard to the future of 5SW.

### A Statement Overdue.

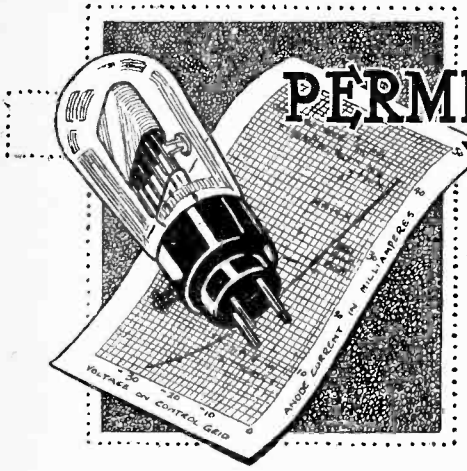
It is not enough that the station should be in existence and conducting experimental transmissions. Some steps should be taken to find a means of contributing to the upkeep of the station on a permanent basis and improving its efficiency, either by a change of site, if necessary, or increase in power; and the programmes must be compiled with a view to giving service and increasing interest in them amongst listeners who look to that station as their most direct touch with England. Further, to be efficient and to give proper service, it is necessary that the station should work at intervals throughout the twenty-four hours, the times of transmission as at present being inconvenient or unsuitable except to a limited proportion of those who might otherwise become regular listeners. Is 5SW to be left where it is until someone creates a stir about it, or is real progress being achieved towards an improvement of its efficiency and the establishment of an Empire short-wave broadcasting station on permanent lines? We owe it to the B.B.C. to suggest to them that they are overdue with a statement of the present position and future policy.

oooo

## B.B.C. CONTROL ROOM.

WE have persistently complained of the methods of control adopted by the B.B.C., and the large amount of correspondence we have received on the subject, a proportion of which we have published, has indicated that the feeling of dissatisfaction with the B.B.C. control room is pretty general.

It is gratifying to learn that in all probability "music control" is to be abandoned, leaving only the one control, which it is stated is essential in order to prevent blasting. To many of our readers it will come as news that the B.B.C. in the past have been in the habit of employing two separate controls for musical broadcasts, as it has been generally considered that one was bad enough! We hope that the B.B.C. will go farther and look into the question of control generally in an endeavour to overcome the many abuses to which control seems to lend itself, and of which the complaints have been so frequent.




# PERMISSIBLE GRID SWING WITH A PENTODE

## How the Valve and the Loud Speaker may Cause Rectification.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

IN a recent article[1] I drew attention to the fact that the grid swing with a pentode would depend upon the impedance in its anode circuit. It was stated that as the number of turns on a high resistance moving coil loud speaker increased, a point was reached beyond which the permissible peak value of the grid swing was definitely less than the grid bias. The object of this article is to discuss this problem of grid swing as applied to a pentode, having in its anode circuit a reactance comparable in magnitude with the internal valve resistance. The case of a resistance will be treated separately later.

The problem is most easily investigated by recourse to experiment. Many readers use a milliammeter to read the anode current to the power valve. They will have noticed that with strong signals, before grid current occurs, the milliammeter needle flickers. A small flicker is not accompanied by any appreciable aural sensation, but there is a limit beyond which the flicker must not go. Overstepping this mark results in unpleasant reproduction. Motion of the needle indicates that rectification occurs. This may be due to two causes: (a) the valve; (b) the loud speaker. Rectification due to the valve means that the anode voltage change is large enough to carry the valve beyond the linear limit of its characteristics. So far as the loud speaker is concerned, the reader may be somewhat amazed. Rectification ensues when something different occurs during the positive and the negative half-waves. Now in many reed drive loud speakers the response of the reed during its motion towards the pole pieces is different from that when it moves away. In other words, if the positive deflection is x, the negative deflection is $x - Ax$, where Ax is a fraction of x. This asymmetry results in the impedance of the loud speaker being different during the positive and negative half cycles. Thus the positive and negative currents will differ, thereby yielding the effect of rectification, with a resultant flicker of the needle. It is possibly some effect of this nature which enables telephony to be heard by putting a pair of telephones direct in an aerial circuit. I have no intention of treating electro-mechanical rectification, but it is interesting to introduce it here. We shall be concerned entirely with rectification due to what is commonly termed "anode blasting"—graphic—but neither highly descriptive nor scientific.

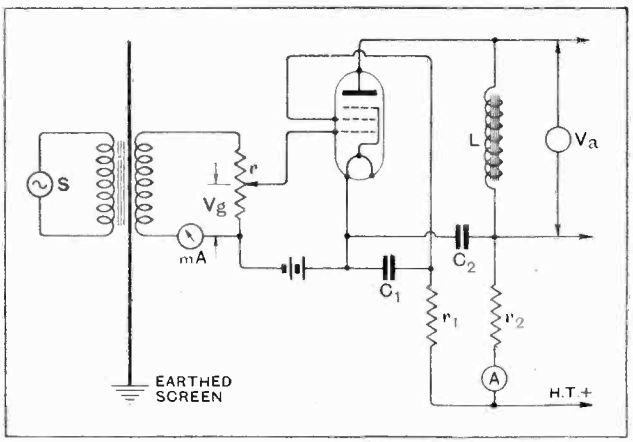



**Fig. 1.—Arrangement for measuring the voltage changes on the anode of a pentode when various voltages are applied to the grid. S is a sine wave generator; mA, an A.C. milliammeter; $V_a$, an electrostatic voltmeter; $V_g$, volts applied to grid; $r_1$, $r_2$, $C_1$, $C_2$, battery anti-coupling units; r, potentiometer; L, 23 henrys.**

The circuit used during the experimental work is illustrated diagrammatically in Fig. 1. A sine wave oscillator is connected via an electrostatically screened and balanced transformer to a non-inductive resistance in series with a milliammeter. A tapping from the resistance is taken to the control grid and filament of a pentode. The anode circuit of the pentode[2] contains an inductance L of 23 henrys and a d.c. feed meter A. The voltage across L is measured by a low reading electrostatic voltmeter. The electrostatic voltmeter reads both the drop due to the feed current and the a.c. change. The drop due to the feed current has been properly subtracted. The usual battery filters are incorporated as shown by the resistances and condensers.

[1] *The Wireless World*, July 18th and 25th, 1928.

[2] The valve used was the P.M.22, described in *The Wireless World*, July 11th, 1928. Its characteristics are fairly linear. With some pentodes curvature and departure from parallelism will make the swing less than that found here.

**Permissible Grid Swing with a Pentode.—**

The oscillator was adjusted to 170 cycles, and a voltage applied to give a suitable reading of the milliammeter. Knowing mA and r, the root mean square and therefore the peak voltage (=1.414 r.m.s.) applied to the grid of the pentode can be calculated. A series of readings of applied grid volts $V_g$ and the corresponding anode voltage $V_a$ were obtained from the electrostatic voltmeter. The values of the anode feed current were also observed. When a voltage is applied to the grid of the pentode, the current in its anode circuit executes corresponding variations. Since there is an inductance of 23 henrys in series with the anode, the current variation causes a voltage change on the anode and therefore on the inductance, as shown in the diagram, Fig. 2.

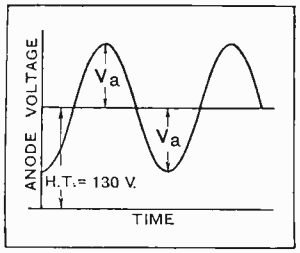



**Fig. 2. — Diagram giving peak voltage change on the anode of a pentode due to voltage change on the grid.**

In Fig. 3 are plotted the experimental values of $V_a$ and $V_g$. The relationship is substantially linear up to a grid peak voltage of 3. After this the curve bends over, since the grid voltage increases more rapidly than the anode current. So long as the relationship is linear, the distortion is small. But beyond the knee of the curve, *i.e.* point A, the distortion becomes serious. By inserting a transformer and oscillograph as shown in Fig. 4, the wave form could be ascertained. In Fig. 5 we have the wave form for an applied grid voltage of about 6, the choke being in circuit. The grid bias on the valve being −7.5, no grid current was present.

**Distortion and the Choke.**

By short-circuiting the choke the wave form becomes sinusoidal, as shown in Fig. 6. It is clear, therefore, that the choke introduces serious distortion when the *input voltage is well below the grid bias*. An indication of the degree of distortion (rectification) is to be found from the change in anode feed current. This is plotted against input volts in Fig. 7. Beyond a change of 1 mA, the distortion of the sine wave began to show up on the oscillograph The corresponding input voltage is 3 volts.

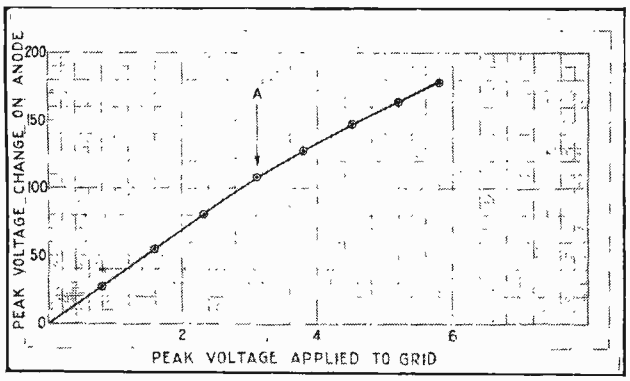



**Fig. 3.—Curve showing relation between peak voltage applied to grid of pentode and the corresponding change in anode voltage. The anode circuit contained an inductance of 23 henrys and the frequency was 170 cycles.**

Now all this can be very easily explained. In the first place the anode voltage cannot decrease below zero. Its normal d.c. value is 130 volts. If the valve characteristics were perfectly straight and parallel for all anode voltages, the peak anode (a.c.) voltage would be 130. Thus it would fluctuate from 0 to 130, and 130 to 260 volts. But the characteristics are imperfect at low anode voltages, so that the permissible swing is less than 130 volts. In our case we find the swing should not exceed about 100 volts. The anode swing is the grid volt swing × *effective* magnification of valve $= V_g\mu$. The value of $\mu$ is therefore $\frac{V_a}{V_g}$. The values of this quotient are given in table 1, from which we see that $\mu$ is about 35. It is this high *effective* magnification and the curved characteristics which make it necessary to restrict the grid swing on the pentode.[3]

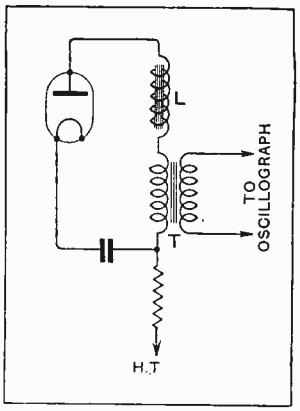



**Fig. 4. — Method of using oscillograph to delineate wave-form distortion due to excessive grid swing. T is a step-down transformer.**

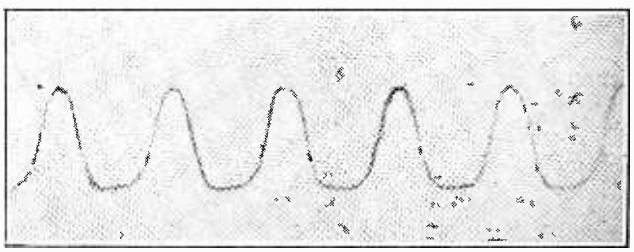


**Fig. 5.—Oscillogram showing distortion of sine wave due to excessive swing on grid of pentode. The H.T. was 130 volts; $V_g' = 6$ volts; and the choke in the anode circuit 23 henrys. The frequency was 170 cycles.**

TABLE. P.M.22. m. = 60; $\rho$ = 33,000 ohms.

| Peak Grid Volts. $V_g$. | Peak Anode Volt Change. $V_a$. | Effective Valve Magnification. $\mu = V_a/V$ |
|---|---|---|
| 1.58 | 55.2 | 34.8 |
| 2.35 | 80.7 | 34.3 |
| 3.09 | 108 | 34.9 |

Suppose we take a concrete instance and determine the permissible grid swing when the *effective* valve magnification—the magnification factor is 60—is 35. The anode voltage swing must not exceed 100, so that the peak swing on the grid is $\frac{100}{35} = 3$ volts., which corresponds to a root mean square grid voltage of 2.15. If the grid bias is −7.5, the swing is, therefore, only 40%. This applies in the case of a choke of 23

[3] Owing to non-parallelisms and curvature of characteristics at low anode voltage.

**Permissible Grid Swing with a Pentode.—**

henrys at 170 cycles. The governing factor is the reactance of the choke, which in this case is 24,500 ohms. A choke of 2.3 henrys at 1,700 cycles, or a choke of

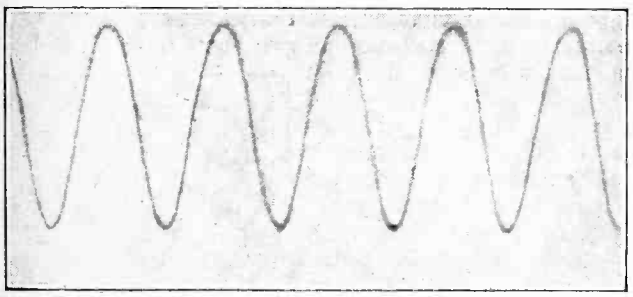


Fig. 6.—Oscillogram showing that the curve is substantially sinusoidal when the choke is removed; conditions otherwise the same as in Fig. 5.

0.8 henry at 5,000 cycles, also has this reactance. Now a reed drive loud speaker has an inductance of the order of 2 henrys (at 5,000 cycles), so that the permissible peak grid swing *at this frequency* will be between 1 and 2 volts.[4] Of course, all the voltage is not at this frequency, since the voltage components range from 30 to 10,000 cycles. However, these data do show that the permissible grid swing decreases as the reactance and effective resistance of the loud speaker increase.[5] This can be verified by inserting (1) a choke of 20 henrys, (2) a reed drive loud speaker, (3) a coil drive loud speaker of 1,000 turns. The signal strength required to cause motion of the feed meter needle is less for 2 than for 1, and still less for 3.

I expect the reader will now feel inclined to say something of this nature: This is all very well; we accept your argument confirmed by experiment, but the difficulty did not arise with triodes. It did! less acutely. Let us take an LS5A used with a loud speaker of 0.2 henry inductance at 5,000 cycles. Assume the H.T. is 350 volts. The amplification due to the valve is nearly the "*m*" value of the valve, since the loud speaker impedance is several times the internal valve resistance. The permissible anode swing we shall assume as 200 volts. Since $\mu$ is about 2, the peak grid swing is $\frac{200}{2} = 100$ volts. But the grid bias on the LS5A is about 100 volts, so that grid current will be experienced before anode blasting is really serious. The above calculation shows why the limitation of swing has not cropped up before. In practice, using LS5As with 300 volts H.T. and a grid swing as low as 20 volts there is a small amount of rectification. This is probably indiscernible by ear, but it goes to show that when one looks at the matter in a critical spirit, no family of valve characteristics fulfils Euclid's definition of a straight line.

When the impedance in the anode circuit of a valve exceeds a certain value, the permissible peak grid swing is less than the grid bias. Moreover, the main criterion for distortion is movement of the feed meter needle.

The above investigation corroborates what can readily be deduced by theory, and the limitation of grid swing indicated above is to be regarded as a physical fact. That such anode voltage change can be obtained with a small grid swing is due to enhanced sensitivity.

[4] See loud speaker data in *The Wireless World*, July 18th.

[5] The effective resistance of the loud speaker has also to be taken into account.

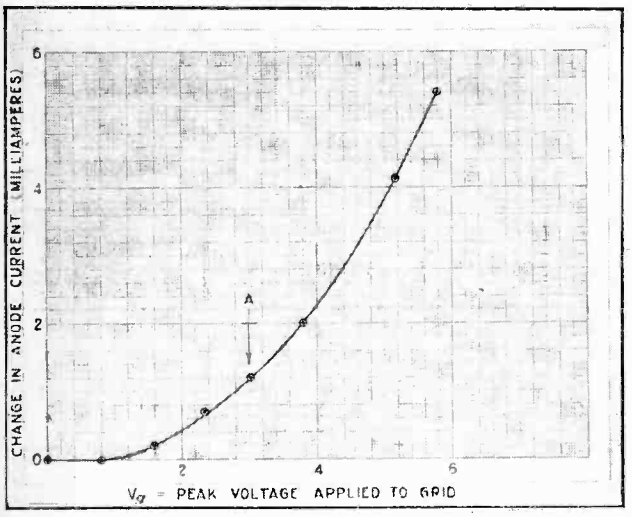



Fig. 7.—Curve showing the *reduction* in feed current with increase in the peak volts applied to the grid of a pentode. Although distortion occurs above $V_g = 0.8$ it is not serious until the point A is passed. The anode was in series with a choke of 23 henrys and $f = 170$ cycles. Anode feed current with $V_g = 0$ and bias $-7.5$ was 22.6 mA.

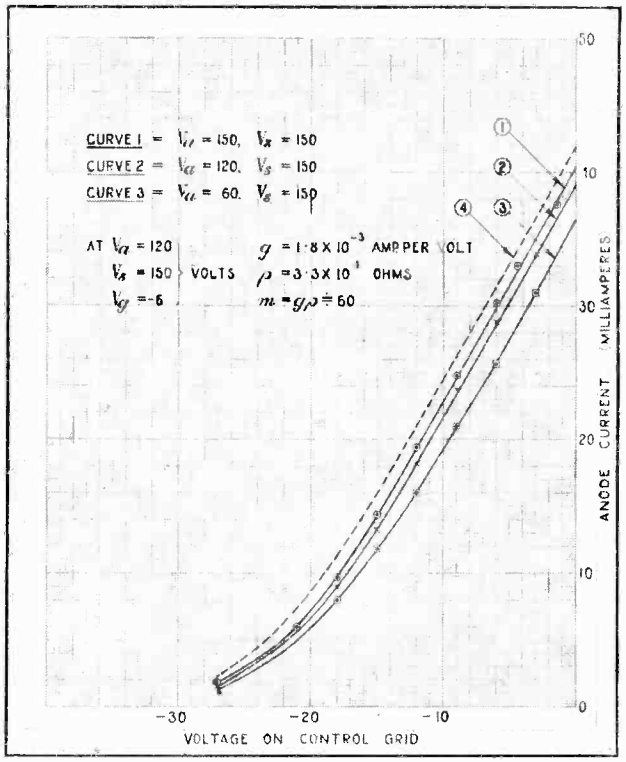
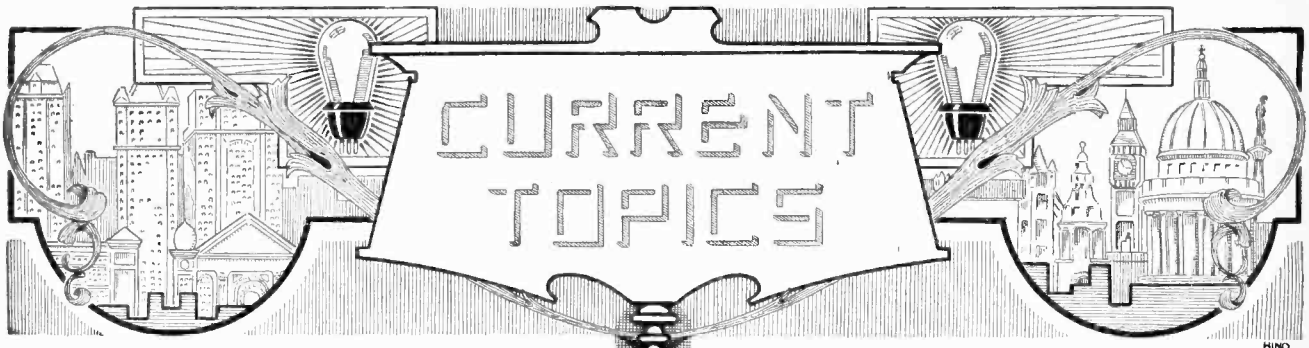



Fig. 8.—Grid volts–anode current curves or "conductance" curves of a two-volt pentode (P.M.22). The dotted curve (4) represents the characteristic when the anode voltage is higher than the screened grid voltage. When $V_a$ = 10 to 20 volts there is curvature at both ends of the lines (not shown) and they are not parallel.




## Events of the Week in Brief Review.

### WINGED WORDS.

"I look forward to the time when people will regard the presence of a radio set in the house of as much importance as a bath."—Mrs. Philip Snowden, at the Manchester Wireless Exhibition.

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### FOR GERMANS OVERSEAS.

A "world programme" is to be broadcast in February next from a new short-wave station now under construction by the German Post Office at Königswusterhausen. The station will apparently be a second 5SW, its object being to enable Germans living abroad to keep in touch with the homeland by means of relatively simple receiving sets.

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### GOOD OLD CRYSTAL.

A Norfolk listener is astounded by the latent powers revealed by his crystal set. He writes: "I heard the whole transmission from America through 5XX, including a description of the Zeppelin and of the great hangar."

It is understood that 5XX did not interfere with the reception.

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### GERMAN "PIRATE" HUNT.

A "round-up" recently conducted by the German Post Office has resulted in the discovery of 150 illicit transmitters, says a Berlin message. The majority of the culprits were found to be experimenting with short waves.

The methods of the official flying squad are being kept secret, a fact which is causing considerable perturbation among the "black-senders," as they are called, who have not yet been caught.

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### PICTURE BROADCASTS.

Following the example of the British and Austrian broadcasting authorities, the German Postal Administration will inaugurate picture broadcasting from Koenigswusterhausen by the "Fultograph" system on November 15th.

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### A CORRECTION.

In the description of the "Avometer" on p. 401 of our issue of September 26th the resistance was erroneously given as 1.67 ohms per volt instead of 167 ohms per volt.

### CABLE WIRELESS HEADQUARTERS.

The erection of a vast and imposing building on the Thames Embankment to house the wireless and cable interests of the Empire is indicated in an announcement of the Eastern Telegraph Co., Ltd. The new building will be the headquarters not only of the Eastern and Associated Telegraph companies but probably of the Marconi company, the Pacific and West Indies Cables and of the Government Beam Wireless.

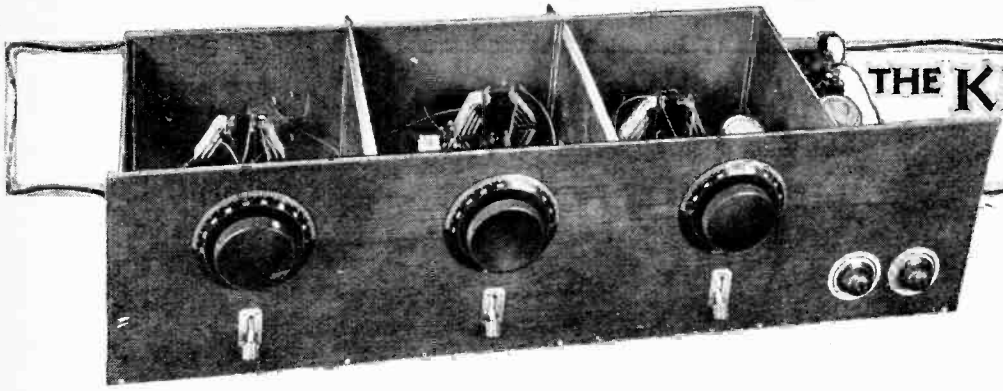
It is possible that Marconi House and Electra House (the present home of the cable companies) will find their way into the property market in the not-far-distant future.

### "WIRELESS" BY WIRE.

That the wires might constitute a public danger is the explanation advanced by the Darlington Streets Committee in recommending that permission should be refused to the Broadcast Relay Service Company, of Clacton-on-Sea, to instal a broadcast exchange station in the town.

The company's stated intention is to establish relay stations in all large towns in the country and by means of connecting wires to provide broadcast entertainment to subscribers at a cost of 1s. 6d. a week. Subscribers have only to instal a loud speaker and press a button in order to be linked up with the company's super-receiver at local headquarters.

**WIRELESS PICTURES AT MANCHESTER. Mrs. Philip Snowden, a Governor of the B.B.C., who opened the Manchester Radio Exhibition, is here seen examining her portrait on the stand of Wireless Pictures (1928), Ltd., where it was received from a transmitter in the gallery.**



# THE KILO-MAG FOUR

By H. F. SMITH.

(*Concluded from page 554 of last week's issue.*)

## Constructional Details and Operating Hints.

AFTER having mounted the switches and condensers, and assured oneself that they are properly fitted and that the latter are not short-circuited to the metal case, these components should be removed, as otherwise it is impossible to insert the baseboards which are fitted in each compartment. The screening box should now be finally secured to the main baseboard by means of wood screws.

Before inserting the small baseboards, it will be found convenient to mount the components on them, and, as far as possible, to complete the wiring of each unit before they are placed in position. Light rubber-covered flexible wire is used for the majority of the connections, as it makes for easier working, and, moreover, low-potential leads can be passed through the screen without elaborate precautions if insulated wire is used. In the set described, bushings are used only for the connections to grids and plates of the H.F. valves; the aerial lead-in is passed through a ¼in. clearance hole, a piece of sleeving being slipped over the wire as a precaution in the event of an accidental contact.

### Filament Circuit Connections.

When the three units are wired, they are placed in their boxes and condensers and switches are fitted; lengths of flexible wire should be soldered to each contact of the latter before mounting, as they are rather inaccessible. The remaining internal connections should now be completed.

Filament wiring will be made clear by studying the practical wiring plan, Fig. 7. Pairs of twisted rubber-covered and braided leads are run to each of the H.F. valves, the positive wires being joined together in the position shown and run as a single wire to the volume control rheostat $R_7$. It will be observed that separate connections from the negative L.T. terminal are carried to the filaments of each of the first three valves, while the L.F. amplifier is fed through a lead joined to the screening box. This latter is in metallic contact with the battery terminal, as the negative sides of each of the H.F. valve filaments are connected directly to it. As far as possible, all low-potential leads are run in close proximity to the metal work.

The mounting and wiring of external components calls for little comment, as the details are clearly shown in the various illustrations and diagrams. The projecting screens and the H.F. valve-holders should be fitted in approximately the positions shown in Fig. 4, but, as already suggested, some slight rearrangement may be necessary if the valves differ from those actually used in the receiver as described. If single-ended valves, in which the internal shield is connected to what is normally the anode pin, are substituted, the socket shown must be replaced by a lead passed through the screen and joined to the anode terminal of the valve-holder, the position of which must be moved slightly, as described in the first instalment of this article.

### Insulating the High-Potential Leads.

To avoid the possibility of damaging the insulation of wires which pass through the screens, care should be taken to remove any roughness or "burr" from the holes drilled to pass the conductors. It is a good plan to use wire with a woven braided covering over a layer of rubber, as the outer covering gives additional protection.

Mention has already been made of the fact that the H.F. grid and plate leads are more thoroughly insulated where they pass through the screen; for this purpose, short lengths of ebonite tube, ¼in. in external diameter, are used.

The performance of a receiver of this kind, as far as range is concerned, will be decided largely by the efficiency of the H.F. valves. The double-ended S.625 type, of Marconi or Osram make, are well suited for use in a two-stage amplifier. The Mullard P.M.14 single-ended valves have also been tested with eminently satisfactory results. For a detector it is almost essential that a valve with a high "figure of merit" should be chosen; its rated impedance should not exceed some 12,000 ohms, as this value will be exceeded very considerably under working conditions, even when dealing with strong signals, the effect of which is to reduce the mean negative grid voltage. The Mullard P.M.2DX, P.M.4DX, and P.M.6D, are all suitable for rectification purposes. On the L.F. side we have a wide choice, and a decision will be influenced by requirements as to output and the user's facilities for supplying anode current. An excellent output valve is the Marconi or Osram P.625, which is probably better in a "single L.F." set than its companion valve, the P.625A, which has a lower impedance and voltage factor.

**The Kilo-Mag Four.—**

As far as the actual operation of the set is concerned, there is little need for detailed instructions. The detector and L.F. valves are, of course, biased in accordance with the makers' instructions; for the first-mentioned, some 6 to 9 volts are required, assuming that one of the types specified above is used; this will be suitable for an applied H.T. voltage in the order of 120, which has become almost standard. If it is decided to apply a greatly increased pressure to the output valve, an extra terminal should be provided. The screen grid voltage will generally be about 75 or 80 volts; here, again, the manufacturers' recommendations should be observed.

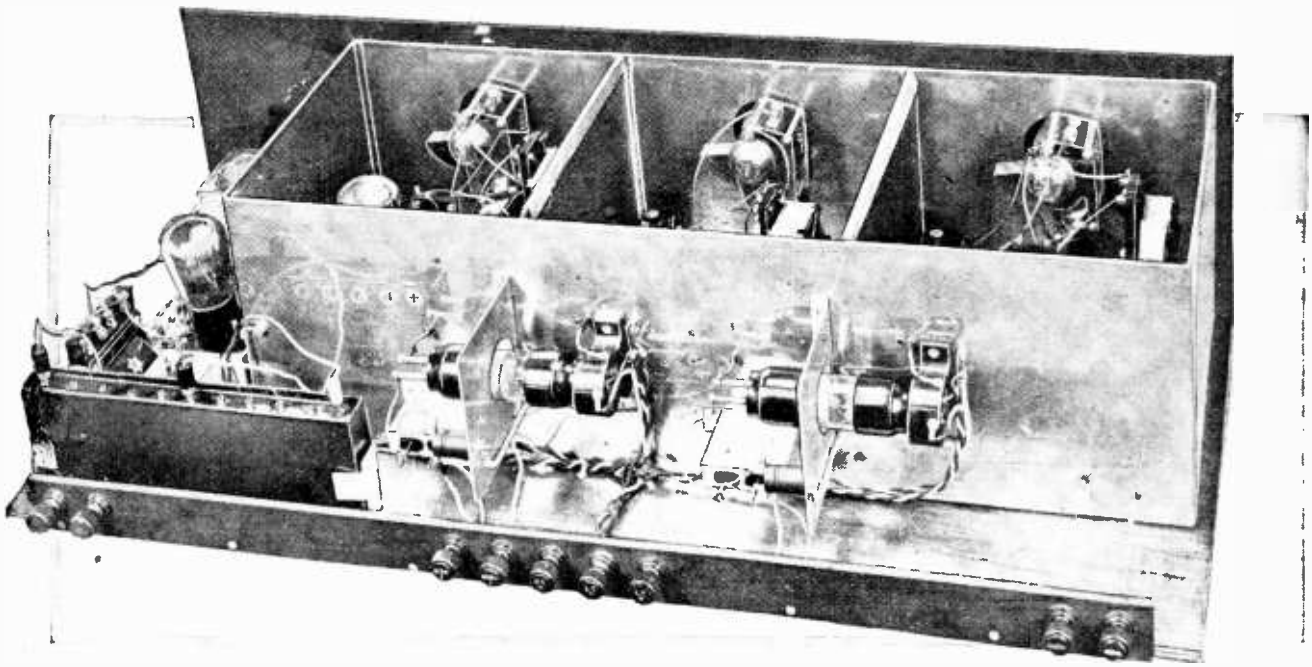
Before attempting to receive signals, the knobs of the three wave-changing switches must be set—" down " for medium waves and " up " for long waves.

As with any receiver having two or more tuning controls, it is necessary to rotate the dials " in step," keeping the various circuits approximately in tune. It is recommended that a record should be kept of the various settings; although the adjustment of individual condensers is not excessively critical, stations are found only when the resonance point is approached: with the exception of signals from a powerful local transmitter, which may become audible when one circuit is in tune, little else will be heard until at least two of the dials are accurately set.

raised, signal strength will be reduced, and selectivity will be increased. Another way of reducing volume is to use a short indoor aerial, which will generally act as a sufficiently effective collector to enable a number of stations to be received at full strength. Indeed, conditions are but seldom sufficiently good to enable the user of the receiver to derive the full benefit from a full-size aerial.

**Adjustments for Local Conditions.**

It has already been stated that the selectivity of the receiver may be adjusted—but only at the expense of magnification, which, however, can generally be afforded—by reducing the number of primary turns on the H.F. transformers. In cases where local signals tend to " spread " this should always be tried, but it is inadvisable to continue the removal of turns (which should be taken off from the " anode " end of the winding, one or two at a time) beyond the point where a greater decrease in volume than can be readily tolerated is observed. If the local interference is not completely eliminated by these means, it will be necessary to move the aerial tapping nearer to the earthed end of the input coil. No difficulty should be experienced in getting an infinitely higher degree of selectivity than is obtainable from a set with a single H.F. stage; this without any serious sacrifice of magnification. It may be pointed out



Rear view of the receiver, with lid of screening box removed.

The enormous high-frequency magnification which is available may, under certain conditions, seem at first to be rather an embarrassment than a help in receiving distant stations, because atmospherics and " untunable " interference are also magnified. One soon learns, however, that a " reserve of power " can be invaluable when properly used. The first step is to try the effect of dimming the H.F. valve filament by means of the volume control rheostat. As the valve impedance is

that those living in the " wipe-out area " surrounding a transmitter may find it desirable to provide two tappings on the appropriate aerial-grid coil.

With the valves that have been used for testing purposes, the set is completely stable over the whole of both ranges. It is conceivable, however, that this would not be the case with screened grid amplifiers having a greatly improved mutual conductance (should they become available) or with a considerably greater residual

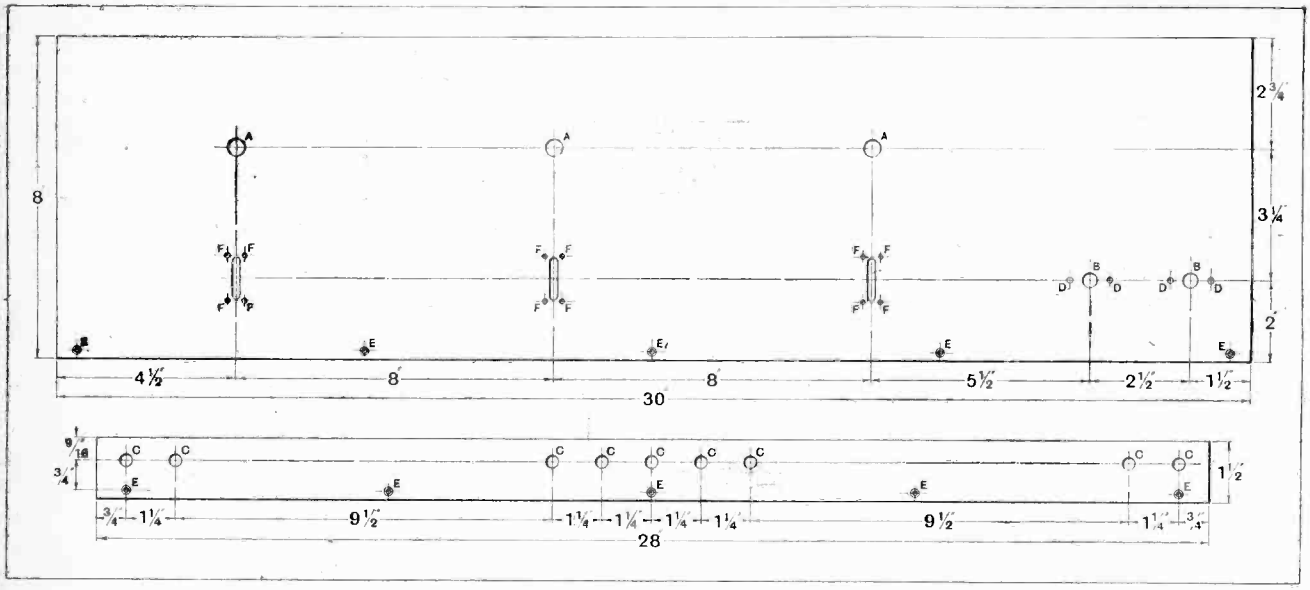



Fig. 5.—Details of front panel and terminal strip. A, 7/16in. dia.; B, 3/8in. dia.; C, 5/16in. dia.; D, 5.32in. dia.; E, 1/8in. dia., countersunk for No. 4 wood screws; F, 1/8in. dia.

capacity. If there are signs of oscillation, the first steps should be towards the improvement of the electrical "sealing" of the lid; this may be done in a simple manner by fitting strips of copper gauze over the top edges of both sides and ends of the box and also over the transverse partitions. Stability is also improved by reducing the number of primary turns on the H.F. transformers. As an alternative, it would be possible to prevent oscillation by dimming the H.F. filaments; this is not an expedient that appeals to the writer, although it is, perhaps, permissible in cases where there is lack of stability only at the lower end of the tuning scale.

In cases where an extra L.F. amplifier is required, it is suggested that the detector should be coupled to the first L.F. stage by means of a low value of anode resistance; no attempt should be made to secure the greatest possible magnification. For the next stage, transformer coupling may be retained.

It will have been observed that for reception of the medium waves a larger coil is used for the aerial-grid winding than for the H.F. transformer secondaries; this is for the reason that its effective inductance is not increased by the proximity of a primary coil. The standard size chosen (No. 75) is rather larger than is actually necessary, so the tuning condenser $C_1$ will read

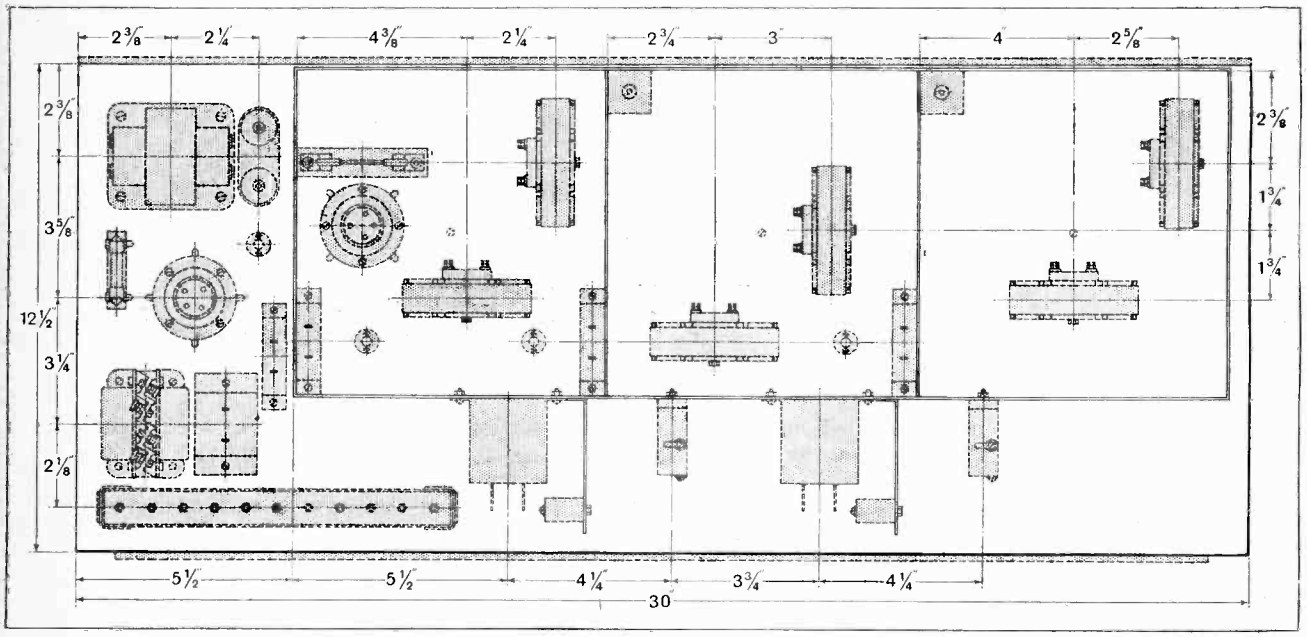



Fig. 6.—Arrangement of the components, which can be identified by referring to the practical wiring plan.

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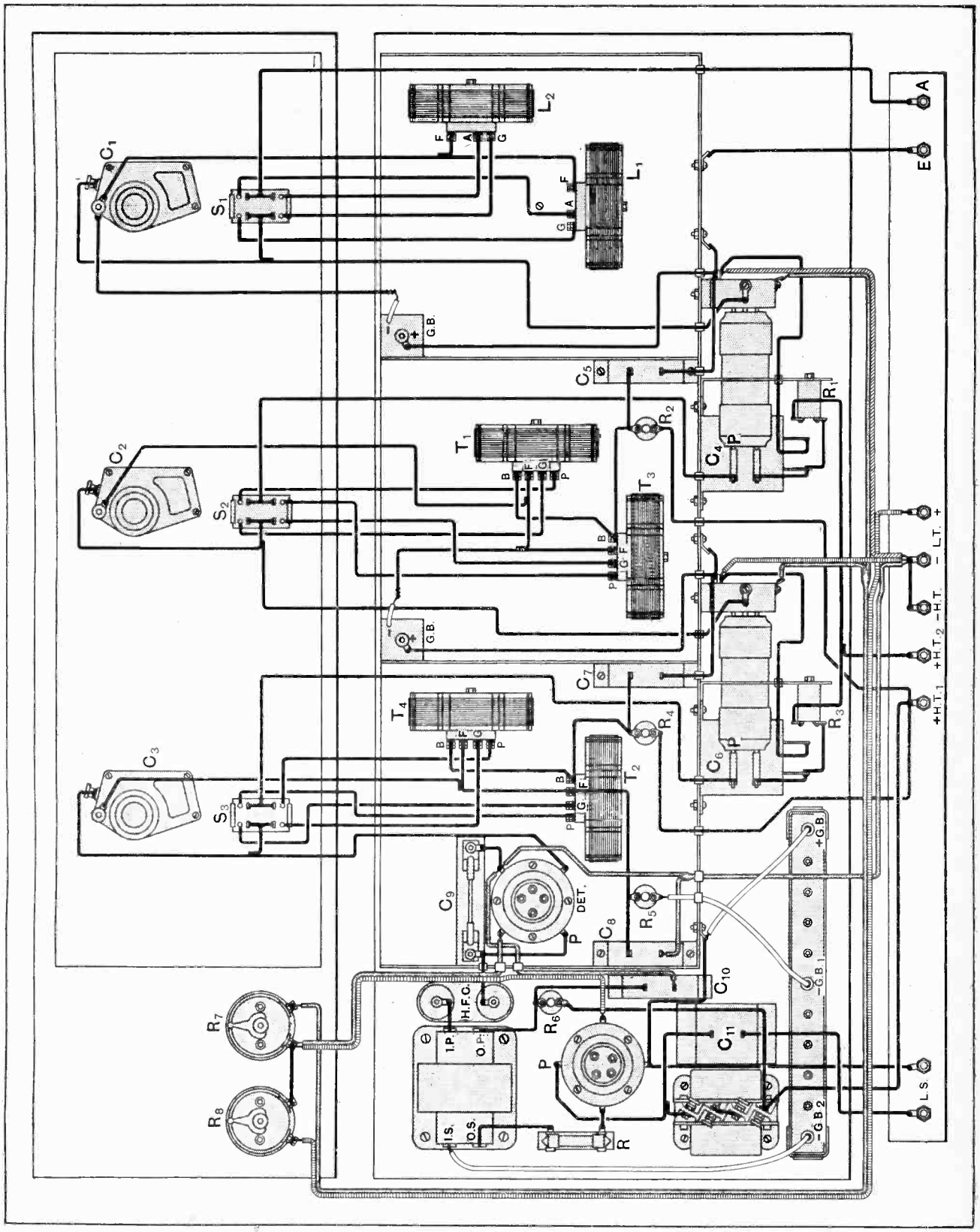


Fig. 7.—The practical wiring plan; note junction of the leads connected to the positive ends of the H.F. valve filaments.

**The Kilo-Mag Four.—**

lower than the other. There is, however, no intermediate value; if it is considered important that the three dials should show an approximately equal reading, a few turns may be removed from the end of $L_1$, which is marked G.

A somewhat similar state of affairs exists with regard to the long waves; here an aerial-grid coil of the same size as is used for the transformers will enable the desired waveband to be covered, so its tuning condenser must be set at a slightly higher value than the others.

**A Correction.**

In last week's instalment the H.F. stopping resistance was inadvertently omitted from the circuit diagram Fig. 2; it should be interposed between the secondary of the L.F. transformer and the grid of the output valve, and is marked R in the accompanying practical wiring plan.

# CLUB NEWS.

**A Visit to Croydon.**

Seventeen members of the Ilford and District Radio Society spent an enjoyable afternoon on Saturday, October 6th, when the Croydon Aerodrome was visited. The party afterwards proceeded to the transmitting station at Mitcham, and were able to see the station in actual operation.

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

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**New Portable Demonstrated.**

The Marconiphone Company's new five-valve portable receiver was demonstrated at the meeting of the Bec Radio Society on October 16th. Despite the fact that the Society's meetings are held in a building which is badly screened, the receiver picked up a number of distant stations.

The Society, which holds weekly meetings on Tuesdays at 7.30 p.m. at the Bec School, Beechcroft Road, Balham, S.W.17, has prepared an interesting syllabus, and new members will be welcomed at any of the meetings.

Hon. Secretary: Mr. A. L. Odell, 171, Tranmere Road, S.W.18.

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**Wireless Section I.E.E.**

The Wireless Section of the Institution of Electrical Engineers will open the winter session on Wednesday next, November 7th, at 6 p.m., with an inaugural address by the chairman, Commander J. A. Slee, C.B.E., R.N.

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**New Screened-grid Valve Set.**

The Marconiphone "44" receiver, with self-contained power stage for output and one of the new Marconiphone moving coil loud speakers, provided the ingredients for a highly successful demonstration given by Mr. F. Yonle, of the Marconiphone Co., at the last meeting of the North Middlesex Radio Society. The receiver embodied the new screened-grid high-frequency valves which are a notable improvement on the earlier double-ended type. The two H.F. stages were followed by anode-bend rectification and one L.F. stage. Having described the receiver, the lecturer proceeded to deal with the output stage, which was entirely self-contained and worked from the mains. So great was the interest aroused and so many were the questions asked that there was little time to demonstrate the set! The results, however, fully justified the lecturer's optimism.

Hon. Secretary: Mr. E. H. Laister, "Endcliffe," Station Road, N.21.

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**All About Valves.**

When Mr. Ree, of Mullard Radio Valve Co., concluded his lecture on valves at the last meeting of the Queen's Park Radio Society, the general opinion was that there was little left to be said about the structure, functions and characteristics of valves in general and the well-known P.M. valves in particular.

The Society meets each Wednesday at eight o'clock in the "Shaw" Room attached to St. Jude's Church, Lancefield Street, Queen's Park, W. All enthusiasts in the neighbourhood are invited to join the Society. Communications should be addressed to the hon. secretary, Mr. Fred. J. Batho, 37, Enbrook Street, Queen's Park, W.10.

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**Lectures for Brighton Amateurs.**

Interest is being well-sustained in the meetings of the Technical Section of the Brighton, Hove and District Branch of the Wireless League. At a well attended meeting on October 17th Mr. Arthur W. Privett continued his course of lectures for wireless amateurs and experimenters, dealing with the principles of the thermionic valve. The history of the valve, its theory and construction all received lucid treatment, and a feature of the evening was the answering of numerous queries at the end of the meeting.

Hon. Secretary: Mr. W. M. Summarsell, 1, Clifton Street, Brighton.

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**Ohms, Volts and Amperes.**

A subject of fundamental importance—the definition and standardisation of electrical units—was dealt with by Mr. F. L. Best in his lecture before the Muswell Hill and District Radio Society on October 17th. The lecturer outlined the early work of the British Association from its inception to the standardisation of the ohm, the volt and the ampere. The researches of the early pioneers such as Wheatstone and Clark were also briefly dealt with. Mr. Best concluded with a demonstration of his four-valve set.

Hon. Secretary: Mr. G. S. Sessions, 20, Grasmere Road, Muswell Hill, N.10.

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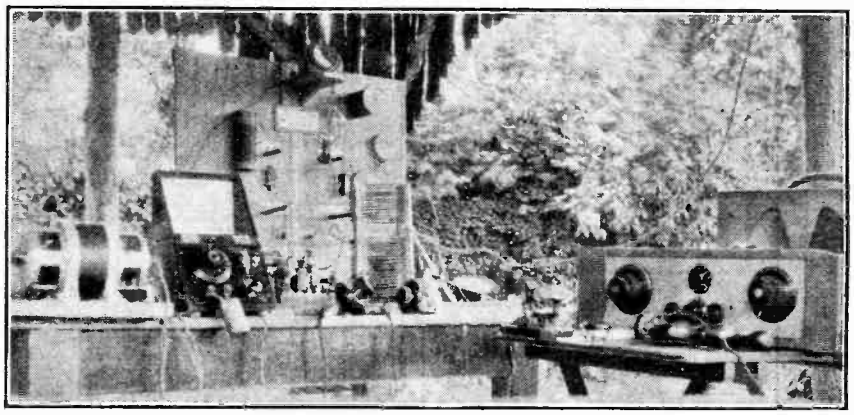
**New Session at Golders Green.**

The Golders Green and Hendon Radio Society is actively preparing an attractive syllabus for the winter months. At the first meeting on October 4th Mr. A. J. Bremner, B.Sc., lectured on "Experiments with Liquid Air." Particulars regarding the Society and its forthcoming programme can be obtained on application to the hon. secretary, Lt.-Col. H. A. Scarlett, D.S.O., 60, Pattison Road, Child's Hill, N.W.2.



**AN ECHO OF SUMMER. The transmitting and receiving equipment used by the Wimbledon Radio Society on recent field days.**

**Society with Junior Branch.**

The new metal rectifiers were the centre of an interesting discussion among members of the Wembley Wireless Society on October 19th, when the many advantages of metal rectifiers for both high and low tension purposes were dealt with.

The Society possesses an enthusiastic Junior section for boys up to the age of 16 years. Membership is only a 1s. per session, and the enthusiastic gatherings testify to the helpfulness of the talks given by members of the Senior section in addition to the lectures provided by well-known wireless manufacturers. The Junior meetings are held at 6.30 p.m. on Fridays, and the Senior branch meets on the same evening at eight o'clock.

Hon. Secretary: Mr. H. E. Combes, 24, Park Lane, Wembley.

## FORTHCOMING EVENTS.

**WEDNESDAY, OCTOBER 31st.**

*Edinburgh and District Radio Society.* At 7.30 p.m. Visit to Caledonian Wireless College, 22 Walker Street.

*Wigan and District Technical College Radio Society.* Demonstration of the Neutrosonic Seven and of Short Wave Receiving Sets by a representative of Messrs. The Igranic Electric Co., Ltd.

*Muswell Hill and District Radio Society.* At 8 p.m. At Tollington School, Tetherdown. Demonstration of a Portable Receiver by Messrs. B. and J. Wireless Co.

*Tottenham Wireless Society.* At 8 p.m. At 10, Bruce Grove. Lecture: "Insulating Materials," by Mr. A. G. Tucker.

**THURSDAY, NOVEMBER 1st.**

*Leyton and Leytonstone Radio Society.* At 8 p.m. At Grove House, High Road. Gramophone Pick-up and Amplifier Demonstration.

*Stretford and District Radio Society.* At 8 p.m. At 6A, Derbyshire Lane. Lecture: "Recent Radio Developments," by a representative of Messrs. The Igranic Electric Co., Ltd.

*Peckham Radio Society.* At the County Secondary School, Peckham Road, S.E.15. Open Night. "Old v. New Cossor Melody Maker."

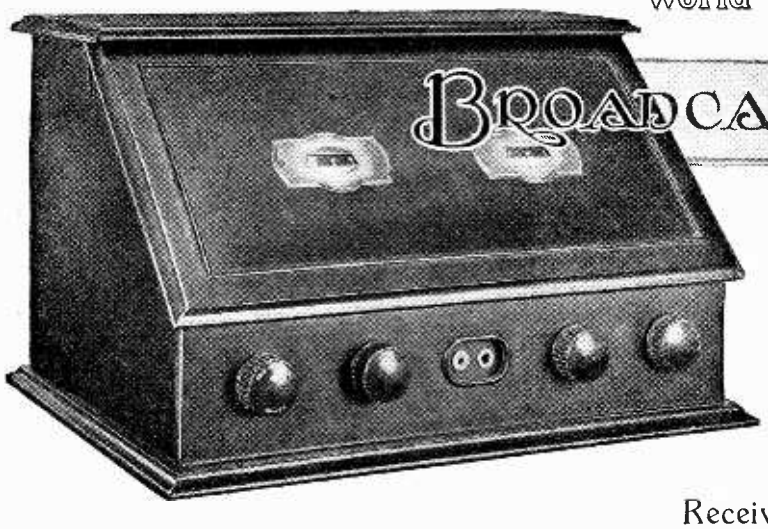
**MONDAY, NOVEMBER 5th.**

*Hackney Radio and Physical Society.* At 8 p.m. At Hackney Electricity Hall, 18-24, Lower Clapton Road, E.5. Discussion on merits of different sets.

*Newcastle-upon-Tyne Radio Society.* At 7.30 p.m. At 11, Saville Row. Lecture: "Valve Characteristic Curves," by Mr. N. Hendry (G 6FG).

*Holloway Radio Society.* At 7.30 p.m. At the Holloway Literary Evening Institute, County Secondary School, Hilldrop Road. "The Cossor Melody Maker."

*Croydon Wireless and Physical Society.* At 8 p.m. At 5, Altyre Road, East Croydon. Questions and Answers.



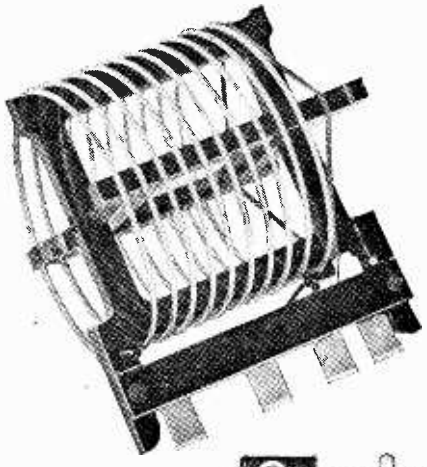
# BROADCAST RECEIVERS

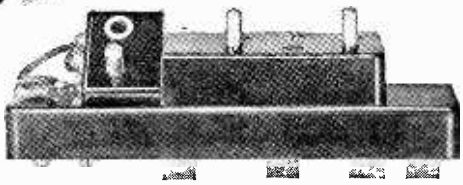
## MARCONIPHONE SHORT WAVE SET

### A Sensitive Short-wave Receiver adaptable for Long Waves.

IN view of the many variable influences affecting the long-distance transmission of short waves, it is difficult to make any claims for a short-wave set; nevertheless, in the illustrated leaflet issued by the Marconiphone Co., Ltd., in connection with the Model 34, stations 5SW (Chelmsford), PCJJ (Holland), 3LO (Melbourne), and 2XAD (Schenectady) are mentioned as being heard regularly over thousands of miles. Accordingly the receiver was unpacked and at once put on the aerial with the object of picking up these transmissions.

Chelmsford (5SW) and Eindhoven (PCJJ) proved to be easy game, as one might expect. 5SW in London is steady but not of overpowering strength when compared with some of the other European short-wave stations. PCJJ and some of the German short-wave transmitters are at times almost equal to 5GB in volume, and the quality is remarkably good. However, the comparative proximity of these stations robs them of much of their interest; European stations can always be received after nightfall on the medium broadcast wavelengths, and a special coil adaptor is included for this purpose in the equipment supplied with the set. It is for communication over great distances that short waves are used, and long-distance reception must be the criterion of performance of a short-wave set.





The long-wave coil adaptor and one of the short-wave coils showing skeleton former and knife-blade contacts.

#### Signals from the Antipodes.

It was decided to commence with the greatest distance possible on the earth's surface, and to attempt to pick up transmissions from Melbourne, Australia. The conditions on the particular Sunday chosen for the attempt were by no means as good as they have been during the summer months, but the transmission was quite definitely received. Although speech was not clearly intelligible, musical items could be easily identified. On the same evening the conditions for the reception of American stations were remarkably good. The strength and quality from 2XAD were so good that during an organ transmission it was possible to identify the make of organ being used. Later, on the evening of the landing of the "Graf Zeppelin," the whole of the commentary relayed from 2XAD was followed for hour after hour, during which time the transmission never once faded so low that speech could not be followed. Nearly a week later this station was coming in at the same strength and a running commentary on a Saturday afternoon ball game was followed without serious interference from extraneous noise. There is now no need to wait up until the early hours of the morning for American stations, for the short-wave transmissions are easily received from 7 p.m. onwards.

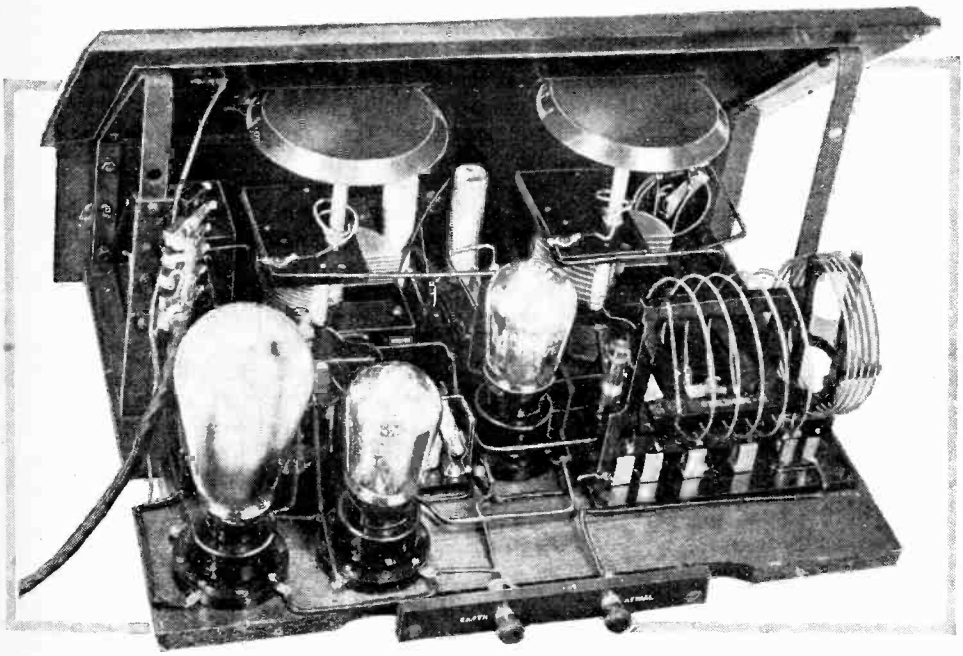
Having proved the capabilities of the set in the matter of long-distance reception, the next step was to investigate the ease of control. Rightly or wrongly, short-wave sets have a reputation for being difficult to tune. This is largely a matter of experience, and there is no reason why anyone with previous knowledge of the tuning of ordinary broadcast receivers employing reaction should have any real difficulty in learning to tune-in short-wave stations. On the other hand, if hand-capacity effects are present in a short-wave set some little time must elapse before one is able so to mistune the receiver that it returns exactly to resonance when the hands are withdrawn from the controls. In the Marconiphone receiver, in spite of careful screening of the cabinet, hand-capacity effects are noticeable on the 29-52-metre band; curiously enough, the 16-29-metre band,

**Broadcast Receivers.—**

which should be worse, is reasonably free from hand-capacity. The set was tested with a rather long earth lead, but at least one short-wave set has performed under the same conditions without the slightest trace of hand-capacity. However, there is no reason to doubt that a short earth lead would effectively cure the trouble in the case of the Marconiphone set. It is interesting to note that H.F. chokes are included in both loud-speaker leads, and that, although the tuning and reaction controls, and even the escutcheon plates on the condensers were "live," the loud-speaker leads could be handled without seriously affecting the tuning.

### A Well-designed Condenser Gear.

On short waves tuning is exceptionally sharp, and on the 45-metre amateur band it is not uncommon to find two or three stations crowded into one degree of the tuning dial. In the Marconiphone receiver both condensers are mounted vertically with edgewise dials fitted to extensions of the condenser spindles. The control knobs are at table level and are connected to the condenser through a double reduction gear giving an overall ratio of 70 : 1. This ratio is exactly suited to the capacity of the variable condensers, and gives perfect control without being too slow when transferring from one region of the dial to another. The use of a two-stage reduction gear, besides keeping the mechanism compact, has a further advantage in that the direction of rotation of the indicating dials corresponds with that of the control knobs. The metal-to-metal friction contacts are spring-loaded, free from backlash, and do not give rise to electrical noises on the shortest wavelengths.



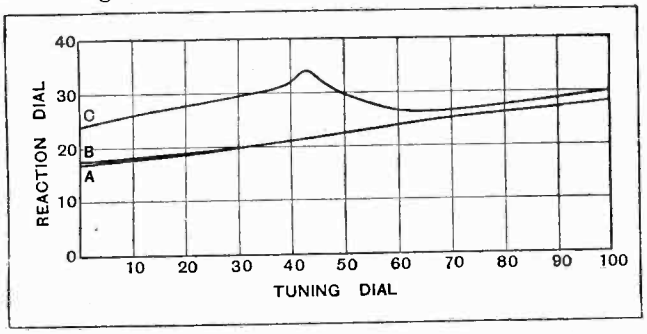
The "works" removed from the cabinet; note the plug-in air-spaced coils and horizontal condenser dials.

By means of a potentiometer the grid potential of the detector valve can be so controlled that the receiver goes into and out of oscillation without the slightest overlap. This enables the set to be easily maintained in its most sensitive condition just below the oscillation point without sacrificing detector efficiency. In practice the reaction control is moved backwards and forwards over the oscillation point while the potentiometer knob is slowly rotated from positive towards negative until a point is reached where the set goes into oscillation smoothly and without the "plop" which indicates too positive a bias. It is advisable to work with as much positive on the grid as possible consistent with smooth reaction, since the detector efficiency falls off as the grid is made more negative.

Uniformity of reaction is a quality which is governed by the electrical properties of the tuned circuits in the receiver, including such so-called aperiodic circuits as the reaction coil, aerial circuit, and H.F. chokes. This quality can be shown graphically by plotting the reaction scale reading against the tuning scale. The curves show that the Marconiphone set is exceptionally good over the 29-52-metre waveband. If the aerial coil, which is mounted on a hinged support, is not too tightly coupled, a perfectly regular increase of the reaction scale reading is necessary to keep the receiver just off the oscillation point over the whole of the tuning scale from 0 to 100. When the maximum coupling with the aerial is used, however, a hump, due to a harmonic of the aerial circuit, appears at 43 degrees. For this reason a weak aerial coupling is advisable; it will be found that the coupling can be reduced almost to the minimum without adversely affecting signal strength. The reaction curve for the 16-29-metre coil is not quite so good and shows two distinct humps at 52 and 66 degrees on the tuning dial. By disconnecting the aerial and removing the aerial coil the first of these was proved to be due to a harmonic of the aerial, but the second hump at 66 degrees persisted when the aerial circuit was removed, and must be ascribed to some resonance in the remainder of the circuit. It will be observed that curves A and B touch the zero line just above 20 degrees on the tuning scale. This means that, with 120 volts H.T. (the value used throughout the tests), the receiver will oscillate uncontrollably below 20 degrees if the aerial coupling is too weak. Of course, oscillation over this range could be stopped by reducing the H.T. voltage on the detector, but, in the set under review, this cannot be done without reducing also the H.T. voltage applied to the L.F. valves, which would adversely affect amplification and quality. The correct procedure, therefore,

**Broadcast Receivers.—**

should be to gradually increase the aerial coupling until the set is just not oscillating with both dials set at zero; reaction will then be under control over the whole of the tuning scale.



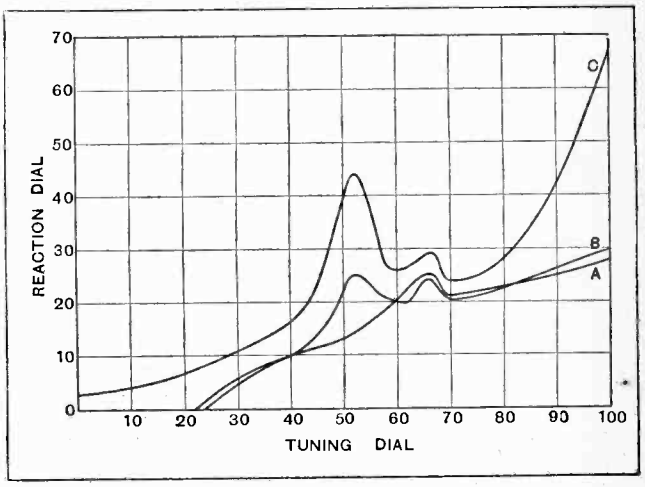

**Curve showing relation between tuning scale and reaction scale settings required to keep the receiver near the oscillation point over the 29–52 metre waveband; A, aerial coil removed and aerial disconnected; B, minimum aerial coupling; C, maximum aerial coupling.**

The receiver follows standard short-wave practice in general design and layout, and is soundly made and well finished. The mahogany cabinet is screened internally on all sides, but there are gaps at some of the joints, and the screening plate on the lid is connected to the main screen only through the hinges. The "chassis" of the set can be removed from the cabinet after withdrawing wood screws under the base and disconnecting two flexible leads between the screening plates on the front panel and the metal lining of the case. There is a grid leak holder behind the terminal strip at the right-hand end of the set, and a 0.25 megohm resistance should be inserted if the set is found to be unstable on the normal broadcast wavelengths. The holder is in an inaccessible position, and it may be found necessary to withdraw the chassis before the resistance can be inserted. The resistance is connected across the secondary of "Ideal" L.F. transformer, which has a ratio of 2.7 : 1. The L.F. stage preceding this transformer is resistance-coupled to the detector, and a H.F. choke and by-pass condenser are included in the anode circuit of the detector to prevent the transfer of H.F. energy into the L.F. amplifier.

The loud speaker or telephone output terminal sockets are connected directly in the anode circuit of the last valve, so that if a power valve is used a filter circuit must be connected externally for the purpose of by-passing the D.C. component of the anode current.

The tuning coils are air-spaced and wound on skeleton formers. Knife-blade contacts are used for the grid and reaction coils, and pins and sockets for the aerial coupling coil, which is adjustable, and consists of five turns. In addition to the 16-52 metre coils supplied with the set, extra coils for wavebands from 10 to 16 and from 52 to 100 metres can be obtained, priced 10s. 6d. and 11s. 3d. respectively. A broadcast coil adaptor with a hinged plug for the aerial coil is also supplied with the set.

The price of the Model 34 receiver is £23 17s. 6d., including royalty, and accessories would amount to about £6 8s. 6d. for headphone reception, and from £8 to £16 for working a loud speaker, depending on the type chosen. In our opinion, the quality of reproduction justifies a really first-class loud speaker, provided that a good output valve, such as the P.625 or P.625A, is used in the last stage.




**Reaction curve for the 16–29 metre waveband; A, aerial coil removed and aerial disconnected; B, minimum aerial coupling; C, maximum aerial coupling.**

**General Notes.**

Mr. A. E. Livesey informs us that his station G 6LI is now licensed, under the new regulations, for all wavebands except that of 32 metres, and including the 5- and 10-metre bands.

Mr. P. H. B. Trasler has relinquished his call-sign 6TR, as he is going to the West Indies, where his address will be c/o Trinidad Leaseholds, Ltd., La Carriere Shipping and Refining Place, Pointe a Pierre, Trinidad. He hopes to get a transmitting licence there, and to keep up his wireless communication with friends in this country.

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**"R" Code Obsolescent.**

We would remind readers that, when the new regulations under the Washington Convention come into force in January next, the old and somewhat unsatisfactory "R" code will be superseded by the figures 1 to 5, used without the letter "R," and signifying:—

1—Hardly perceptible; unreadable.
2—Weak; readable now and then.
3—Fairly good; readable, but with difficulty.
4—Good; readable.
5—Very good; perfectly readable.

This would seem a far better system than the "R" code, because it deals more with weak signals, assuming that when they have reached class 5 it is only a question of amplification to bring them up to any desired strength, whereas under the old code the same signal might be reported as anything from R4 to R9, according to the receiver used; it was therefore no real guide to the quality of the received signal.

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**"Q" Code and Other Abbreviations.**

We would again draw attention to the revision of the "Q" code. Only about 20 of the original signals retain their old meaning, while a considerable number of new "Q" abbreviations have been added. The miscellaneous abbreviations authorised will be used and recognised all over the world and will, therefore, be of great service in communicating with foreign countries. They will, we hope, entirely take the place of the abused and misused "Ham language."

## TRANSMITTERS' NOTES

# USEFUL DATA CHARTS. (No. 14.)

## The Relation between Watts, Amperes and Volts.

WHEN direct current flows down a fall of potential, power is liberated in the circuit; this power is expressed in watts, and we have the relation watts = drop in volts × amps. This power may appear as heat, as in a lamp bulb or electric radiator, and 1 watt is equivalent to a production of heat at the rate of 0.24 calorie per second, or 1 kilowatt-hour equals 0.0341 therms, the therm being the unit by which gas supply is charged.

Again, watts may be transformed into mechanical power, as in a direct-current motor; 746 watts equal 1 horse-power, so that a $\frac{1}{8}$ h.p. motor when loaded requires a consumption of 93 watts, or 0.93 amps at 100 volts, neglecting the losses in the motor; actually the current would be about 15 per cent. greater than this, *i.e.*, 1.4 amps. Thirdly, we may turn watts into electrolytic action, as when we charge an accumulator; some power will be lost in the charging rheostat, and the rest, with a deduction of 10 per cent. for losses in the accumulator, will be stored as energy in the cell.

### Examples with D.C. Circuits.

An electric radiator taking 10 amps at 240 volts consumes 2,400 watts, or 2.4 kilowatts, and, since the kilowatt-hour is taken as the unit on which the supply company charges the householder, this radiator will cost 1s. 2½d. per hour on a basis of 6d. per unit.

The field magnet winding of your coil-driven loud speaker may take 0.15 amps at 110 volts; the power taken will accordingly be $110 \times 0.15 = 16.5$ watts, which is quite inexpensive; to ensure that the magnet coil does not heat up excessively, it is usual to allow half a watt per square inch of coil surface so that the whole surface of the coil, including the two ends, should be at least $16.5 \times 2 = 33$ square inches; a coil of 3in. dia. and 2in. height would serve.

### A.C. Circuits.

So far the matter has been quite simple, but when we come to deal with A.C., care is required. The product of root mean square volts into root mean square amps is termed volt-amps, *and has nothing to do with the watts consumed till the details of the circuit are known.*

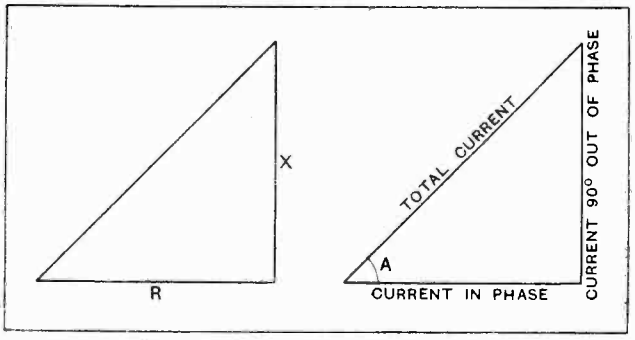
If a coil containing resistance and reactance is connected to an A.C. supply, the current will consist of a component in phase with the volts, and a component 90° out of phase (i.e., in quadrature). It is only the "in phase" component which consumes power.

A diagram will make the matter clear. Draw a right-angled triangle whose base and vertical represent the resistance and reactance respectively of the circuit; draw a geometrically similar triangle whose hypotenuse is the total current, then the component currents are given by the other two sides of this triangle.

The definition of watts when A.C. circuits are in question is watts = r.m.s. volts × r.m.s. amps in phase with the volts.

This is equivalent to watts = r.m.s. volts × r.m.s. total amps × cosine A, where A is the angle shown in the diagram. Cosine A is called the power factor; it is the ratio of the "in phase" current to the total current, or the ratio of watts to volt-amps, and is a decimal always less than unity.

If your coil possessed zero resistance, all the current would be 90° out of phase, or wattless current, and no power would be consumed. Nevertheless, the supply company would charge you for this idle current.




**In a right-angled triangle whose hypotenuse represents the total A.C. current, the other two sides give the component currents in phase and in quadrature.**

In using the above with A.C. circuits we must then be careful to mark off, not the whole current, but the "in phase" component, which is $\frac{R}{\sqrt{R^2+X^2}}$ the whole current. Thus, if a coil has a resistance of 50 ohms and a reactance of 150 ohms giving an impedance of $\sqrt{50^2+150^2} = 158$ ohms, and is connected to a 110-volt supply, the total current is $110/158 = 0.696$ amp., and the "in phase" current is $0.696 \times \frac{50}{\sqrt{50^2+150^2}} =$ 0.22 amp. Hence from the above the power consumed is 24.2 watts.

R. T. B.

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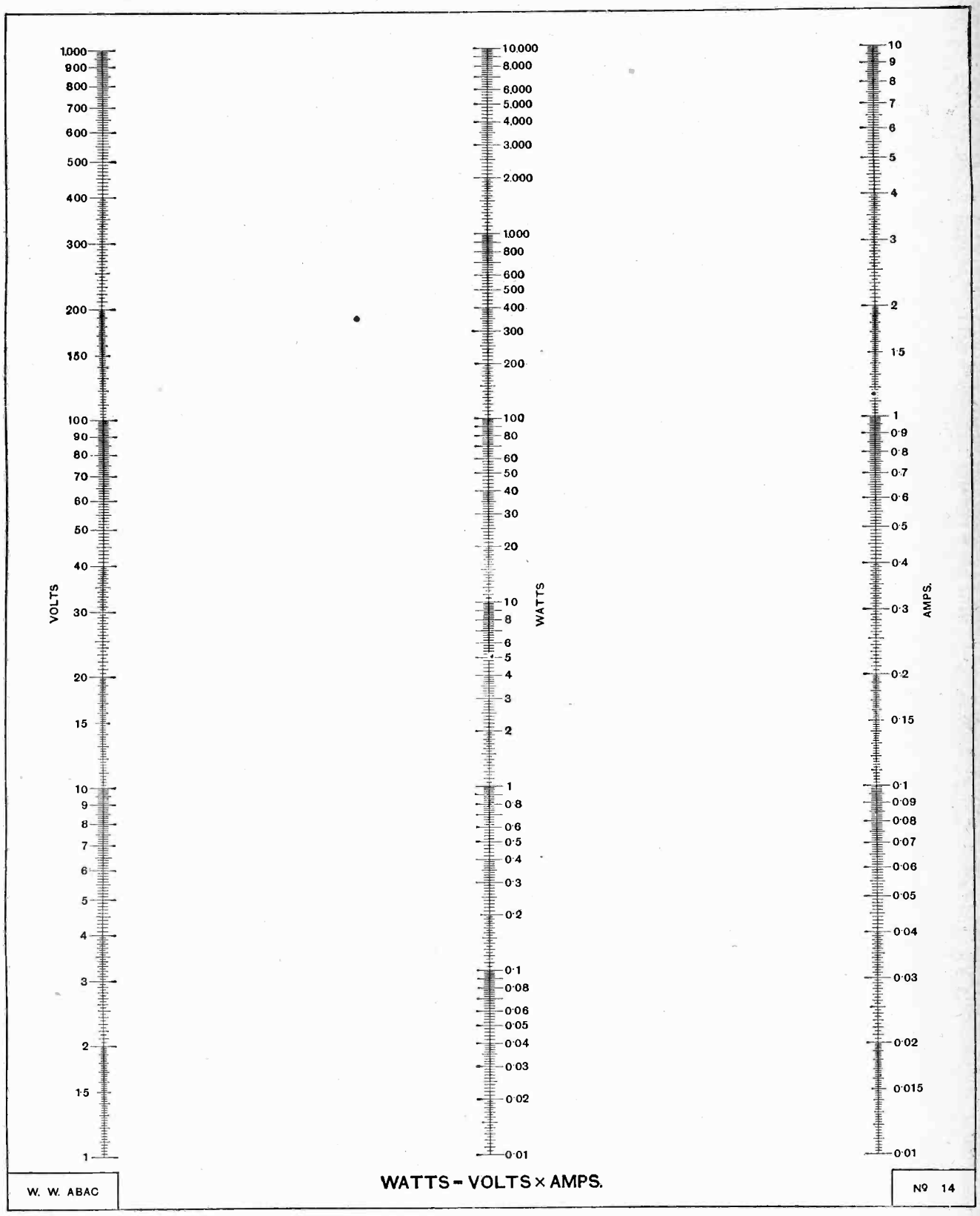
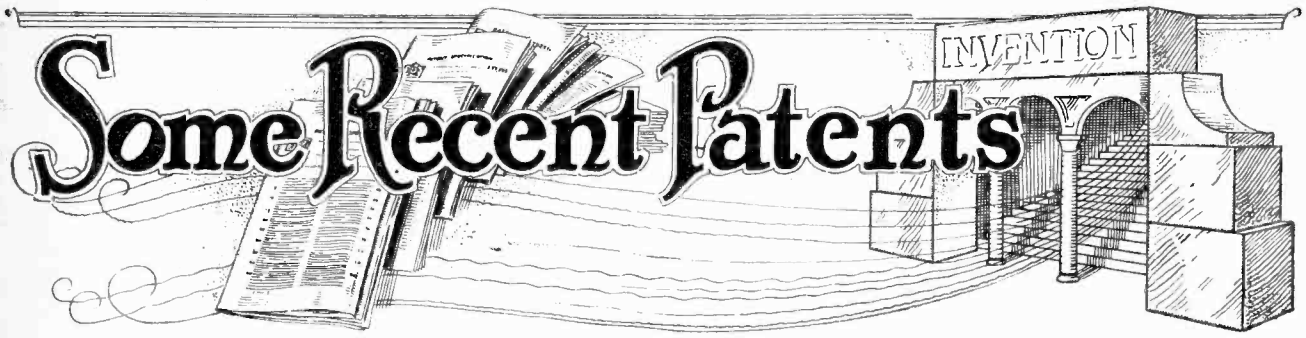
**The following useful data charts have already appeared:—**

Frequency and Wavelength.—July 11th, page 38.
Inductance, Capacity and Frequency: Short-wave Band.—July 18th, page 82.
Inductance, Capacity and Frequency: Medium-wave Band.—July 25th, page 110.
Inductance, Capacity and Frequency: Long-wave Band.—August 1st, page 126.
The Reactance of a Coil at Audio Frequencies.—August 8th, page 158.
Reactance of a coil at Radio Frequencies.—August 15th, page 204.
Reactance of a Condenser at Audio Frequencies.—August 29th, page 252.
Reactance of a Condenser at Radio Frequencies.—September 5th, page 294.
D.C. Resistance of Copper Wire.—September 19th, page 360.
D.C. Resistance of Resistance Wire.—September 26th, page 388.
Value of Resistances in Parallel.—October 3rd, page 483.
Capacity of Condensers in Series.—October 10th, page 500.
Relation between Volts, Ohms, and Amperes.—October 24th, page 580.



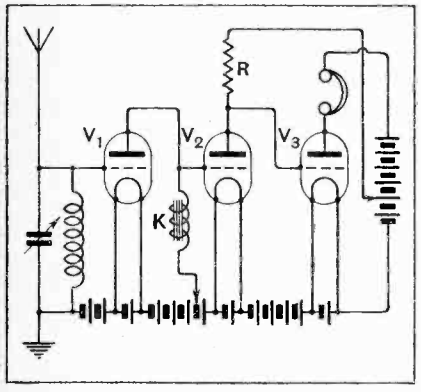



*The following abstracts are prepared, with the permission of the Controller of H.M. Stationery Office, from Specifications obtainable at the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.*

### A Direct Coupling System. (No. 289,217)

*Application date: March 10th, 1927.*

Instead of using a blocking condenser to protect the grid of one valve from the plate voltage of the preceding valve, a direct metallic connection is made between the two, means being provided to




Circuit of direct coupling system.

maintain successive valve electrodes at suitable operating potentials. As shown in the figure the plate of valve $V_1$ is connected directly to the grid of valve $V_2$, the high tension to the first valve being tapped off through a choke coil K from an extended source of supply, such as may be derived from electric supply mains.

The filament current to the valve $V_2$ is tapped off from the same source of supply at a point further along the continual potential gradient, whilst the plate voltage is fed through a resistance R from a point still further removed. The filament and plate supply to the valve $V_3$ is derived in similar fashion.

The grid bias of the first valve is adjusted to secure anode-bend rectification, the rectified signalling impulses being communicated from stage to stage through the plate impedances K and R.

Patent issued to J. F. Johnston.

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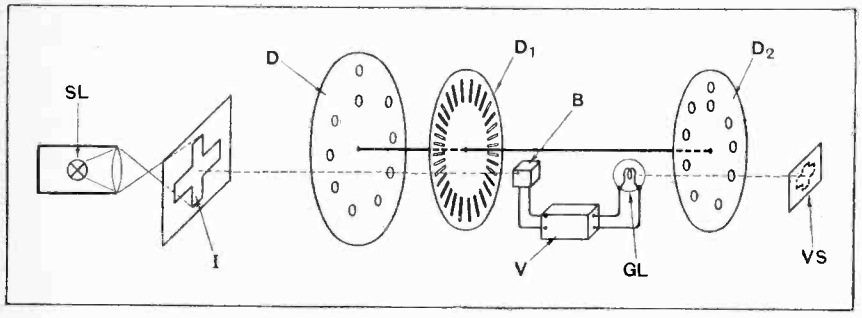
### Television Apparatus. (No. 288,882.)

*Application dates: October 15th, 1926; January 26th and March 10th, 1927.*

The figure illustrates a scheme for providing a visible image of a distant object which is in darkness, a system to which the term "Noctovision" has since been applied by the inventor. A searchlight projector SL is screened by a thin diaphragm of ebonite so as to cut off all visible light. The residual infra-red rays are then focussed on to the object and produce an invisible image at I.

This is explored by a system of rotating slotted discs, D, $D_1$, so as to project a succession of intermittent infra-red energy-impulses upon a bolometer B or similar device sensitive to such energy. The resultant current impulses from the bolometer are fed to an amplifier V and energise a glow-lamp GL. The intermittent flashes from this lamp are reassembled by another slotted disc $D_2$, and are then projected as a visible reproduction of the original dark object upon a viewing screen VS. To ensure synchronisation under all conditions, the near and distant exploring discs D, $D_1$, $D_2$ are stated to be mounted on the same rotating shaft.

Patent issued to Television, Ltd., and J. L. Baird.




"Noctovision" scheme of J. L. Baird.

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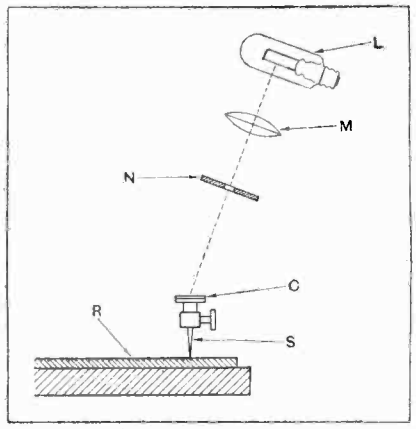
### Light-sensitive "Pick-ups." (No. 283,711.)

*Application date: January 11th, 1927.*

A selenium cell C, having a plain surface, is mounted on the top of a stylus S vibrated by a gramophone record R




A light-sensitive pick-up.

Light from a lamp L is focussed by a lens M, and after passing through a perforated screen N falls at an acute angle on to the cell. The vibrations of the stylus alter the angle of incidence of the light, and thus vary the intensity of illumination with each movement, the effect being increased by the cut-off action of the screen N. The cell C is connected in series with a battery in the input circuit of a thermionic valve, and the resulting current variations after suitable amplification are fed to a loud speaker.

Patent issued to the British Thomson-Houston Co., Ltd.

# BROADCAST BREVITIES

*By Our Special Correspondent.*

***A Relay Contest.—The Midland Regional Station.—"G.B.S." at the Microphone.—5NG's Farewell.—Reception on Armistice Day.—5SW in Canada.***

### Keston *v.* Chelmsford.

A stirring little contest is promised for November 10th, when the Sydney broadcasting station will transmit greetings from members of the English Test Team. Chelmsford, with its spaced aerial system, will make an attempt to repeat the success obtained with the Zeppelin relay from New York a fortnight ago. So far, so good. "But," says Mr. J. A. Partridge, of Keston fame, "we intend to try, too!"

The contest between the two receiving stations will be decided in the Savoy Hill control room. Whichever sends in the better "sigs" will secure the honours of a national relay.

Sydney will be transmitting on 32 metres and reception is expected between 7.45 and 8 p.m.

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### Tarling.

Strictly speaking, "Chelmsford" is a misnomer when applied to the spaced-aerial station, which is situated at Tarling, several miles to the south of the city.

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### "Regional" Rumours in the Midlands.

The B.B.C. mobile transmitter seems to travel in an aura of suspicion, rumour and uncertainty. The phenomenon was apparent when the vehicle was roaming the northern outskirts of London in the search which eventually led to the choice of the Brookman's Park site. The same phenomenon is now to be observed in an area surrounding Barkisland, a village in Yorkshire, where the mobile transmitter has been distinctly seen by independent, sober witnesses in full possession of their natural, not to mention supernatural, faculties.

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### "Wipe Out" Areas.

The reports broadcast by these good people have set up some reasonable apprehensions among the listeners of Halifax and Huddersfield, who, if the Midland regional station were to find its niche in the area mentioned, would be fairly swamped. Happily, I learn that there is no cause for alarm. An official at Savoy Hill hastened to assure me that no site had yet been definitely chosen.

The B.B.C., he said, is not committed definitely to the closing down of the present stations. If, when the regional stations are working, any difficulty is found due to transmission, local listeners will probably have their old transmitters reinstated without a great deal of ceremony.

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### A Watery Question.

It has been suggested that the Midland regional station should be perched on the top of the Pennines, far away from any populous localities, but the obstacle to this scheme is the difficulty of securing an adequate water supply. As an indication of the amount of water consumed daily by a high-power broadcasting station, it is interesting to note that the B.B.C. recently asked the Barkisland District Council whether it could supply a station with 5,000 to 10,000 gallons a day.

If Captain Eckersley can only think of a way to make water run uphill the top of the Peak would be an ideal spot.

**FUTURE FEATURES.**

**London and Daventry**

NOVEMBER 4TH.—Service from Canterbury Cathedral. Address by the Most Rev. the Archbishop of Canterbury.

NOVEMBER 8TH.—Miss Margaret Bondfield: "A Woman M.P.'s Day."

NOVEMBER 9TH.—Prime Minister's Speech relayed from the Guildhall.

**Daventry Experimental (5GB).**

NOVEMBER 6TH.—An Hour with British Composers.

NOVEMBER 8TH.—Selections from the Popular Operas.

NOVEMBER 9TH.—B.B.C. Symphony Concert, relayed from the Queen's Hall.

**Cardiff.**

NOVEMBER 5TH.—Some Hysterical Scenes in the Life of Guy P. Faux, depicted by Penn Gwyn.

NOVEMBER 8TH.—"The Drawback," a diminutive drama by Maurice Baring.

**Manchester.**

NOVEMBER 5TH.—"The Fifth of November," by Howard Peacey.

NOVEMBER 10TH.—"War Time Memories," presented by the Station Repertory Players.

**Newcastle.**

NOVEMBER 6TH.—"Heart's Desire," a comic opera specially written for broadcasting by Mabel Constanduros.

NOVEMBER 9TH.—Speeches on the occasion of the election of the New Lord Mayor of Newcastle-on-Tyne, relayed from the Council Chamber.

**Glasgow.**

NOVEMBER 5TH.—Scottish Humour Series—No. 10.

NOVEMBER 6TH.—"The Land of Romance," a Border Programme.

**Aberdeen.**

NOVEMBER 5TH.—Scottish Concert.

**Belfast.**

NOVEMBER 5TH.—Guy Fawkes Day Programme.

### Bernard Shaw to Broadcast.

"G. B. S." has consented to the broadcasting of his lecture on December 7th at the Royal Academy of Dramatic Art. The lecture is the first of a series of four, by prominent people, on the arresting subject "How it Strikes Me," and will be heard at 5 p.m. by listeners to 5GB.

How things strike Mr. Bernard Shaw is of peculiar interest to a good many people, and I imagine that the famous dramatist will provide us with some ear-openers on December 7th.

I hear that Sir Gerald du Maurier will probably be another speaker in the series.

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### Adieu to 5NG.

To-day (Wednesday) sees the farewell performance of 5NG, and to-morrow Nottingham listeners will share the joys and sorrows of their Birmingham brothers who flirt with 5GB.

The B.B.C. learnt a good deal on the two days when Nottingham closed down to enable listeners to try their luck on Daventry. After receiving a number of complaints, the engineers paid a number of personal visits to the houses of those in distress. It was found that in all cases insufficiency of signal strength from both the Daventry stations was due to faults in listeners' equipment. The faults included bad connections, inefficient aerials, insensitive headphones (very prevalent), and inability to reach the wavelength.

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### Prognostication.

A time will come (says Old Bore) when every school will include elementary wireless in its regular curriculum, and when every (presumably) educated person will prefer death with honour rather than bear the reproach that he can't tune in to the nearest broadcasting station.

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### Bouquets for a Speaker.

The champion talker (microphonic) at the moment seems to be Mr. S. K. Ratcliffe, whose half-hourly lectures from 5XX on American problems have elicited quite a flood of appreciatory correspondence. Which only shows that even half an hour is not too long if the speaker has something to say and knows how to say it.

**New Word Wanted.**

It seems a pity, by the way, that we have no distinct word applicable to those who give broadcast talks. "Speaker" is too vague; "talker" sounds almost disrespectful. A hybrid word embodying the notions of broadcast speech might be found, but examples which first leap to the tongue are not altogether happy.

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**Daventry's New Wavelength.**

The slight alteration in the wavelength of Daventry (5XX) was made in consequence of heterodyning by Kalundborg, which settled on to a frequency only 7 cycles from that of the Daventry station. 5XX is now working on a frequency of 192 kilocycles (wavelength 1,562.5 metres) instead of 187 kilocycles (1,604.3 metres). Since the change there have been no further complaints of heterodyning.

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**The Two Minutes' Silence.**

To avoid disturbance by atmospherics or other extraneous noises during the Two Minutes' Silence on Armistice Day, the B.B.C. is recommending that receivers used for public reception of the Cenotaph service should be switched off during the Silence. This should offer no difficulty, even where it is felt that part of the ensuing service may be missed, for it should be easily possible for one person to listen on headphones for the signal indicating that the two minutes are over.

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**Advice to the Clergy.**

With regard to reception in church, the B.B.C. has issued a strong recommendation to the clergy to see that the equipment used is given a full preliminary test. In some cases it has been found that the intention is to use simple 3- or 4-valve sets of the home type, quite inadequate for use in a public building.

It would be far better to omit the broadcast from church services than to make the attempt with overloaded valves and consequent distortion.

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**Armistice Day in Scotland.**

The Scottish stations of the B.B.C. are to broadcast their own Remembrance Programme on November 11th. The Cenotaph Ceremony in the morning and the Trafalgar Square meeting in the afternoon will both be relayed for Scottish listeners, but a portion of the afternoon will be devoted to a purely Scottish tribute. This programme will be given in the Glasgow studio and relayed by all Scottish stations. Two new works will receive their first performance on this occasion. These are "Threnody" (A Highland Lament), which is a choral setting of Miss Agnes Muir Mackenzie's words by Katherine Wilson, and "The Noble Nature," a choral setting of Ben Jonson's words by the composer of "The Knight of Bethlehem."

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**Mr. Percy Scholes.**

Readers of these notes last week may have been wondering whether a new wireless link was to be created to enable Mr. Percy Scholes to continue his fortnightly criticism of current music from his new home in Switzerland. I am sorry to disappoint with the explanation that the paragraph was both erroneous and untimely, having crept in from the limbo of "old and unused copy."

Mr. Scholes is now busily occupied, still in matters musical, on his little estate above Lake Geneva. He points out that, in a sense, he is still at Savoy Hill, for the eminence on which his house stands was once the property of Peter the Second, Count of Savoy.

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**The Archbishop's Farewell.**

The farewell address by the Archbishop of Canterbury will be broadcast from 2LO and 5XX on November 4th, in a service relayed from Canterbury at 8 p.m.

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**Earl Jellicoe's Appeal.**

As the Prince of Wales will not be able this year to make his usual Poppy Day broadcast appeal from B.B.C. stations, the task will be performed on November 9th by Earl Jellicoe

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**Famous Violinist.**

Isolde Menges, the violin virtuoso, will broadcast from 2LO on November 6th

**OLYMPIA SHOW COMPETITION.**

Results of the "Wireless World" Voting Competition will be published in next week's issue.

**Mrs. MacFarlane.**

One of the most irrepressible people who make regular appearances in the studio at Aberdeen—"Mrs. MacFarlane of Ragbag Lane"—has prevailed upon the authorities to allow her to arrange a programme of her own, and on November 12th local listeners are to hear "My Programme" by this vociferous broadcaster.

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**Mottoes About Mother.**

Many listeners will remember those ornate mottoes which used to adorn the front parlour in the old days, such as "What is home without a mother?" This forms the basis of a comedy by Edwin Lewis which 5GB is broadcasting on November 15th. Wortley Allen, Harry Saxton, Mabel France, and Helen Enoch are in the cast.

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**5SW in Canada.**

The wireless department of the Canadian National Railways reports successful experiments in picking up British broadcasts on moving trains.

With a specially installed receiving set, the short-wave broadcast from Chelmsford has been heard on a Canadian National train moving between Sioux Lookout and Redditt, Ontario, 1,219 miles west of Montreal and almost 4,000 miles from the broadcasting station. Passengers were able to listen-in to the British programme for 15 minutes.

**Concentrating on British Broadcasts.**

A representative of the Radio department tells me that the company intends to make a special feature of the reception of British broadcasts on their trains—which are already equipped with ordinary sets for reception from local stations—for the entertainment of passengers on the five-day journey between Montreal and Vancouver.

The reception on board the Canadian train is regarded as the first instance of a British broadcast having been picked up by a moving train in North America.

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**Words of Wisdom.**

"It has been said that broadcasting is an evil influence in this country. That is all rubbish. Any influence that helps to spread the love of good music cannot be evil. . . .

"As long as we can get the support of the public, as long as you have 3,000,000 people listening-in at wireless sets; as long as gramophone company shares boom—provided that be not due to accursed jazz records—so long you can write me down as an optimist in music."—Sir Landon Ronald in a speech at Manchester.

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**Gramophone Studio for Broadcasting.**

Owing to the impossibility of accommodating in the London studio an orchestra and chorus of the size required for Debussy's opera, "Pelleas and Melisande," which is being broadcast this evening (Wednesday), the B.B.C. is changing the venue to the Parlophone studio, which is well adapted acoustically to performances on a large scale.

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**Georgianne.**

Although Donald Calthrop relinquished his position on the B.B.C. staff a couple of years ago, he still takes part occasionally in 2LO's broadcasts. To-morrow night he is to head the cast in a sketch entitled "Yo Soy Ombre," after the style of the play, "When Knights Were Bold," and with him will be Ambrose Manning, Frederick Cooper and other well-known broadcasting artists. This sketch occurs in a programme called "Nea-r-Georgian, or Quasi-Queen Anne." The vocalists are John Thorne and Rose Hignell, supported by the Gershom Parkington Quintet.

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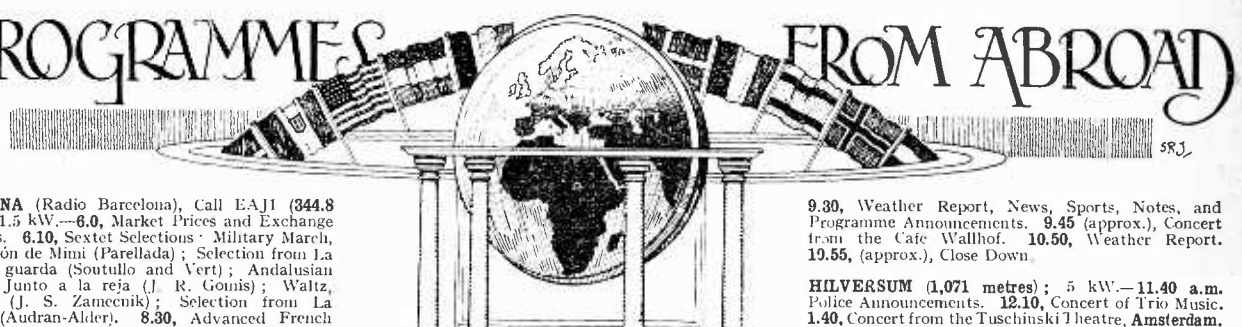
**A Border Night in Scotland.**

A programme of Border works is to be relayed from Glasgow by all Scottish stations on November 6th. The programme is titled "The Land of Romance," and seeks to convey to listeners in music, song and story something of that indescribable glamour which gives the Borders their name of "The Land of Romance." An important feature of the programme is the first performance of the "Border Rhapsody" by Baker and Percy Reed, a Border ballad for male voice chorus and orchestra by Hamish McCunn. Both these works will be conducted by their composers.

# PROGRAMMES FROM ABROAD



## SATURDAY, NOVEMBER 3rd.

**All Times are Reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**BARCELONA** (Radio Barcelona), Call EAJ1 **(344.8 metres ;** 1.5 kW.—**6.0,** Market Prices and Exchange Quotations. **6.10,** Sextet Selections : Military March, La Perdición de Mimi (Parellada) ; Selection from La casita del guarda (Soutullo and Vert) ; Andalusian Serenade, Junto a la reja (J. R. Gomis) ; Waltz, Rosemary (J. S. Zamecnik) ; Selection from La Mascotte (Audran-Alder). **8.30,** Advanced French Lesson by Prof. Martin. **9.0,** Chimes and Weather Report. **9.5,** Exchange Quotations and News. **9.10,** Orchestral Selections : Two-Step, Currito de la Macarena (Fernández) ; Selection from Pan y Toros (Barbieri) ; Moorish Dance (Fernández) ; Waltz, Flowers (Waldteufel) ; Cimarrón (Versalles) ; In a Persian Market (Ketelbey). **10.0,** Programme relayed from **Madrid,** EAJ7.

**BERGEN (370.4 metres) ;** 1.5 kW.—**6.0,** Programme for Children. **6.30,** Talk for Girls. **7.0,** Orchestral Music. **7.50,** Talk : Topics of To-day. **8.0,** Recital of Ballads by Victor Ivarson. **8.30,** Herr P. E. Brantzeg, Talk : Albrecht Dürer. **9.0,** Weather Report, News and Time Signal. **9.15,** Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) **(1,250 metres) ;** 40 kW. —**3.0,** Educational Talk. **3.30,** Programme from **Hamburg. 4.30,** David Stetter, Talk : The Tasks of Officials in the Service of the Public. **5.0,** Max Bärtel, Talk : The Modern City. **5.30,** Elementary Spanish Lesson. **5.55,** Talk by Dr. Eilers. **7.0,** Programme from **Voxhaus.**

**BERLIN** (Voxhaus) **(484 metres) ;** 4 kW.—**9.10 a.m.,** Market Prices. **9.15 a.m.,** Weather Report, News and Time Signal. **10.0 a.m.,** Programme of Gramophone Records. **10.30 a.m.,** Exchange Quotations. **11.55 a.m.,** Time Signal. **12.30,** Weather Report and News. **1.0,** Programme of Gramophone Records. **2.10,** Agricultural Report and Time Signal. **2.45,** Dialogue. **3.30,** Light Recitations by Paul Nicolaus. **4.0,** Concert : Selection from The Count of Luxembourg (Lehár) ; Arietta in Old Style (Brogi) ; Waltz, Roses of the South (Joh. Strauss) ; Serenata della laguna (Becce) ; Scène passionée (Becce) ; Fox-Trot, Naïla (Lange) ; Tango, Ich küsse Ihre Hand, Madame (Erwin) ; Selection from La Bohème (Leoncavallo) ; Tango from Casanova (Joh. Strauss-Benatzky) ; followed by Announcements. **5.30,** Talk by Dr. G. Frey. **6.0,** Wolfgang Schwarz, Talk : War and Peace in Capitalism. **6.30,** Armin T. Wegner, Talk : Tiflis, the Gate to the South. **7.0,** Talk on the following Transmission. **7.10** (approx.), "Seeschlacht," Drama (Goering), followed by Weather Report, News, Time Signal and Sports Notes. **9.30** (approx.), Dance Music. **11.30** (approx.), Close Down.

**BERN (411 metres) ;** 1.5 kW.—**6.29,** Time Signal and Weather Report. **6.30,** Herrn E. Bünzli, Educational Talk : False Severity and Pampering. **7.0,** Swiss Programme : Selections by a Mandoline Orchestra ; Songs to the Lute ; Accordion Duets ; Bern and Basle Town Competitions ; The Bern v. The Basle Dialect. **8.45,** News and Weather Report. **9.0,** Orchestral Concert. **9.35,** Dance Music. **11.0** (approx.), Close Down.

**BRESLAU (322.6 metres) ;** 4 kW.—**3.0,** Review of Books. **3.30,** Concert of Songs to the Lute, relayed from **Gleiwitz** (329.7 metres). **5.0,** Eberhard Giese, Talk : Political Economy in the Waldenburg District. **5.25,** Esperanto Talk by Alfred Hanuschke. **5.35,** Georg Landsberg, Talk : Public Health. **6.25,** Shorthand Lesson. **6.50,** Georg Lichey, Talk : Christopher Columbus. **7.15,** Humorous Broadcasting Programme of Talks, Songs and Dance Music. **9.0,** News. **9.30,** Dance Music by the Wireless Jazz Orchestra. **11.0** (approx.), Close Down.

**BRÜNN (441.2 metres) ;** 3 kW.—**3.30,** Programme for Children. **4.45,** German Transmission. **5.15,** Weekly Report. **6.0,** "Only One Night" : Drama (Stolz) from the National Theatre. **9.0,** Programme from **Prague.**

**BRUSSELS (508.5 metres) ;** 1.5 kW.—**5.0,** Programme to be announced. **6.0,** Elementary English Lesson. **6.25,** Advanced English Lesson. **6.45,** Sonata for Violin and Pianoforte (Handel). **7.0,** Gramophone Selections. **7.30,** "Radio-Chronique." **8.15,** Concert. In the Interval : Topical Talk. **10.15,** News and Close Down.

**BUDAPEST (556.6 metres) ;** 20 kW.—**4.30,** Concert by a Military Band. **5.50,** Talk arranged by Magyar Radio Ujsag. **6.30,** Readings, The Railways of Great Britain. **7.30,** Cabaret Programme. **8.30,** Time Signal and News. **8.45,** Concert for Wind Instruments, followed by Weather Report. **9.30,** Orchestral Concert : Hunyady March (Erkel) ; Overture to Florentia (Carlini) ; Potpourri (Fétras) ; Mattinata (Leoncavallo) ; Souvenir (Drdla) ; March (Sousa) ; Selections (Eulenberg) ; Die Mühle im Schwarzwald (Lincke) ; Lass den Kopf nicht hangen (Lincke) ; Polka (Keil).

**CRACOW (566 metres) ;** 1.5 kW.—**4.35,** Talk by Dr. J. Regula. **5.0,** Divine Service from the Vilna Cathedral. **6.0,** Miscellaneous Items. **6.25,** English Talk by Mr. Jean Stanislawski. **6.55,** Time Signal from the Observatory. **7.0,** Agricultural Report. **7.10,** News. **7.30,** Programme from **Warsaw. 9.30,** Concert from a Restaurant. **10.30** (approx.), Close Down.

**DUBLIN,** Call 2RN **(319.1 metres) ;** 1.5 kW.—**1.30,** Weather Report and Gramophone Selections. **7.20,** News. **7.30,** Talk by Patricia Hoey. **7.45,** Irish Lesson by Seamus O'Duirinne. **8.0,** Comedy Overture by The Augmented Station Orchestra. **8.10,** Sketch by Mme. K. Hackett and Company. **8.40,** Pianoforte Solos by Claude de Ville. **8.55,** 'Cello Solos and Vocal Selections by Joseph Schofield and Mary Maguire. **9.15,** Revue by John McDonagh and Company. **10.0,** Gaelic and Anglo-Gaelic Songs by Denis Cox (Tenor). **10.15,** The Augmented Station Orchestra : (a) La Ballarina, (b) Ballet espagnol (Colin). **10.30,** News, Weather Report and Close Down.

**FRANKFURT (423.6 metres) ;** 4 kW.—**2.5,** Concert for Children : Three Wanderers' Songs, (a) Juchheissa, Juchhei (Kahn), (b) Es lachen der Himmel (Kahn), (c) Früh am Morgen auf zu Fuss ; Vom Büblein auf dem Eis (Vogt) ; German Dances for Pianoforte and Violin (Schubert) ; Danube Waltz (Joh. Strauss). **2.55,** Hints for the Housewife, by Fini Pfannes. **3.35,** Orchestral Concert, Announcements in the Interval. **5.10,** Reading from Kurd Lasswitz' "On two Planets," by O. W. Studtmann. **5.30,** Talk relayed from **Cassel** (252.1 metres). **5.45,** The Letter Box. **6.15,** Talk for Chess Players, by Prof. N. Mannheimer. **6.45,** Prof. Sittig, Talk : The Heavens in November. **7.15,** "Zwei glückliche Tage" : Farce in Three Acts (Blumenthal and Kadelburg), followed by Dance Music from **Voxhaus. 11.30,** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse) **(394.7 metres) ;** 4 kW. —**9.15 a.m.,** News. **10.0 a.m.,** Programme of Gramophone Records. **11.10 a.m.,** Weather Report. **11.15 a.m.,** Exchange Quotations. **11.30 a.m.,** Concert relayed from **Hanover** (297 metres). **11.55 a.m.,** Time Signal. **12.10,** News. **1.40,** Exchange Quotations. **2.30,** Review of Books. **3.0,** Dr. Wilh. Heinitz, Talk : The Works of Kreisler, with Illustrations. **3.30,** Programme of Modern Waltzes by the Jazz Symphony Orchestra under the direction of Francesco Scarpa. **4.30,** Request Programme. **5.30,** Karl Minor, Talk : The Meaning and Origin of German Idioms. **6.0,** Experimental Travels on the Organ with Hans Henny Jahnn. **6.55,** Weather Report. **7.0,** "Meyers" : Farce in Three Acts (Fritz Friedmann-Frederich). **9.30,** Weather Report, News, Sports, Notes, and Programme Announcements. **9.45** (approx.), Concert from the Cafe Wallhof. **10.50,** Weather Report. **19.55,** (approx.), Close Down

**HILVERSUM (1,071 metres) ;** 5 kW.—**11.40 a.m.** Police Announcements. **12.10,** Concert of Trio Music. **1.40,** Concert from the Tuschinski Theatre, **Amsterdam. 3.10,** Talk. **3.40,** Italian Lesson. **4.40,** French Lesson. **5.30,** Orchestral Concert : Musical Comedy Overture (Lincke) ; Waltz, Gold and Silver (Lehár) ; Marquisette (Lindsay-Theimer) ; Parana (Castro) ; We whisper (Dostal) ; Tango, Mi padre (Moretti) ; Pasodoble, Cadiz (Sentis), In the Interval at **5.40,** Time Signal. **6.30,** German Lesson. **7.25,** Police Announcements. **7.45,** Concert and Talk arranged by the Workers' Radio Society. **11.15** (approx.), Close Down.

**HUIZEN (340.9 metres) ;** 4 kW.—Transmits on 1,870 metres from 5.40 p.m.—**12.10,** Concert of Trio Music. **2.40,** Programme for Children. **5.10,** Gramophone Selections. **6.30,** Catholic News. **6.40,** English Lesson. **7.10,** Lesson in Dress Making. **7.40,** Talk by Mr. Haastert. **8.0,** "The Marriage of Figaro" —Opera in Four Acts (Mozart).

**JUAN-LES-PINS,** (Radio LL), **(244 metres) ;** 1.5 kW.—**1.0,** Concert. **9.0,** News, followed by Fashion Talk by Mme. la Comtesse de Tremcuge. **10.0,** Dance Music. **10.30,** (approx.) Close Down.

**KALUNDBORG (1,680 metres) ;** 7 kW.—Programme also for **Copenhagen** (337 metres).—**6.30 a.m.,** Morning Gymnastics. **10.0 a.m.,** Weather Report. **2.0,** Programme for Children. **2.30,** Concert : March from Fatinitza (Suppé) ; Overture to The Caliph of Bagdad (Boieldieu) ; Waltz, Geschichten aus dem Wienerwald (Joh. Strauss) ; Selection from Madame Butterfly (Puccini) ; Violin Solo, Meditation from Thaïs (Massenet) ; Tivoli-Vauxhall-Polka (Lumbye) ; Swedish Folk Songs and Dances (Söderman) ; Recitations by Clara Schwartz ; Overture to La Dame Blanche (Boieldieu) ; Selection from Si j'étais Roi (Adam) ; Vals des Blondes (Ganne) ; Grossmütterchen (Langer) ; Pizzicato from Sylvia (Delibes) ; Esprit français (Waldteufel). **5.50,** Weather Report. **6.0,** News and Exchange Quotations. **6.15,** Time Signal. **6.30,** Mr. I. V. Christensen, Talk : Old Danish Country Towns. **7.0,** Chimes from the Town Hall. **7.2,** Concert of Old Dance Music, followed by News. **8.15,** 'Cello Recital : Air (Bach) ; Sonata in E Major (Valentini) ; Adagio (Boccherini) ; Air (Lotti) ; Andante (Martini) ; Sonata (Corelli) ; Lento (Breval) ; Menestrel (Glazounoff). **9.0,** Light Entertainment. **10.0,** Dance Music from the Industri Restaurant **11.0,** Chimes from the Town Hall. **11.15** (approx.), Close Down.

**KATTOWITZ (422 metres) ;** 10 kW.—**3.0,** Programme for Children. **4.10,** E. Rybarz, Talk : Jules Slowacki. **4.35,** Children's Letter Box. **5.0,** Programme from **Vilna. 6.0,** Announcements. **6.30,** Talk by Dir. T. Dobrowolski. **6.55,** Time Signal and Market Report. **7.5,** K. Rutkowski, Talk : Impressions of a Journey to Greece. **7.30,** Programme from **Warsaw. 9.0,** Weather Report and News. **9.30,** Dance Music.

**KAUNAS (2,000 metres) ;** 7 kW.—**3.30,** Concert : Marinarella (Fucik) ; Waltz, Champangerrausch (Urbach) ; Cavatine (Raff) ; Selection from La Traviata (Verdi) ; Ständchen des Arlekins (Drigo) ; Romance No. 6 (Tchaikovsky) ; Die Schmiede im Wald (Capua) ; O sole mio (Capua) ; Spanish Dance (Moszkovsky) ; Vals Poudrée (Poppy) ; Slavonic Dance No. 8 (Dvorák). **4.45,** Talks. **6.0,** Weather Report and News. **6.15,** Programme Announcements. **6.30,** Musical Interlude. **6.45,** Press Review. **7.15,** Concert of Popular Music. **8.30,** Dance Music.

**LAHTI (1,522.8 metres) ;** 35 kW.—**4.0,** Orchestral Concert. **5.15,** Programme of Talks. **6.0,** Choral Concert : Suvi illan vieno tuuli (Madetoja) ; Niinkuin ennen (Pesola) ; Tärsar (Palmgren) ; Fridolins därskap (Sibelius) ; Finnish Songs (Könni) ; Kuokkavieras (Ranta) ; Renkutus (arr. Kyander) ; Polska (Kuula) ; Loitsu (Törnudd) ; Serenade (Kjerulf) ; Säv, säv susa (Palmgren) ; Taiston tiellä (Palmgren). **7.45,** News in Finnish and Swedish and Close Down.

**LANGENBERG (468.8 metres) ;** 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres), and **Münster** (250 metres).—**11.10 a.m.,** Gramophone Selections. **12.5,** Concert : Waltz,

## Programmes from Abroad.—

New Vienna (Strauss); Overture to The Bartered Bride (Smetana); Selections from Eugen Onegin (Tchaikovsky); Paraphrase on Das Wiegenlied (Brahms); Fantasy, An evening with Liszt (Urbach); Rosenlieder (Eulenburg); Selection from Die tote Stadt (Korngold); Selection from Der Bettelstudent (Millöcker); March, Ehrenwache (Lehnhardt). **1.30,** Hints for the Housewife. **2.40,** "Der Junge Mensch." **3.0,** Richard Wenz, Talk: The Rhineland on Working Days and Festivals in Poetry. **3.30,** Talk for Women by Dr. Hanna Meuter. **4.0,** Dr. Huber, Talk: Old Babylon. **4.25,** English Talk by Prof. Hase. **4.45,** Orchestral Concert: Selections from Romeo and Juliet (Gounod); Concerto for Pianoforte in D Minor (Rubinstein). **5.30,** Legal Talk. **6.15,** Talk: Building and Architectural Problems of Large Towns. **6.40,** Dr. Otto Förster, Talk: German Cathedrals. **7.0,** Variety Programme. **9.30.** (approx.). News, Sports Notes, Announcements, and Dance Music.

**LEIPZIG (365.8 metres);** 4 kW.—**1.30,** Gramophone Selections. **3.0,** Music Talk. **3.30,** Orchestral Concert: Overture to Le Postillon de Longjumeau (Adam); Symphony in D Major (Gurlitt); Minuet and Gavotte from Tanzspiel (Schrecker); Selections from Gasparone (Millöcker); Kreuzrittermarsch (Liszt.) **4.45,** Wireless News and Talk. **5.20,** Weather Forecast, Time Signal and Labour Exchange Report. **5.30,** Programme from Königswusterhausen. **6.0,** Josef Greil, Talk: Psycho-Analysis. **6.30,** Maximillian Kreiszel, Talk: Electricity. **7.0,** "Si j'étais Roi"—Opera in Three Acts (Adam), from the National Theatre, Weimar. **10.0,** News, Sunday Programme Announcements and Sports Notes, followed by Dance Music from **Voxhaus.**

**MADRID** (Union Radio), Call EAJ1 **(375 metres);** 3 kW.—**7.0,** Sextet Selections: Three Preludes (Debussy), (a) La fille aux cheveux de lin, (b) La cathédrale engloutie, (c) Bruyères: Suite, Las hormigas (Alverez); Selection from Fedora (Giordano); Interlude by Luis Medina. **8.0,** Dance Music. **8.25,** News and Announcements. **9.45,** Weekly Market Report. **10.0,** Chimes and Musical Comedy Selections from (a) El Chaleco blanco (Chueca), (b) La Fiesta de San Anton (Torregrosa); News in the Interval. **12.30 a.m.** (approx.), (Sunday), Close Down.

**MILAN,** Call IMI **(549 metres);** 7 kW.—**11.30 a.m.** Opening Signal and Quartet Selections. **12.30,** Time Signal, Exchange Closing Prices and News. **3.30,** Time Signal and Concert of Quintet Selections: Selection from I dispettosi amanti (Parelli); Berceuse, Culle e palpiti (Albergoni); Minuetto per archi (Van Westerhout); Waltz, Confidenze amorose (Capitani). **4.0,** Exchange Quotations. **4.23,** Programme for Children. **4.45,** Agricultural Report and News. **7.15,** Time Signal. **7.17,** Wireless Notes. **7.35,** Time Signal and Talk. **7.45,** News. **7.50,** Concert from the Works of Rossini and Reading by Angelo Sodini. **9.55,** News. **10.0,** Selections of Tzigane Music from the Fiaschetteria Toscana. **10.45** (approx.), Close Down.

**MOTALA (1.330 metres);** 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1.190 metres) **Göteborg** (416.5 metres), **Malmö** (290.9 metres), **Ostersund** (720 metres), **Sundsvall** (545.6 metres).—**6.45,** Pianoforte Recital from the Works of Schubert. **7.0,** Concert by Military Band: Homage March from Sigurd Jorsalfar (Grieg); Selection from Der Bettelstudent (Millöcker); Hofballtänze (Lanner); Poem (Fibich); Czech Dance (Ritter); Hungarian Rhapsody No. 1 (Liszt); Sons of the Brave (Bidgood). **8.0,** Topical Talk. **8.15,** News and Weather Report. **8.45,** Dance Music. **11.0** (approx.), Close Down.

**NAPLES,** Call INA **(333.3 metres);** 1.5 kW.—**1.0,** Exchange Quotations and News. **3.45,** Weather Report and News. **3.50,** Reading. **3.58,** Chamber of Commerce Report. **4.0,** Concert of Variety Music: Orchestral Selections, (a) Le minuet de la Grand'mère (Tarenghi), (b) Gavotte, Si tendre (Tartini); Soprano Solo, Segreto (Tosti); Orchestral Selection, Gavotte, Profumi di rose (Eilenberg); Soprano Solo, Se . . . (Denza); Orchestral Selection, Potpourri, Il paese dei campanelli (Ranzato); Soprano Solo, Tra il dire e il fare (Guidi); Orchestral Selection, Il giardino e le farfalle (Angiolini); Soprano Solo, Fammi morir con te (Cosentino); Orchestral Selections, (a) Intermezzo, Serenade passionée (Tarenghi), (b) Spanish Serenade (Bornioli). **4.30,** Time Signal. **4.35,** Foreign Report. **7.20,** Wireless Notes. **7.30,** Announcements. **7.40,** Time Signal. **7.45,** News. **7.48,** Harbour Notes. **7.50,** Concert: Overture to Le Roi l'a dit (Delibes); "Fatemi la Corte," Comedy (Salvestri); in the Intervals: Symphonic Poem, Ultava (Smetana); Spanish Caprice (Rimsky-Korsakoff); Overture to The Students of Heidelberg (Suppé). **9.0,** Topical Review. **9.50,** News, followed by Calendar and Programme Announcements. **10.0,** Dance Music from the Trocadero. **10.30** (approx.), Close Down.

# Saturday, November 3rd.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

**OSLO (461.5 metres);** 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres). **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres) and **Rjukan** (448 metres).—**5.0,** Programme for Children. **6.15,** Weather Report, News and Agricultural Announcements. **6.30,** M. John Grieg Müller, Talk: The Equestrian Tournament at Paris. **7.0,** Time Signal. **7.2,** Orchestral Concert: Overture to Czar and Carpenter (Lortzing); Selection from The Barber of Seville (Rossini); Tarantella (d'Ambrosio); Song at Sunset (Olsen); Serenade piémontêse (Leopold); Caucasian Suite (Ippolito Ivanoff); Extravagances (Morena); Delirium Waltz (Strauss); Siamese Patrol (Lincke). **8.30,** Weather Report and News. **8.45,** Topical Talk. **9.0,** Cabaret Programme. **10.0** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT **(458 metres);** 0.5 kW.—**6.30,** "Radio Journal de France." **8.0,** Talk by Dr. Grunberg. **8.15,** Sports Review. **8.30,** Relay from the Salle Wagramm, followed by News, and Dance Music from the Coliseum de Paris. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower). Call FL **(2.650 metres);** 6 kW. **5.0,** Pasdeloup Concert. **7.10,** Weather Report. **7.30,** "Le Journal Parle."

**PARIS** (Petit Parisien) **(340.9 metres);** 0.5 kW.—**8.45,** Gramophone Selections, Talk, News and Announcements. **9.0,** Concert: Mozart Overture (Hahn); Orchestral Suite, Summer Days (Coates); Symphony Orchestra, (a) Overture to Gwendoline (Chabrier), (b) La Procession del Rocio (Turina); Sleeping Beauty (Tchaikovsky); Invocation to Night from La vie du Poète (Charpentier); Pipers of Bertrand de Born (Casadesus); News in the Intervals.

**PARIS** (Radio Paris), Call CFR **(1,750 metres);** 6 kW.—**12.30,** Concert of Gramophone Selections: Noche de Nieve (Ferrete), by the South American Lucchesi Orchestra; Oh, dis Claudie from L'eau à la bouche (Pares and van Parys); Five-Step from L'eau à la bouche (Pares and van Parys); Waltz, Chiquita, by Paul Whiteman and his Orchestra; Waltz, Ramona, by Chick Endor with Pianoforte Accompaniment; Ol' Man River by Noris Smith and the Mississippi Chorus; L'Autre (Lenoir), by Mlle. Yvonne George, with Orchestral Accompaniment; Pianoforte Solos, Preludes Nos. 10, 11, 12 and 13 (Chopin), by M. R. Lortat; Mouvement perpetuel (Poulenc); Organ Selection, Toccata (Gigout), by M. Comette; Symphony in E Flat (Mozart), by the Royal Philharmonic Orchestra, under the direction of Felix Weingartner. **1.0,** News and Exchange Quotations. **1.15,** Concert (continued). **2.0,** Exchange Quotations, Market Prices and Religious Information. **3.45,** Dance Music by the Joss Ghislery Symphonians; News in the Intervals. **7.0,** Agricultural Report. **7.45,** Talk, Exchange Quotations and News. **8.0,** Symphony Concert: "Passionnement" (Messager); News in the Intervals.

**POSEN (344.8 metres);** 1.5 kW.—**6.0,** Herr Rubach, Talk: Travels in the Posen District: The Southern Frontier. **6.25,** Advanced English Lesson, by Dr. Arend. **6.50,** Talk for Women by Mme. Swidzinska. **7.10,** Finance Report. **7.30,** Variety Concert. **9.0,** Time Signal, News and Weather Report. **9.20,** Miscellaneous Items, by Mr. Janusz Warnecki. **9.40,** Dance Music from the Carlton Restaurant. **11.0,** Concert, arranged by Maison Philips. **1.0 a.m.** (Sunday), Close Down.

**PRAGUE (348.9 metres);** 5 kW.—**3.30,** Dance Music. **4.30,** Pedagogic Transmission. **4.40,** Talk. **4.50,** Agricultural Report. **5.0,** German Transmission. **6.0,** Tambourin Selections. **6.45,** Talk. **7.0,** "Bocaccio"—Operetta (Suppé). **9.0,** Time Signal and News, followed by Popular Music from the Sramota Restaurant.

**ROME,** Call 1RO **(447.8 metres);** 3 kW.—**3.50,** Programme for Children. **4.15,** Agricultural Report. **4.29,** Time Signal. **4.30,** Concert: Violin Solo, Ciaccona (Vitali); Soprano Solo, Se tu m'ami (Pergolesi); Soprano Songs of the 18th Century (Weckerlin), (a) Bergère légère, (b) Venez agréable printemps; Tenor Solos, (a) Air from Arlesiana (Cilea), (b) Air from La Traviata (Verdi); Violin Solo, Kol Nidrei (Max Bruch); Soprano Solos, (a) Selection from Philemon and Baucis (Gounod), (b) L'assiolo canta (Santoliquido); Tenor Solos from (a) Adrienne Lecouvreur (Cilea), (b) Zazà (Leoncavallo). **6.50,** Time Signal, Wireless Notes and Announcements. **7.10,** Topical Talk. **7.29,** Works Report. **7.39,** Time Signal. **7.45,** Concert of Modern Music: March on a Popular Scottish theme (Debussy); Suite from La Pisanella (Pizzitti); Topical Review; Pianoforte Selections (Tedesco), (a) Spring, (b) Autumn; Orchestral Selection from Salome (Richard Strauss); Review of Art and Literature by Lucio D'Ambra; Pianoforte Solos, Three Episodes from Petrouchka (Stravinski); Orchestral Selections, (a) Buffalmacco (Gasco), (b) Church Windows (Respighi). **9.50,** News and Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF **(21.96 and 31.4 metres);** 30 kW.—**12.0 Midnight,** Statler's Pennsylvanians, directed by Johnny Johnson, from **New York. 12.30 a.m.** (Sunday), Concert from the Hotel Sagamore, **Rochester 1.0 to 4.0 a.m., New York Relay. 1.0 a.m.,** Musical Programme. **1.30 a.m.,** "The Park Bench." **2.0 a.m.,** Variety Programme. **3.0 a.m.,** Lucky Strike Programme. **4.0 a.m.,** Time Signal and Dance Music from the Hotel Ten Eyck, **Albany. 5.0 a.m.** (approx.), Close Down.

**STAMBOUL (1,200 metres);** 5 kW.—**7.30,** Weather Report and Time Signal. **7.40,** Orchestral Concert: Overture to Matrosen (Flotow); Two Nocturnes (Chopin); Preludes Nos. 2 and 21 (Chopin); Songs; Ballet Music from Coppélia (Delibes). **9.0,** News and Close Down.

**STUTTGART (379.7 metres);** 4 kW.—**5.0,** Time Signal, and Weather Report. **5.15,** Talk by Dr Hölzl, relayed from **Freiburg** (577 metres). **5.45,** Talk by Dr. Wolff. **6.15,** Dr. Friedrich Wallisch, Talk: Albania the Youngest Kingdom. **6.45,** Time Signal, Weather Report and Sports Announcements. **7.0,** Herr Willie Talk: The South-German Tannery Centre Bachnang. **7.15,** Swabian Concert from Bachnang: Orchestral Selections; Greetings; The Night (Eichhorn); Found (Seyffardt); Duet, To the Faithless (Silcher); Orchestral Selection; Meditations; Home Song (Benignus); Scherzlied (Eichhorn); Duet, Yearning (Eichhorn); Orchestral Selections; Songs, (a) True Love, (b) Wohin mit der Freude? (Silcher); Orchestral Selections; Swabian Item; Folk Songs (a) s'Herz, (b) Rosestock, Holderblut, Orchestral Selections, followed by News. **10.30,** (approx.), Dance Music from the Pavillon Excelsior, followed by Experimental Relay of American Stations.

**TOULOUSE** (Radiophonie du Midi). **(391 metres);** 3 kW.—**12.45,** Concert. **8.0,** Exchange Quotations and News. **8.30,** Instrumental Concert: Quartet in B Flat Major (Beethoven); Overture to The Thieving Magpie (Rossini); Second Waltz (Godard); Waltz, Moss Rose (Bosc); Tyrolese Waltz; Foxtrot, Julie c'est Julie (Padilla); Tout ça pour vous (Padilla); One-Step, Parisette (Wolter); Sa valse (Padilla). **11.0,** North African News. **11.15** (approx.), Close Down.

**VIENNA (577 and 517.2 metres);** 1.5 and 15 kW.—**3.0,** Orchestral Concert: Overture to Undine (Lortzing); Waltz, Rudolfsklänge (Jos. Strauss); Selection from Carmen (Bizet); Selection from Der Göttergatte (Lehár); Tarantella (Hellmesberger); Potpourri, Ernst und Scherz furs Wienerherz (Komzik); Rose Marie (Dostal). **4.30,** Programme for Children. **5.10,** Chamber Music: Variations on Trockne Blumen (Schubert); Frauen Liebe und Leben Op. 42 (Schumann). **6.25,** Alfred Grünewald Programme: Introductory Talk by Dr. Eugen Antoine. **7.30,** "Die Fledermaus"—Operetta in Three Acts (Johann Strauss), followed by Phototelegraphy Transmission.

**VILNA (435 metres);** 1.5 kW.—**3.10,** News in Lithuanian. **3.30,** Announcements. **3.45,** Talk for Women by Mme. Ela Buncler. **4.10,** Literary Programme. **4.35,** Programme from **Warsaw. 5.0,** Divine Service from the Chapelle d'Ostra Brama. **5.45,** News and Gramophone Selections. **6.30,** Programme from **Warsaw. 10.30** (approx.) Close Down.

**WARSAW (1.111 metres);** 10 kW.—**2.0,** News, Weather Forecast and Finance Report. **3.0,** Programme for Children. **4.10,** Talk by Dr. Adamczewski. **5.0,** Programme from Vilna. **6.0,** Miscellaneous Items. **6.30,** "Radio-Chronique," by Dr. M. Stepowski. **6.56,** Time Signal. **7.0,** Agricultural Report. **7.5,** Mr. Bruno Winawer, Talk: Wireless Technique. **7.30,** Concert. **9.0.** Aviation Notes and Weather Report. **9.5,** News. **9.20,** Police Report and Sports Notes. **9.30** Dance Music from the Oaza Restaurant. **10.30,** (approx.), Close Down.

**ZURICH (588 metres);** 1 kW.—**6.17,** Orchestral Concert. **7.0,** Radio Ball 1928, with the assistance of Anton Smetaks' Zither Trio, Agnes Delsarto (Songs to the Lute) and The Drei Könige Music Society. **9.0,** Weather Report and News.

# SUNDAY, NOVEMBER 4th.

**All Times are reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

## Programmes from Abroad.—

**BARCELONA** (Radio-Barcelona), Call EAJI (**344.8 metres**) ; 1.5 kW.—**11.0 a.m.**, Chimes relayed from the Barcelona Cathedral followed by Weather Report for Europe, Weather Forecast for North East Spain and Aviation Route Conditions. **1.30,** Popular Music by the Iberia Trio and Gramophone Records in the Intervals. **2.45 to 6.0.**, No Transmission. **6.0,** Opening Signal and Market Prices. **6.10,** Concert by the Barcelona Wireless Orchestra with Vocalists: Songs by Señor Eusebio Carasusan (Tenor) ; Romance from Doña Francisquita (Vives). In the Interval at **7.0,** Weekly Talk of the Agricultural Institute at San Isidro. **8.40,** Sports Notes. **9.0** (aprox.), Close Down.

**BASLE** (**1,010 metres**) ; 1.5 kW.—Programme relayed from **Bern.** **7.0,** Literary Programme by Hermann Gerig of Arosa: "Poets and Woman"—Shakespeare, Goethe, Strindberg and Heine. **9.0,** Sports Notes, Late News Bulletin and Weather Report. **9.15** (approx.), Close Down.

**BERGEN** (**370.4 metres**) ; 1.5 kW.—**9.30 a.m.**, Relay of Morning Service. **11.30 a.m.**, Weather Report and Forecast and General News Bulletin. **7.0,** Concert by the Bergen Wireless Orchestra. **7.50,** Talk on Current Events. **8.30,** Violin Recital by Arve Arvesen. At the piano: Mrs. Elisabeth Hals Andersen. **9.0,** Weather Report and Forecast, Late News Bulletin and Time Signal. **9.15,** Popular Dance Music. **11.0** (approx.), Close Down.

**BERLIN** (Königswusterhausen) (**1,250 metres**) ; 40 kW.—**7.55 a.m.**, Garrison Church Chimes relayed from Potsdam. **8.0 a.m.**, Choral and Instrumental Selections and Address, relayed from **Voxhaus** followed by relay of Berlin Cathedral Chimes. **2.0** (approx.), Three Talks on Agricultural Topics relayed from **Voxhaus.** **3.30,** Orchestral Programme relayed from **Voxhaus.** **5.0 to 7.0,** Programme of Talks arranged by the "Deutsche Welle" followed by relay of another German Station. **9.15,** Late News Bulletin and Sports News. **9.30,** Popular Dance Music. **11.30** (approx.), Close Down.

**BERLIN** (Voxhaus) (**484 metres**) ; 4 kW.—**7.55 a.m.**, Garrison Church Chimes from Potsdam. **8.0,** Recital of Choral and Instrumental Music, with address in the Interval, followed by Chimes from the Berlin Cathedral. **2.0** (approx.), Three Talks for Farmers. **3.30,** Concert, followed by Advertisements. **6.0,** Talk. **6.30,** Talk. **7.0,** Popular Programme. **8.0,** Musical Selections. **9.15,** Weather Report and Forecast, Time Signal, Sports News and Late News Bulletin. **9.30,** Dance Music by the Marek Weber Orchestra. **11.30** (approx.), Close Down.

**BERN** (**411 metres**) ; 1.5 kW.—**9.30 a.m. to 10.30 a.m.**, Religious Address. **12.0 Noon,** Time Signal and Weather Report and Forecast. **12.5,** Orchestral Concert. **2.30,** Selections by the Kursaal Orchestra. **6.29,** Time Signal and Weather Report. **6.30,** Talk. **7.0,** Dramatic and Musical Story in Eight Tableaux: "The Dream Journey of a Swiss Abroad to his Native Land." **9.0,** Sports News, Late News Bulletin and Weather Report. **9.15,** The Station Orchestra in a programme of Light Music. **9.35** (approx.), Close Down.

**BRESLAU** (**322.6 metres**) ; 4 kW.—Programme relayed by **Gleiwitz** (329.7 metres).—**8.15 a.m.**, Chimes relayed from Christ Church. **10.0 a.m.** (approx.), Catholic Recital of Music with Address. **11.0 a.m.**, Concert. **1.0,** Guessing Competitions. **1.35,** Interesting points for Chess Players. **2.0,** Children's Corner conducted by Friedrich Reinicke. **2.30,** Talk on Agriculture. **7.15,** Selections of Music by Leon Jessel. **10.9** (approx.), Relay of Dance Music. **11.0** (approx.), Close Down.

**BRUSSELS** (**508.5 metres**) ; 1.5 kW.—**5.0,** Dance Music. **6.0,** Children's Corner. **6.30,** Concert by the Radio-Belgique Trio and Soloists. **7.30,** "Le Journal Parlé de Radio-Belgique." **8.15,** Concert. **10.15,** Late news Bulletin. **10.30** (approx.), Close Down.

**BUDAPEST** (**556.6 metres**) ; 20 kW.—**9.0 a.m.**, Relay of Church Service. **11.15 a.m.** (approx.), Orchestral Concert. **2.30,** Talk on Agriculture. **9.30,** Relay of Dance Music. **10.30** (approx.), Close Down.

**COLOGNE** (**283 metres**) ; 4 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Langenberg** (468.8 metres), and **Münster** (250 metres).—**7.5 a.m.**, Alfred Dormanns: Review of the Week's Programme in Esperanto. **7.15 a.m.**, Instruction on the Lute and Guitar by Olly Wirtz-Koort. **7.35 a.m. to 7.55 a.m.** Lesson in Esperanto by Alfred Dormanns. **8.0 a.m.**, Relay of Chimes. **8.5,** Evangelical Morning Festival with Address and Music. **10.0 a.m.**, Fritz Worm, Talk: The German Language. **11.0 a.m.**, Organ Recital by Professor Hans Bachem, relayed from the Grosse Messehalle, Cologne. **12.0 Noon,** Orchestral Concert, followed by Talk on Literature by Arnold Stecher and Chess Talk by Dr. van Nüss. **3.30,** Orchestral Concert. **7.0,** Concert, followed by Late News Bulletin, Sports Notes and Programme of Light Music. **11.0** (approx.), Close Down.

**CORK,** Call 6CK (**400 metres**) ; 1.5 kW.—**8.30,** Vocal and Instrumental Concert. **9.0,** Organ Recital, relayed from the Dominican Church, Cork: Organist: Herr Heinrich Tils, A.R.C.M., L.R.A.M. **9.30,** Continuation of Concert. **11.0,** Weather Report and Forecast and National Anthem. **11.15** (approx.), Close Down.

**CRACOW** (**566 metres**) ; 1.5 kW.—**9.15 a.m. to 10.45 a.m.**, Relay of Morning Cathedral Service. **11.0 a.m.**, Time Signal and Relay of Fanfare from the Notre Dame Church. **11.5 a.m.**, Weather Report. **1.0,** Agricultural Talk. **1.20,** Agricultural Talk. **1.40,** Dr. St. Wasniewski: "La Chronique Agricole." **2.15,** Programme relayed from **Warsaw.** **5.0,** Programme relayed from **Warsaw.** **6.0,** Twenty Minutes of Variety. **7.0,** Time Signal and Fanfare from Notre Dame. **7.15,** Sports Announcements. **7.30,** Concert with Violin Solos by Mr. Ladislaw Neumann, Songs by Mademoiselle Felicie Günther and Mr. Hugo Zathey. **9.0,** Programme relayed from **Warsaw.** Time Signal, Aviation Route Conditions, Weather Report, Late News Bulletin and Police and Sports News. **9.30,** Concert of Light Music relayed from the "Pavillon." **10.30** (approx.), Close Down.

**DUBLIN,** Call 2RN (**319.1 metres**) ; 1.5 kW.—**8.30 to 11.15** (approx.), Programme relayed from Cork. Instrumental Concert with Vocalists; Violin Solos by W. E. Brady. **11.0,** Weather Report and National Anthem. **11.15** (approx.), Close Down.

**FRANKFURT** (**428.6 metres**) ; 4 kW.—Programme relayed by **Cassel** (252.1 metres).—**7.30 a.m.** (approx.), Sacred Recital of Music. **10.0 a.m.**, Talks. **12 Noon,** Notes by the Wiesbaden Agricultural Institute. **3.15,** (approx.), Concert by the Wireless Orchestra. **4.30,** Transmission devoted to Country Topics, conducted by Dr. Carl Gabhardt. **5.0,** Programme arranged by the Rhein-Main League for Popular Education. **6.0,** Sports News. **7.30,** Musical or Literary Programme. **8.30,** Orchestral Concert. **9.30** (approx.), Relay of Dance Music. **11.0** (approx.), Close Down.

**HAMBURG,** Call HA (in Morse), (**394.7 metres**) ; 4 kW.—Programme relayed by **Bremen** (272.7 metres), **Hanover** (297 metres) and **Kiel** (254.2 metres).—**7.25 a.m.**, Time Signal. **7.30, a.m.**, Weather Report and Forecast and General News Bulletin. **8.0 a.m.**, Legal Notes for the Week. **8.15 a.m.**, Recital of Music. **9.55 a.m.** (for **Kiel** only), Sacred Service relayed from the University Church, **Kiel.** **11.55 a.m.**, Time Signal relayed from **Nauen.** **12.5** (for **Hamburg** and **Kiel**) Programme of Music. **12.5** (for **Bremen**), Orchestral Concert. **12.5** (for **Hanover**), Popular Gramophone Selections. **1.0,** Children's Corner. **2.0,** Orchestral Concert. **4.30** (approx.), Literary or Musical Programme. **6.0,** Talk. **6.30,** Transmission arranged by the Hamburg School of Physical Training. **6.40,** Sports News. **6.55,** Weather Report and Forecast. **7.0** (approx.), Concert or Play, followed by Late News Bulletin, Weather Report and Musical Programme. **11.0** (approx.), Close Down.

**HILVERSUM** (**1,071 metres**) ; 5 kW.—**12.10,** Concert of Trio Music. **1.40,** Running Commentary on the International Football Match, Holland v. Belgium, relayed from the Olympic Stadium, Amsterdam. **7.40,** General News Bulletin and Sports Notes. **7.55,** Concert relayed from the Concert Hall at **Amsterdam.** **11.0** (approx.), Close Down.

**HUIZEN** (**340.9 metres**) ; 4 kW.—Transmits on 1,870 metres from **5.40 to 8.10 a.m.**, Relay of Morning Service and Address. **9.40 a.m.**, Church Service relayed from **Meppel.** Sermon by the Minister, the Rev. Y. K. Vellenga. **12.10,** Music by the Trio of the Katholieke Radio Omroep. **4.40,** Relay of Evening Service. **1.10,** Talk. **2.10,** Concert. **7.30** (approx.), Concert. **10.25,** Choral Epilogue, conducted by Mr. Jos H. Pickkers. **10.40** (approx.), Close Down.

**JUAN-LES-PINS** (Radio L.L.) (**244 metres**) ; 1.5 kW.—**1.0 to 2.0,** Concert of Popular Music with Children's Corner. **9.0,** General News Bulletin and Sports News. **9.15,** Orchestral Concert. **10.0,** Programme of Dance Music. **10.30** (approx.), Close Down.

**KALUNDBORG** (**1,680 metres**) ; 7 kW.—Programme also for **Copenhagen** (337 metres). **9.0 a.m.**, Morning Service and Sermon relayed from a Church in **Copenhagen.** **10.30 a.m. to 10.40 a.m.**, (**Kalundborg** only) Weather Report and Forecast from the Meteorological Institute. **12.0 Noon to 12.25,** German Instruction arranged by the paper "Radiolytteren." **12.30 to 12.55,** French Lesson arranged by "Radiolytteren." **2.30,** Concert of Instrumental Music. **5.50** (**Kalundborg** only), Weather Report and Forecast from the Meteorological Institute. **6.0,** News from the Press. **6.15,** Time Signal. **6.30,** Talk. **7.0,** Chimes relayed from the Town Hall, **Copenhagen.** **7.5,** Concert of "Sports" Music, by the Copenhagen Wireless Orchestra under the direction of Launy Grondahl. Hojby Shooting March by Niels Nielsen. **8.30,** General News Bulletin. **8.45,** Concert of Orchestral Music with soloists. **9.45,** Programme of Popular Dance Music by the Orchestra of the Palace Hotel, Copenhagen, conducted by Teddy Petersen, in the Interval at **11.0,** Chimes relayed from the Town Hall, **Copenhagen.** **11.30** (approx.), Close Down.

**KATTOWITZ** (**422 metres**) : 10 kW.—**9.15 a.m.**, Relay of Church Service. **11.0 a.m.**, Time Signal and Weather Report and Forecast. **11.15 a.m.**, The Wireless Quartet, in a Concert of popular selections. **1.0,** Religious Talk. **1.20,** Talk: The Silesian Gardener. **1.40,** Talk on Agriculture. **2.0,** Weather Report and Forecast. **2.15,** Concert relayed from **Warsaw.** **5.0,** Popular Concert. **6.0,** Announcements. **6.20,** Humorous Half-Hour by Professor Ligon. **7.30,** Relay of Concert from **Warsaw.** **9.0,** Weather Report and Forecast, News from the Press and Sports Notes. **9.30,** Dance Music. **10.30** (approx.), Close Down.

**KAUNAS** (**2,000 metres**) ; 7 kW.—**12.30,** Gymnastics conducted by K. Dineika. **2.0,** Recital of Mandoline Guitar Music. **3.30,** Half-Hour for Young People. **4.0,** Talk. **5.0,** Health Talk. **6.0,** Weather Report and Political News. **6.30,** Concert or Opera. **9.30** (approx.), Close Down.

**KÖNIGSBERG** (**303 metres**) ; 4 kW.—Programme relayed by **Danzig** (272.7 metres).—**8.0 a.m.**, Concert of Instrumental Music and Choral Items. **10.0 a.m.** (**Konigsberg** only), Weather Report and Forecast. **10.15 a.m.**, Orchestral Programme. **11.55 a.m.**, Relay of Time Signal from **Nauen** followed by Weather Report and Forecast. **1.50,** P. S. Leonhardt, Talk: Chess Problems. **2.20,** Spanish Instruction for Beginners by Kurt Metze, Lecturer in Spanish at the Königsberg Technical Institute. **3.45** (approx.), Concert. **7.10,** Concert by the Wireless Orchestra under the direction of Karl Hrubetz, Programme of Viennese Music; Potpourri on "The Bird Fancier" by Zeller. **9.15,** Late News Bulletin and Sports Notes. **9.30** (approx.), Relay of Dance Music. **11.30** (approx.), Close Down.

**LAHTI** (**1,522.8 metres**) ; 35 kW.—Programme also for **Helsingiors** (375 metres).—**8.0 a.m.** (approx.), Morning Service. **9.50 a.m.**, General News Bulletin. **10.5 a.m.**, Musical Programme. **10.50 a.m.**, Weather Report and Forecast followed by Time Signal. **11.0 a.m.**, Relay of Church Service in Swedish. **3.0,** Concert by the Station Orchestra. **4.0,** Talk. **4.25,** Musical Selections. **4.57,** Time Signal and Weather Report and Forecast. **5.10,** History Talk. **5.40,** Talk. **7.15,** Concert by the Wireless Orchestra, with Clarionet Solos by H. Mannerström. **7.45,** Late News Bulletin given in Finnish and Swedish. **9.0** (approx.), Close Down.

**LANGENBERG** (**468.8 metres**) ; 20 kW.—Programme also for **Aix-la-Chapelle** (400 metres), **Cologne** (283 metres) and **Münster** (250 metres).—**7.5 a.m.**, Review in Esperanto of the Week's Programme by Alfred Dormanns. **7.15 a.m.**, Music Talk. **7.35 a.m. to 7.55 a.m.**, Esperanto Talk by Alfred Dormanns. **8.0 a.m.**, Relay of Chimes. **8.5 a.m.**, Evangelical Recital of Choral and Instrumental Music and Address. **10.0 a.m.**, Talk by Fritz Worm. **12.0 Noon,** Concert by Herr Eysoldt and Literary and Chess Talks. **3.30,** Orchestral Selections. **7.0,** Concert of National Music by the Westdeutscher Rundfunk Orchestra directed by Herr Kühn. Violin Solo by Walter Schneiderhan, Concerto in D Minor (Wieńcawsley), followed by Late News Bulletin, Sports News and Dance Music, conducted by Herr Eysoldt. **11.0** (approx.), Close Down.

**LEIPZIG** (**365.8 metres**) ; 4 kW.—Programme relayed by **Dresden** (275.2 metres).—**7.30 a.m.**, Organ Recital relayed from St. Matthew's Church. **8.0 a.m.**, Recital of Choral and Instrumental Music. **12.0 Noon and 12.30,** Two Talks on Agriculture. **1.0,** Notes on Foreign Events. **1.45,** Talk arranged by the German Speaking Union. **2.0,** Gramophone Records. **5.30,** Talk. **6.30,** Concert devoted to the works of Wagner, The Leipzig Symphony Orchestra conducted by Wilhelm Rettich: "Dance of the Apprentices and Entry of the Masters" from "The Mastersingers of Nüremburg." **9.15,** Sports News. **9.30,** Dance Music relayed from **Berlin.** **11.30** (approx.), Close Down.

## Programmes from Abroad.—

**MADRID** (Unión Radio), Call EAJ7 (**375 metres**); 3 kW.—Programme relayed by **Salamanca** (EAJ22) (405 metres).—**11.30 a.m.,** Municipal Band Concert relayed from "El Retiro" (weather permitting), Conductor, Señor Villa. **2.0,** Relay of Chimes and Time Signal. **2.5,** Concert by the Union Radio Orchestra, with Interlude by Luis Medina. **3.30 to 7.0,** No Transmission. **7.0,** Relay of Chimes followed by Concert by the Station Sextet and Interlude by Luis Medina. **8.0,** Dance Music. **8.30 to 10.0,** No transmission. **10.0,** Chimes and Time Signal. **10.5,** Concert by the Band of the Covadonga Regiment conducted by Don Alejandro Contreras. **12.0 (Midnight),** Relay of Dance Music. **12.30 a.m.** (approx.) (Monday), Close Down.

**MILAN,** 1MI (**549 metres**); 7 kW.—**9.30 a.m. to 10.0 a.m.,** Vocal and Instrumental Concert of Sacred Music. **11.30 a.m.,** Time Signal and Concert by the Radio Quartet. **12.30 to 3.0,** No Transmission. **3.0,** Opening Signal and Concert by the Station Quintet; Overture to "Poet and Peasant" (Suppé). **5.0 to 7.25,** No Transmission. **7.25,** Opening Signal and Topical Talk. **7.35,** Time Signal and Talk. **7.45,** Sports News. **7.50,** Opera relayed from the Teatro dal Verme; Late News Bulletin and Sports Notes at the end of Act 2. **10.45** (approx.), Close Down.

**MOTALA** (**1,380 metres**); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (260.9 metres), **Ostersund** (720 metres), and **Sundsvall** (545.6 metres).—**10.0 a.m.,** Church Service relayed from **Stockholm. 4.55,** Chimes relayed from the **Stockholm** Town Hall. **5.0,** Relay of Evening Service from **Stockholm. 6.15,** Concert. **8.15,** Late News Bulletin. **8.30,** Weather Report and Forecast. **8.40,** Literary Programme. **10.0** (approx.), Close Down.

**MUNICH** (**535.7 metres**); 4 kW.—Programme relayed by **Augsberg** (566 metres), **Kaiserslautern** (277.8 metres), and **Nuremberg** (241.9 metres).—**10.0 a.m.,** Chimes relayed from the Munich Rathaus. **2.0,** Orchestral Concert. **3.0,** Literary Half-Hour. **3.30,** Orchestral Concert. **5.5,** Talk. **7.0,** Concert of Popular Music by the Concert League of Munich, relayed from the Tonhalle in Munich. **9.5,** Late News Bulletin. **9.30,** Concert. **10.30** (approx.), Close Down.

**NAPLES,** Call 1NA (**333.3 metres**); 1.5 kW.—**9.0 a.m.,** Sacred Recital of Music. **3.45,** Children's Corner. **4.0,** Variety Programme. **4.30,** Time Signal. **7.20,** News of the Day. **7.40,** Time Signal. **7.48,** Communications from the Harbour Authorities of Naples. **7.50,** Concert devoted to the works of Puccini: Duet from Act 3 of "Tosca" by Signora L. Maddaloni (Soprano), and R. Rotondo (Tenor), accompanied by the Station Orchestra. **9.0,** Sports News. **9.55,** Calendar and Notes on Foreign Programme. **10.0** (approx.), Close Down.

**OSLO** (**461.5 metres**); 1.5 kW.—Programme relayed by **Fredriksstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—**9.50 a.m.,** Carillon. **10.0 a.m.** (approx.), Divine Service relayed from the Garrison Church. **6.15,** Weather Report and Forecast and Press Review, followed by Literary or Musical Programme. **7.0,** Orchestral Concert. **8.30,** Weather Report and Press News. **8.45,** Topical Notes. **9.0,** Dance Music by the Orchestra at the Hotel Bristol. **10.45** (approx.), Close Down.

**PARIS** (Ecole Supérieure), Call FPTT (**458 metres**); 0.5 kW.—Programme relayed at Intervals by the following stations: **Bordeaux PTT** (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille, PTT** (264 metres), **Limoges** (285 metres), **Lyons, PTT** (480 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse PTT** (260 metres).—**8.0 a.m.,** General News Bulletin and Time Signal. **9.25 a.m.,** International Time Signal and Weather Report and Forecast. **12.0 Noon,** Concert. **1.0,** Trade Communications. **1.30,** Instrumental Programme arranged by the General Association of Wireless Listeners. **4.0,** Pasdeloup Concert, relayed from Théâtre des Champs Elysées: Programme of Symphony Music, conducted by M. Rhené Bâton and under the auspices of Philips Radio. **6.30,** "Le Radio Journal de France." **8.0,** Talk arranged by the General Union of French Associations. **8.15,** Sports Results. **8.30,** Instrumental Concert, followed by Late News Bulletin, Time Signal and Weather Report. **10.30** (approx). The Orchestra of the Coliseum de Paris in Selections of Popular Dance Music. **12.0 Midnight** (approx.), Close Down.

**PARIS** (Eiffel Tower), Call FL (**2,650 metres**); 5 kW.—**7.56 a.m.,** Time Signal on 32.5 metres. **9.26 a.m.,** Time Signal on 2,650 metres. **7.10 to 7.20,** Weather Report. **7.30,** "Le Journal Parlé par T.S.F.," with Talks by Doctor Pierre Vachet: Portez-vous bien.

# Sunday, November 4th.

**All Times are Reduced to Greenwich Mean Time and are p.m. except where otherwise stated.**

Detective Ashelbé: Police Anecdotes. M. René Casalis: Talk on Sport. The day's sports results with news from "Paris Sport." **7.56,** Time Signal on 32.5 metres. **8.0 to 9.0,** Orchestral Concert, arranged by the Hebdo. T.S.F., with solos by Basile Dan. **10.26.** Time Signal on 2,650 metres. **11.15** (approx.), Close Down.

**PARIS** (Radio L.L.) (**370 and 60 metres**); 1 kW.—**12.30,** Programme arranged by Radio-Liberté. Topical Talk and News from "La Liberté," and Concert by the Charles Séringes Trio: Violin Solos by M. Charles Séringes, 'Cello Solos by Madame Mendes-Guasco and Pianoforte Solos by M. Edouard Flament of the Paris Conservatoire. **1.0,** Carillon de Fontenay. **3.0,** Concert arranged by "Les Etablissements Radio LL." Popular Dance Tunes. **9.0,** Instrumental Concert.

**PARIS** (Petit Parisien) (**340.9 metres**); 0.5 kW.—**8.45,** Popular Gramophone Selections. **8.50,** Talk. **8.55,** Press Review. **9.0,** Instrumental Music. **9.30,** Concert of well-known Symphony Compositions conducted by Professor Estyle, of the Paris Conservatoire; Second Movement from the Unfinished Symphony (Borodine). **10.0,** Late News Bulletin. **10.15,** Orchestral Concert. **11.0** (approx.), Close Down.

**PARIS** (Radio-Paris), Call CFR (**1,750 metres**); 6 kW.—**8.0 a.m.,** General News Bulletin and News from the Press. **12.0 Noon,** Religious Address, and Recital of Sacred Music with Choral Items organised by "La Vie Catholique." **12.30,** News from the Press. **12.45,** The Albert Locatelli Orchestra in Popular Selections. **4.30,** "Odéon Programme" arranged by "L'Industrie Musicale." In the Interval: News from the Press. **7.0,** Agricultural Notes and Press Review. **7.45,** The Radio Paris Circus. **8.30,** Café Concert, Programme of the Radio-Paris Music Hall; Between the Acts: Press Review and Late News Bulletin.

**PITTSBURGH,** Call KDKA (**63 and 27 metres**); 25 kW.—**4.0,** Church Service. **7.0,** Roxy's Stroll Programme by the National Broadcasting Company. **9.45,** Relay of Divine Service, from the Shadyside Presbyterian Church, with Sermon by the Pastor, the Rev. Hugh Thomson Kerr. **11.0,** Concert. **11.30,** Concert by the Whittal Anglo-Persians relayed from WJZ, **New York. 1.0 a.m.** (Monday), Dunn and McCarthy programme relayed from WJZ, **New York. 1.15,** Collier's Radio Hour. **2.15 a.m.,** Vocal Selections. **3.15 a.m.,** Time Signal. **3.30 a.m.** (approx.), Close Down.

**POSEN** (**344.8 metres**); 1.5 kW.—**9.15 a.m. to 10.45 a.m.,** Relay of Cathedral Service. **11.0 a.m.,** Time Signal. **11.5 a.m.,** Two Talks on Agriculture. **11.55 a.m.,** Talk by the Polish Editor, Mr. Winiewicz. **2.15,** Instrumental Concert relayed from **Warsaw. 4.20,** Children's Corner. **6.20,** Talk relayed from **Warsaw. 7.15,** Pianoforte Recital by Madame Olga Karpacka; Four Etudes by Chopin. **9.0,** Time Signal, Weather Report and Forecast and Sports Notes. **9.20,** Variety Programme by Mr. J. Warnecki. **10.0,** Outside relay of Dance Music. **11.0** (approx.), Close Down.

**PRAGUE** (**348.9 metres**); 5 kW.—**8.0 a.m.,** Sacred Recital. **10.15 a.m.** (approx.), Programme of Music. **3.30,** Orchestral Concert. **6.15** (approx.), Concert or Play. **9.0,** Time Signal and Late News Bulletin. **10.15,** Concert of Popular Music.

**RIGA** (**526.3 metres**); 4 kW.—**9.15 a.m.,** Morning Service relayed from the Mara Church. **12.0 Noon,** Children's Corner with Songs and Music. **3.0,** Orchestral Concert, Conductor, Arved Parups. **4.0 to 6.0,** Four Talks. **6.0,** Orchestral Concert with Vocal and Instrumental Solos. **8.0,** Weather Report and Forecast and Late News Bulletin. **8.30,** Dance Music relayed from the Café de l'Opéra. **10.0** (approx.), Close Down.

**ROME,** Call IRO (**447.8 metres**); 3 kW.—**9.0 a.m.,** Opening Signal. **9.45 a.m.,** Morning Recital of Sacred Music. **9.45 a.m. to 12.0 Noon,** Opening Signal. **12.5 to 1.0,** Trio Selections. **1.0 to 4.0,** No Transmission. **4.0,** Opening Signal. **4.45,** Dance Music relayed from the Casinetta. **5.0 to 6.40,** No Transmission. **6.40,** Opening Signal. **6.45,** News of the Day. **7.0,** Talk on Agriculture followed by Sports Notes and General News Bulletin. **7.39,** Time Signal. **7.45,** Orchestral Concert; "L'Amico Fritz," Opera in Three Acts by Mascagni. **9.50,** Late News Bulletin. **10.15** (approx.), Close Down.

**SCHENECTADY,** Call 2XAD and 2XAF (**21.96 and 31.4 metres**); 30 kW.—**4.0,** Service from the First Presbyterian Church, relayed from Schenectady, N.Y. **6.30 to 7.0,** Transmission organised by the United Radio Corporation. **8.30,** Organ Recital by Almer A. Tidmarsh, relayed from the Union College Memorial Chapel, Schenectady. **10.30,** The Acousticon Half-Hour relayed from **New York. 11.0.** Concert by the American Legion Band, relayed from **Boston, Mass. 12.0 Midnight,** Lehigh Programme relayed from **New York. 12.30 a.m.** (Monday), Programme relayed from the Capitol Theatre, **New York. 2.0 a.m.,** Talk by the Editor of the United States Daily, relayed from **Washington, D.C. 2.15 a.m.,** Atwater Kent Hour relayed from **New York. 3.17 a.m.,** Experimental Transmission of Television Signals. **3.30 a.m.** (approx.), Close Down.

**STUTTGART** (**379.7 metres**); 4 kW.—Programme relayed by **Freiburg** (577 metres). **11.0 a.m.** (approx.), Concert of Orchestral Selections, followed by Gramophone Records. **1.0,** Programme for Children. **7.30** (approx.), Concert or Play followed by Programme of Light Music and Late News Bulletin and Sports News.

**TALLINN** (**408 metres**); 2.2 kW.—**7.30 a.m.** (approx.), Relay of Church Service. **5.0,** Orchestral Concert. **5.30,** Agricultural Talk. **6.0,** Instrumental Concert. **7.30,** Late News Bulletin.

**TOULOUSE** (Radiophonie du Midi) (**391 metres**); 3 kW.—**12.30,** Weather Report and Forecast and Market Prices for Toulouse. **12.45,** Orchestral Selections. **1.0,** Time Signal (Carillon). **1.45,** News from the Press. **8.0,** Market Prices from Paris and News from the Fournier Agency. **8.15,** News of the day from "La Dépêche" and "Le Petit Parisien." **8.30,** Instrumental Music, 'Cello Solo, Spring Song (Mendelssohn). **9.0,** Time Signal (Carillon). **9.5,** Concert arranged by "L'Association des Commerçants Radio Electriciens du Midi." **10.15,** "Le Journal sans papier" and North African News, followed by Late News Bulletin. **10.30** (approx.), Close Down.

**VIENNA** (**577 and 517.2 metres**); 1.5 and 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres, **Klagenfurt** (272.7 metres), and **Linz** (254.2 metres).—**9.20 a.m.,** Morning Recital of Music. **10.0 a.m.,** Classical Concert by the Vienna Symphony Orchestra. **3.0,** Concert of Popular Orchestral Music. **6.0,** Concert. **7.10,** "L'Avare," Comedy in Five Acts by Molière. Producer: Hermann Wawra, followed by Light Music. **10.0** (approx.), Close Down.

**VILNA** (**435 metres**); 1.5 kW.—**9.15 a.m.,** Relay of Cathedral Service. **10.56 a.m.,** Time Signal. **11.0 a.m.,** General News Bulletin, relayed from **Warsaw. 11.10 a.m.,** Transmission of the Academy of Literature on the occasion of the Congress of Men of Letters at Vilna. The Philharmonic Orchestra, conducted by J. Oziminski. "Salve Polonia," Interlude from the Oratorio, "Saint Stanislas." **1.0 to 6.0,** Programme relayed from **Warsaw. 1.0 to 2.0,** Three Talks for Farmers. **2.15,** Concert of Instrumental Music. **4.20,** Talk. **4.45,** Aviation Talk. **5.0,** Popular Concert. **6.20,** Talk. **7.30 to 10.30,** Programme relayed from **Warsaw. 7.30,** Concert. **9.0,** Aviation Route Report and Weather Forecast. **9.5,** Late News Bulletin of the Polish Telegraphic Agency, **9.20,** Sports News and Police Communications. **9.30,** Dance Music relayed from the "Oaza" Restaurant, **Warsaw. 10.30,** (approx.), Close Down.

**WARSAW** (**1,111 metres**); 10 kW.—**9.15 a.m. to 10.45 a.m.,** Relay of Cathedral Service. **10.56 a.m.,** Time Signal. **11.0 a.m.,** Aviation Route Conditions and Weather Forecast. **11.10 a.m.,** Concert. **1.0,** Three Talks on Agriculture. **2.0,** Weather Report and Forecast. **2.15,** Instrumental Concert. **4.20,** Talk. **4.45,** Talk on Aviation by J. Osinski. **5.0,** Concert of Popular Selections. **6.0,** Talk. **6.20,** Talk. **7.30,** Relay of the Festival Proceedings on the occasion of the Tenth Anniversary of the "Club des Fonctionnaires" at Warsaw. **9.0,** Aviation Route Report and Weather Forecast. **9.5,** Late News Bulletin from the Polish Telegraphic Agency. **9.20,** Police and Sports Notes. **9.30.** Dance Music by the Orchestra of the "Oaza" Restaurant. **10.30,** (approx.), Close Down.

**ZAGREB** (**309.2 metres**); 0.7 kW.—**10.30 a.m.,** Concert of Popular Music. **4.0,** Cabaret Programme relayed from the "Club-Bar." **6.45,** Radio Talk. **7.0,** Relay of an Opera from the Zagreb National Theatre.

**ZURICH** (**588 metres**); 1 kW.—**10.0 a.m.,** The Orchestra of the Capitol Theatre in the programme of Light Music. **11.0 a.m.,** Weather Report and Forecast **11.30 a.m.,** Orchestral Concert. **3.0,** Musical Selections by the Castellano Orchestra, relayed from the Carlton Elite Hotel. **6.30,** Time Signal. **6.35,** Religious Address. **7.0,** Operatic Programme, with Tenor Solos by Fritz Schnetz and Selections by the Zürich Wireless Orchestra. At the Piano: O. Strauss. **9.0,** Weather Report and Late News Bulletin from the Neue Züricher Zeitung. **9.30** (approx.), Close Down.


# MANCHESTER RADIO SHOW

## A Review of Exhibits of Interest on the Stands of the Manufacturers.

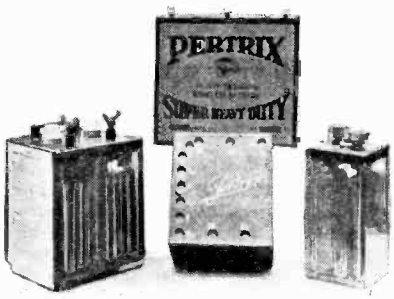
THE fifth annual Radio Exhibition in the City Hall, Manchester, organised by the Manchester *Evening Chronicle*, in conjunction with the Radio Manufacturers' Association, was opened on Monday, October 22nd, by Mrs. Philip Snowden, a governor of the British Broadcasting Corporation.

The Exhibition, which is exceedingly well attended, has a number of attractive special features in addition to the general display of new apparatus, both British and foreign, including many items displayed at an exhibition for the first time in this country. Facilities for demonstrations add to the interest of the visitors. Manchester has always been a centre of broadcasting interest, and perhaps nowhere else in the country is so much enthusiasm to be found, whilst it is also the centre of quite a number of radio manufacturing concerns of high standing.

In the pages which follow it has been our endeavour to provide a report on the apparatus shown, with particular reference to those items shown here for the first time and not previously dealt with in connection with our review of the London Show at Olympia.

### A.F.A. ACCUMULATORS (PERTRIX). (37)

The "Pertrix" range of H.T. dry-cell batteries contain no sal-ammoniac, which the company claims causes corrosion of the zinc cylinders by local action. A special electrolyte is used whereby the minimum deterioration during idle periods




**Pertrix H.T. dry cells and L.T. accumulators (A.F.A. Accumulators, Ltd.).**

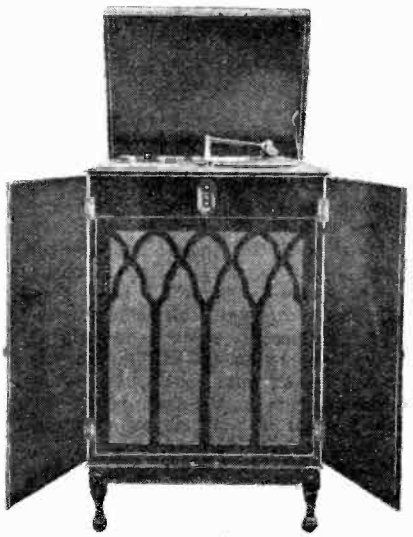
is obtained. In rural districts, where the charging of H.T. accumulators involves their being transported many miles, the super-heavy duty "Pertrix" dry-cell battery, capable of giving 50 milliamperes discharge, should have considerable appeal. The life of a battery delivering this current is given as 7.2 ampere hours, but considerably more than double this can be obtained for 25 milliamperes discharge.

A less expensive 100-volt battery with a maximum economical discharge rate of 20 milliamperes is also marketed. The standard H.T. batteries made in 60-, 100- and 120-volt units are rated to give 10 milliamperes. The "Varta" range of H.T. accumulators can also be seen on this stand.

*A.F.A. Accumulators, Ltd.*, 120, *Tottenham Court Road, London, W.1.*

### AMPLION. (26)

The broadcast programmes can please some listeners all the time and all listeners some of the time, but never all listeners all the time. The gramophone-radio combined set caters for those periods when the listener prefers to choose his own music. The Amplion radio-gramophone type 149 is a beautifully finished example of such a combined instrument, and contains a hand-wound gramophone motor and turntable, and a three-valve wireless receiver. In a lower compartment with hinged doors is an 18in. "Lion" cone loud speaker capable of accepting an output of about 20 watts before distress from overloading occurs. The wireless set is entirely A.C. mains driven and contains three Cosmos A.C.



**Amplion combined radio gramophone installation with "Lion" loud speaker incorporated.**

**Manchester Radio Show.—**

valves, which derive their bias from a potential divider in the H.T. minus lead. The mains supply after passing through a transformer is rectified by two dry metal oxide units (not a bridge), giving a voltage doubling effect, and a pilot light gives evidence that the valve current switch is closed. The circuit consists, contrary to usual practice, of an initial valve connected as an anode bend detector; the other two valves are coupled by resistance capacity and transformer respectively. Reinartz reaction is employed, and the two usual wavebands are selected by a lever switch. Meticulous care has been exercised to avoid all possibility of L.F. back-coupling, which otherwise would be unavoidable with two L.F. interstage couplings. Every separate H.T. and bias lead has a de-coupling device, and the pick-up lead has a flexible metal casing which is earthed.

On this stand are to be seen various models of the "Lion" loud speaker, for the potentialities of which the reader is referred to the Olympia Show reports of *The Wireless World*.

*Graham Amplion, Ltd., 25, Savile Row, London, W.1.*

**ATLAS. (42)**

An entirely new product is the Atlas low-tension supply unit, which delivers currents up to 1 ampere at either 2, 4 or 6 volts, as desired, from an A.C. mains

**Filament current from A.C. mains: the new Atlas L.T. unit.**

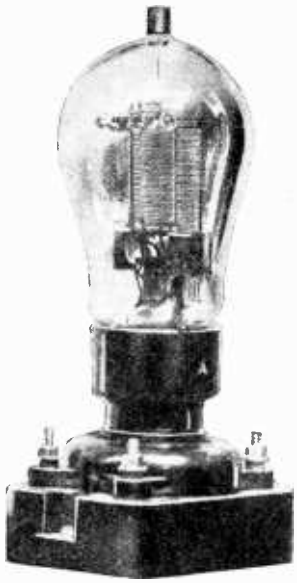
supply. It should be emphasised that it is designed to work in conjunction with existing receiving sets without any modification whatsoever of the circuits.

It comprises a metal rectifier with low resistance chokes and high capacity "dry" electrolytic smoothing condensers, the whole assembly being mounted in an olive green enamelled steel container. A moving coil voltmeter is permanently connected across the output terminals, and by means of the rheostat included it is an easy matter to ensure that the current supply shall be of the correct voltage for whatever type of valves may be used in a receiver.

*H. Clarke and Co. (Manchester), Ltd., Atlas Works, Old Trafford, Manchester.*

**B.T.H. (47)**

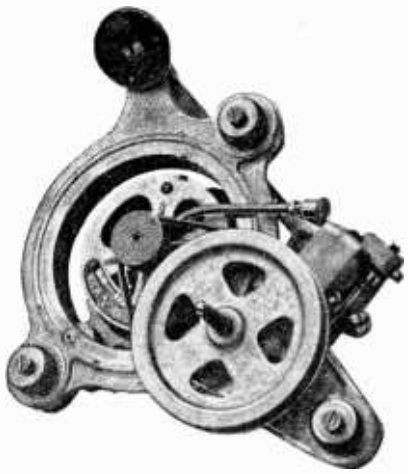
Supplied complete with turntable and controlling resistance at six guineas, the new B.T.-H. electric gramophone motor seems likely to meet with a wide demand. The power unit is of the universal type, being suitable for D.C. voltages of between 50 and 250, and A.C. voltages between 110 and 250. The tension of the belt which drives the turntable spindle is automatically adjusted by means of a spring, and grease cups for lubrication purposes are fitted in an extremely accessible position. Silencing of the motor seems to have received careful



**The B.T.H. screened grid valve with 2-volt filament.**

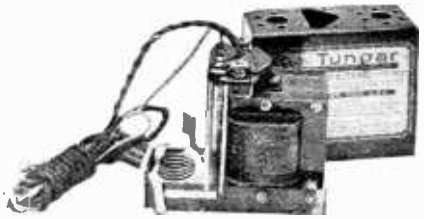
attention, as it is noted that the governor spindle is driven through a fibre pinion, which will be conducive to quiet running. There is an automatic stop-switch arranged to interrupt the supply of current to the motor after the needle has completed its traverse of the record

Yet another addition to the range of R.K. moving coil loud speakers is exhibited; this includes a two-stage transformer-coupled amplifier for connection to a gramophone pick-up, and also a jack by means of which the first amplifying



**The B.T.H. electric gramophone motor, showing fixing screws and driving belt.**

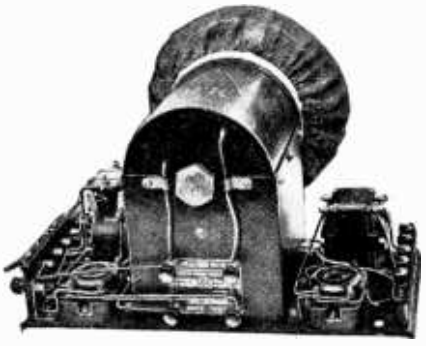
valve is thrown out of circuit when the unit is connected to the amplified output of a wireless receiver. This unit can be fitted in a cabinet, which has space for an eliminator chassis, which is also supplied.




**A Baby Tungar: the new B.T.H. trickle charger.**

A smaller edition of the well-known Tungar battery charger is now available. This instrument is designed to "trickle charge" accumulators of 2, 4 or 6 volts at 0.3 amp. A neat power-control switch, by means of which the accumulator can be put on charge or discharge and the high tension eliminator switched off, is also supplied in the form of a neat moulding carrying a snap action multipole switch, the necessary terminals, and a metal cover

Needless to say, there is a full range of 2-, 4- and 6-volt nickel-filament valves; it is understood that the new



**An R.K. loud speaker and amplifier specially adapted for gramophone reproduction.**

screened grid H.F. valve, with a filament consumption of 0.075 amp. at 2 volts, is now in production.

*The British Thomson-Houston Co., Ltd., Rugby.*

**BARRACLOUGH. (19)**

"Radio of the Future" is the somewhat ambitious name given by this company to a cleverly conceived combined radio and gramophone installation. Containing a Burndept "Screened-Four" receiver and a separate three valve power amplifier, the equipment can be used simultaneously for the reception of broadcast pictures by the Fultograph method and for gramophone reproductions

There is an ingenious switching scheme whereby the raising of the gramophone tone arm starts the motor, switches on the amplifier, and cuts out a trickle-

**Manchester Radio Show.—**

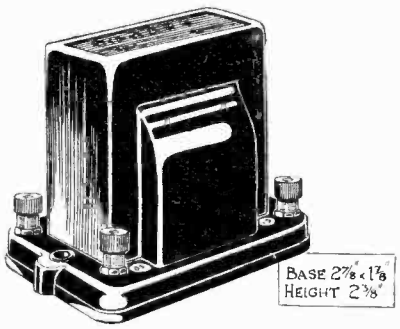
charger which is supplied in the cabinet. When the needle gets to the centre of the record the above processes are reversed. A remote control scheme whereby it is possible to hear radio in one room and electrically - reproduced gramophone records in another will be of interest. The power amplifier already referred to is coupled by the grid-choke or dual impedance method, and is capable of giving a heavy anode dissipation.

A full range of Burndept components and M.L. converters are being exhibited.

*G. D. Barraclough*, 16-18, *Moult Street, Cross Street, Manchester.*

### BRANDES. (33)

Among the recent compact types of intervalve transformer which are now gaining popularity is a new Brandes




**The new Brandes intervalve transformer.**

model. It is completely shrouded in a moulded bakelite case and occupies a baseboard area of only 2½in. × 1¼in., with a height of approximately 2½in. Supplied in ratios of 1 to 3 or 1 to 6, it sells at £1 1s. The terminals are near the baseboard so as to avoid the need for elevated wiring, and are, nevertheless, readily accessible.

*Brandes, Ltd.*, 2-3, *Norfolk Street, Strand, London, W.C.*

### BURGOYNE. (92)

In cabinets or leather cases of various finishes, there are two types of receiver of interest to be seen at this stand. The transportable set employs a circuit which follows well-tried practice; there are five valves (all triodes), the first two of which are coupled aperiodically. One dial thumb tuning with fine and coarse control is used, and a reaction condenser—termed a volume control—reduces the H.F. resistance of the tuned circuits. A Celestion loud speaker is built into the cabinet, and the whole assembly is beautifully finished. The man who pedantically examines a receiver and visualises huge grid swings applied to a meagre output valve usually fitted to the portable set here has a pleasant surprise, for he finds a 156-volt super-H.T. battery easily capable of discharging at 12 milliamperes, and a power valve capable of accepting 36 volts grid swing with a biasing potential of 18 volts. The quality and volume from this set should be entirely satisfactory.

The five-valve suitcase portable having the same general circuit as the transportable sells at 20 guineas and should be good value for money. A new feature is the plug and jack connector for a gramophone pick-up.

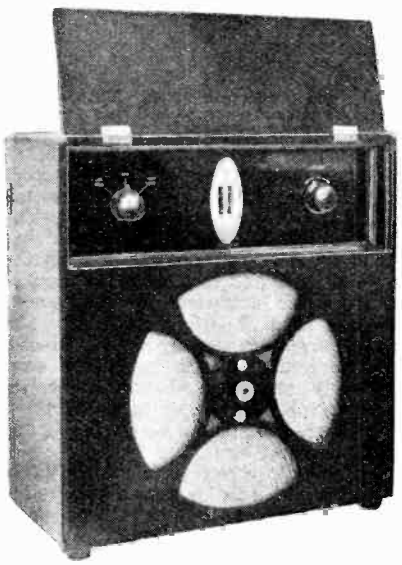
*Burgoyne Manufacturing Co., Ltd.*, 34a, *York Road, King's Cross, London, N.1.*

### CARBORUNDUM. (14)

The recent introduction of directly heated A.C. valves brings to light yet another possible use of the well-known Carborundum permanent crystal detector. As is well known, there is considerable difficulty in operating these valves as rectifiers; this function can safely be entrusted to a good crystal detector in receivers in which they are used. Of course, there is no reason why the crystal should not be preceded by one or more stages of H.F. amplification, in which screened grid valves or neutralised triodes may be used, as preferred.

The range of Carborundum resistances has been extended by the addition of low values suitable for use in the anode feed resistance scheme. A demonstration is being arranged on the stand to show the current-carrying capacity of these elements.

*The Carborundum Co., Ltd., Trafford Park, Manchester.*



**Burgoyne transportable receiver with one tuning control. Coarse and fine adjustment are provided by thumb dials.**

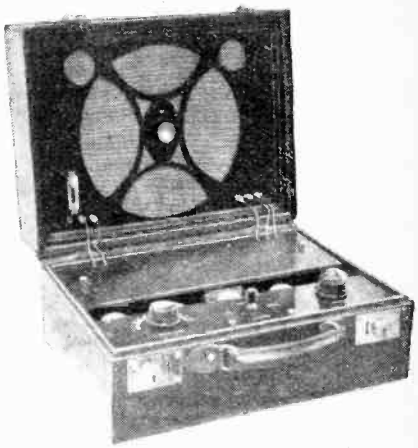
### CELESTION. (31)

The large number of commercial portable and self-contained sets with Celestion loud speaker built in bears testimony to the popularity of this accessory. The faithful reproduction which is characteristic of the Celestion is due in large measure to the reinforced diaphragm, which gives a great rigidity while still employing a thin material.

It is interesting to note that a loud speaker is now being wound with extra turns to give an impedance specially suitable for pentode output.

Besides a large range of reed-driven cone loud speakers, the Celestion Woodroffe gramophone pick-up with its lightly damped mechanism is being exhibited.

*Celestion Radio Co.*, 29, *High Street, Hampton Wick, Kingston-on-Thames.*



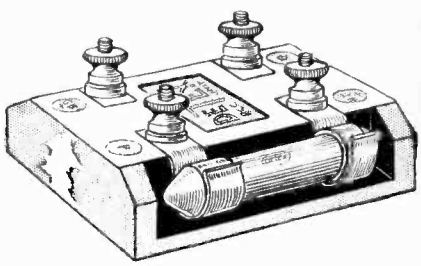
**Burgoyne suitcase portable 5-valve receiver. Provision is made for using a gramophone pick-up.**

### CRYPTO. (64)

Constant potential charging for accumulators is a speciality of the Crypto Electrical Co., whose apparatus is shown on the stand of the Lancashire Dynamo and Motor Co., Ltd. (an associated concern). The advantages claimed are, among others, simplicity of operation and speed of charging, and the system seems to have met with widespread approval. As the voltage of the source remains constant, a taper charge is obtained, due to the fact that the counter-E.M.F. from the battery tends to rise. The rate falls off to a very low figure when the cells are fully charged, and no harm will be done if they are left in circuit for an excessively long period. Apparatus for A.C. and D.C. supplies are available, with a wide range of outputs both as regards current and voltage.

Rotary commutating rectifiers are also manufactured, in types capable of delivering D.C. voltages of from 16 to 100 from A.C. supplies. An efficiency of from 75 per cent. to 85 per cent. is claimed, and an ingenious device whereby the desired polarity at the output terminals may be automatically obtained is also supplied.

*Lancashire Dynamo and Motor Co., Ltd., Trafford Park, Manchester.*

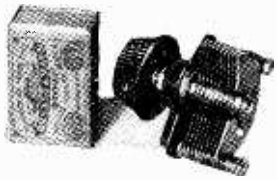


**A new resistance intervalve coupling. It occupies very little space on the baseboard and is offered at an exceedingly low price. (Dextex Distributors, Ltd.).**

**Manchester Radio Show.—**

**DUBILIER. (62)**

For next season this company has designed among a number of other new components two well made drum control condensers. The first is a K-C chassis modified so that the main spindle is parallel to the panel of the receiver. Two adjacent drum controls are provided, one allowing for coarse and the other for geared fine adjustment. The finish is good, and two capacities (namely 0.0003 and 0.0005 mfd.) are available.



**Dubilier midget condenser with a capacity of 0.0002 mfd.**

The K-C triple condenser has three drums sufficiently close together to give either simultaneous or independent control of the three separate condensers; again, 0.0003 or 0.0005 mfd. units may be obtained. The Westminster gramophone-radio set which has been favourably reviewed by *The Wireless World* earlier in the season is being handled by the Dubilier Co., and gives a high standard of performance. There are four valves—2 H.F. Det. 1 L.F.—the last valve being a pentode. For gramophone reproduction the detector is suitably biased to act as an amplifier, and the

**New Dubilier Toroid coil for wavelengths between 44 and 90 metres.**

fluctuating voltages from the pick-up are impressed on the grid. By reducing the screened grid volts on the pentode in this set to a value below that of the anode the anode current is nearly halved while the volume of signals is only slightly reduced. An attractive feature is the provision of a jack to do the combined duties of swivel and double electric contact for the tone arm. There are now ultra-short wave toroids, H.F. chokes, and two well-designed midget reaction condensers to be seen at this exhibit.

*Dubilier Condenser Co.* (1925), *Ltd., Ducon Works, Victoria Road, North Acton, London, W.*

**EBONART. (57)**

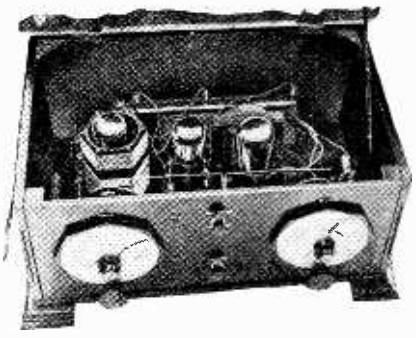
The already extensive range of surface finishes in which Ebonart panels is available has been extended by the addition of an excellent imitation of moiré silk, which is sold at a price only very slightly in excess of that charged for standard black panels.

Ebonite sheet is now available in a second quality, in thicknesses of $\frac{3}{16}$in. and $\frac{1}{4}$in.

*Redfern's Rubber Works, Ltd., Hyde, Cheshire.*

**EDISWAN. (43)**

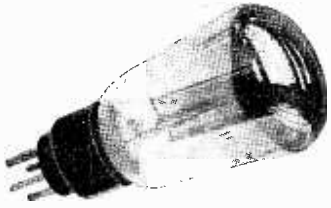
A range of the new type screened-grid valves, in which the anode terminal is brought out at the top of the glass bulb, is being shown. For maximum mutual conductance in triodes we generally have to turn to the 6-volt class, but at the present moment there are practically no 6-volt counterparts available on the



**The new Ediswan R.C. Threesome receiver with resistance and transformer coupling.**

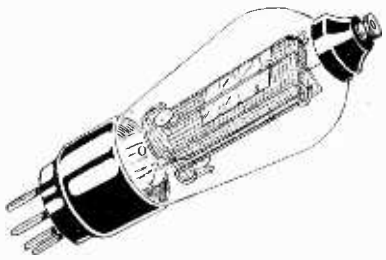
market in the screened grid series except the Ediswan S.G.610, which has extremely interesting characteristics. The disposition of the electrodes is such that secondary emission takes place from the screened grid, and secondary electrons so displaced are attracted to the anode which is at a higher potential. The screen current is thereby much reduced, and the result is a valve of the comparatively high mutual conductance of 1.4 mA./volt; the amplification factor is 140. There are similar valves for 2- and 4-volt accumulators.

A high-voltage rectifier valve (H.V.235) will interest those who employ heavy duty output equipment; with a filament consumption of 3.5 amps. at 2 volts with maximum anode volts at 350+350 the unsmoothed output is 300 milliamperes.



**Ediswan high voltage rectifier giving 300 milliamperes at 400 volts.**

The Ediswan series of pentodes with vertical anodes are now obtainable for 2 and 4-volt accumulators, and it is understood that adherents to a 6-volt low tension supply will soon have available a 6-volt pentode. The present ex-



**Ediswan 6-volt screened grid valve.**

ample of this output valve has a magnification factor of 80 and a slope of 1.2.

*Edison Swan Electric Co., Ltd.*, 123-125, *Queen Victoria Street, London, E.C.*4.

**EPOCH. (103)**

Attention is drawn to the Epoch improved model A moving-coil loud speaker which, offered at £3 3s. as a complete set of parts ready for assembly, represents thoroughly good value. The magnet casting is machined all over, and is 5in. in diameter and 5½in. in length with a centre pole of $1\frac{5}{64}$in. and a range of air gaps from $\frac{5}{64}$in. to $\frac{1}{8}$in. The field winding is supplied ready finished, and in the 2, 4 and 6-volt types consist of 7 lb. of wire. Included in the outfit is an adjustable stand from which the front ring is supported and centring easily effected. Care has been taken to provide a robust moving coil wound on a light and accurately turned ebonite former. The diaphragm paper is supplied cut to shape together with a template for cutting out the rubber surround. Everything except the diaphragm is fully

**To overcome the difficulties experienced by a moving coil losing its shape as a result of changing temperature the Epoch Radio Manufacturing Company have introduced a special turned ebonite former.**

assembled and ready for use. At a small extra cost the moving coil is made to suit a pentode output valve. A still cheaper model with a 2in. moving coil and $\frac{5}{64}$in. gap is offered at £2 10s. complete and ready for use except for fitting the diaphragm which is quite a simple operation. All interested in moving-coil loud speaker construction should apply for the Epoch pamphlets which refer to all materials likely to be needed.

*Epoch Radio Manufacturing Co.*, 53, *Gracechurch Street, London, E.C.*3.

**EXIDE. (29)**

For a source of H.T. supply in which the internal resistance is low and is easily

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measurable at all times, the H.T. accumulator is still undoubtedly the safest means of feeding the plates of the valves in a multi-valve receiver without producing feed-back and oscillation, provided *simple* precautions be taken. For listeners with A.C. lighting mains the charging of H.T. and L.T. accumulators has been rendered extremely easy by the advent of a range of Exide trickle chargers. The principle underlying their design is that the amount of charge given during the non-listening period of a 24-hour day is approximately equal to the discharge taken by the set during the average listening period, *plus* a small extra current to give a margin of safety. Thus, if the trickle charger is *always* left on during non-listening periods, the cells are kept fully charged, and their life is thereby tre-

**Exide H.T. trickle charger with variable output up to 50 milliamperes.**

mendously increased over that which would be possible with sporadic charging at intervals of many weeks. The H.T. charger sells at £5 5s., and contains a transformer and metal oxide bridge and an output control which allows of any charging rate up to 50 milliamperes. The circuit is so arranged that the H.T. battery is either connected to the charger or to the receiver, but the latter is never in circuit with the mains. A low-tension and combined H.T. and L.T. charger are available.

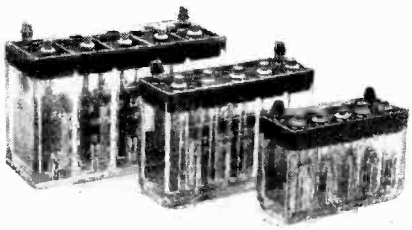
The well-known Exide H.T. accumulators are now made in capacities of 2,500, 5,000, and 10,000 mA. hours; the respective prices, per 10-volt unit, are 5s., 6s. 3d., and 12s. The safe discharge rates are 10, 25, and 50 mA., but if daily trickle charging is carried out, it is possible to treble these rates.

A new range of unspillable accumulators specially suitable for portable sets is being shown. The triple acid trap is ingenious and allows of full covering of plates with electrolyte, whether the cell be used upright or on its side.

*Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester.*

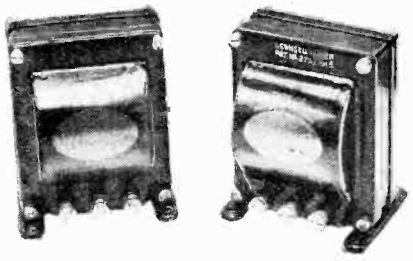
**FERRANTI. (54 and 55)**

As pioneers in research on back-coupling in battery and mains-driven receivers, this company, as was to be expected, have turned their attention to the manufacture of eliminators in which special attention is given to those points in design which militate against L.F. oscillation and "motor boating." Every conceivable component for eliminators is



**Exide H.T. accumulators in three different capacities, namely, 10,000, 5,000 and 2,500 milliampere hours.**

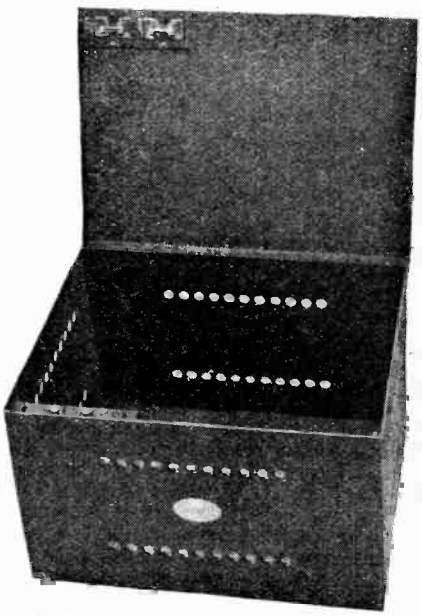
now marketed: condensers with broad-rolled foil, and, therefore, of low resistance are to be obtained tested either at 1,000 or 500 volts D.C.; the insulation resistance is not less than 200 megohms for 2 mfd., and the rated capacity is effective at high frequency. Chokes capable of passing from 7 to 100 milliamperes, and having inductances from 55 to 7.5 henrys, are available, as also are clip-in resistances from 100,000 to 1,000 ohms with current-carrying capacities from 5 to 50 milliamperes. The new mains transformers, similar in shape and appearance to the A.F.5, are designed with various windings to suit either metal oxide or valve rectifiers. The E.M.1 is made specially to be used in front of a metal oxide rectifier, type R.80, giving a D.C. output when smoothed of 200 volts, 100 mA. There are flexible connections on both primary and secondary sides, thus avoiding the possibility of contact with bare terminals. The E.V.3 transformer is available for use with a full-wave rectifying valve of the U.5 type, and gives a D.C. output when smoothed of 120 volts, 20 mA. These transformers undergo rigorous tests and are subjected to a pressure of 2,000 volts A.C., and are not passed unless their insulation resistance is over 200 megohms. All Ferranti mains equipment conforms to lighting companies' requirements and I.E.E. regulations.



**Ferranti push-pull output transformers with tappings on the secondary windings giving three different ratios per instrument.**

For home constructors there is a well-finished sheet-steel safety box, the hinged lid of which when lifted breaks both poles of the mains, so that adjustment of the various components can be carried out without danger of shock. Fuses enclosed in glass tubing are wired in circuit with the switch contacts on the lid. For owners of the "Cossor Melody Maker" explicit instructions are issued in the form of a practical wiring plan, for the construction from parts of an efficient A.C. eliminator to be housed within the safety box already described.

Push-pull enthusiasts will welcome a new output transformer with a tapping on the secondary which is not at mid-point; by connecting the loud speaker across the outers a 3 to 1 ratio is obtained, whilst the tapping with one or other of the outers gives 7.5 to 1 and 5 to 1 respectively. Another model gives 1 to 1, 1.6 to 1, and 2.7 to 1 ratios. There are still further ratios to be obtained, namely, 2 to 1 and 40 to 1, so that a loud speaker of almost any impedance should be able to be matched to the output valves. It is significant that the public demonstration of loud speaker reproduction at this Exhibition, which is being commented upon so favourably, is effected by two stages of Ferranti push-pull in cascade.

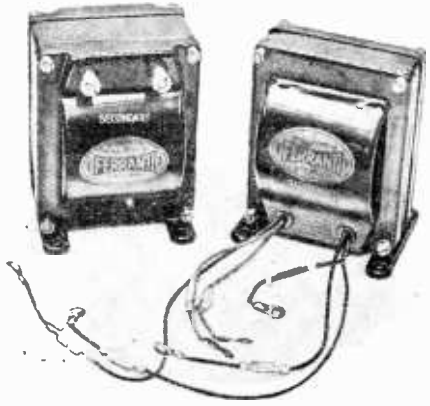


**Ferranti sheet steel safety box for eliminators. When the lid is opened both mains leads are broken.**

To the student who has followed the trend of development in receiver technique and wishes to incorporate the latest practice in his set, the experimental receiver with three inter-valve stages will be of great interest. A tuned transformer couples the screened grid valve to the anode bend detector because better stage gain is obtained in this way and because ripple is not transmitted to the grid of the detector when using an eliminator, as it would be with tuned anode. The screened grid obtains its positive voltage from a potential divider across the H.T. supply, as the ordinary series feed resistance scheme would not provide the necessary critical screen voltage, since the screen current is so

**Manchester Radio Show.–**

small. A similar potential divider H.T. feed (which in effect is the same as the well-known de-coupling or anode feed resistance scheme) is used for the plate of the anode bend detector because the anode current is also small and because the D.C. current changes with modulation and amplitude of the carrier wave, a condition which would cause a change in working anode voltage (and, therefore, the working point on the characteristic) if a single anode feed resistance were used. The plate of the first L.F. valve and that of the screened grid valve are fed through single anode feed resistances, as the voltage in each case is not critical, and there is no change



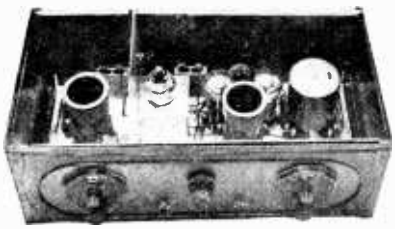
**Ferranti mains transformers. Type EMI is suitable to precede a metal oxide rectifier while type EV3 is made for a full-wave rectifier.**

in mean steady D.C. when a signal is received. A low-reading milliammeter in the anode bend detector plate circuit gives warning of overloading, underloading, and grid current, and an ingenious volume control across the primary of the inter-valve transformer controls the magnitude of the A.C. voltage which is amplified, and actually assists in flattening out any slight unevenness in the frequency response characteristic. A push-pull stage is employed with series grid resistances to prevent inter-valve oscillation. There is indeed much food for thought in this receiver.

*Ferranti, Ltd., Hollinwood, Lancs.*

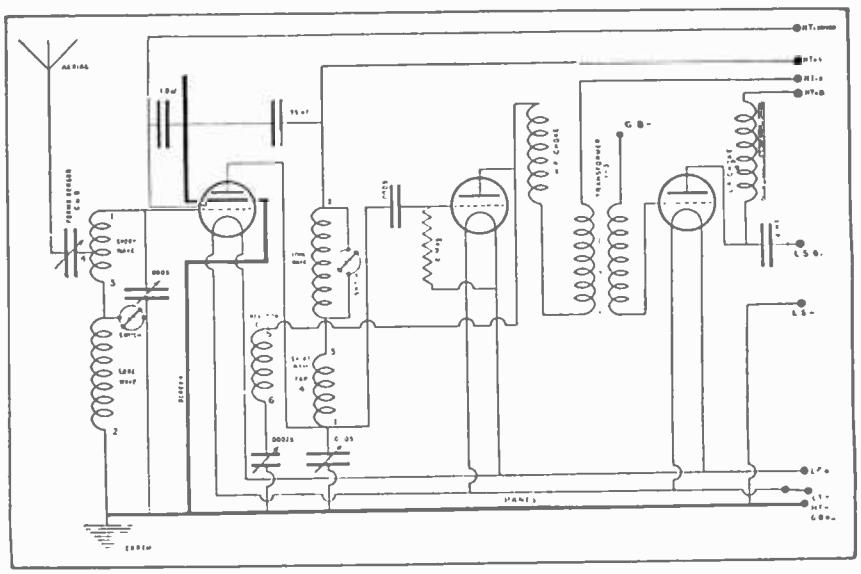
### FORMO. (11)

It seems safe to say that the most popular circuit of the season is an arrangement of screened grid H.F. amplifier, grid circuit detector with reaction, and a single transformer-coupled L.F. amplifier. The outstanding exhibit on the Formo stand is a set of parts for the construction of a receiver to this specification; interesting and commendable features are included, both with regard to the circuit and details of assembly and layout. Constructional difficulties are appreciably reduced by the



**Interior of the Formo receiver.**

inclusion of a "Junit" plywood baseboard, to which is attached a sheet of paper serving as an indication of the positions of components and the appropriate connections to them. A vertical screen between the input and output sides of the H.F. amplifier is included; to it is attached an aluminium four-sided box so arranged that external electrostatic coupling between inner grid and plate of the screened valve is obviated. This desirable result is obtained without introducing any complication in the matter of mounting the valve; its holder



**Circuit diagram of the Formo Screened Grid Three.**

**The new Formo receiver in metal cabinet.**

is secured to the baseboard in the usual way, the screen being fitted after the wiring is completed. Waveband switches are included, the grid and anode tuners being of similar appearance to the Formo Two-range Tuner described and illustrated in our Olympia Show report, although the windings are specially designed for the new receiver.

It is noted with interest that, although the tuned anode system of H.F. coupling is used, the rotor of the anode tuning condenser is connected to the screen and thus to the common L.T.-H.T. negative busbar, the oscillatory circuit being completed through a large anode by-pass condenser. This arrangement, of course, obviates the necessity for insulating the condenser from the metal panel which is used. In other directions there is evidence of painstaking efforts to clear difficulties from the path of the home constructor.

The set is mounted in a "Ritho" steel cabinet, which can be assembled in a few minutes from the parts supplied.

Connections are made without soldering, there being only thirty-two wires, the majority of which are straight. This simplification is due in part to the fact that a "potted" L.F. transformer-cum-output choke filter is used.

*The Formo Co., Crown Works, Cricklewood Lane, London, N.W.2.*

### FULTOGRAPH. (119)

Quite soon after the Exhibition opened the densest part of the crowd was to be found forcing its way to the Fultograph stand where a demonstration was in progress. Transmission was by low power wireless from the hall, and the receiving apparatus carried no line connections. This is the first exhibition demonstration of the Fultograph. Although, perhaps, only a few machines are at present available, it was learned that supplies will be coming to hand almost as soon as it is definitely decided to continue on a permanent basis the experimental B.B.C. picture transmissions which are now commencing. Readers have anxiously awaited information as to the price at which the apparatus is to be sold. It is now learned that two models will be available, one in an oak cabinet selling at £22 15s., and another in mahogany at £24 15s. These prices in-

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clude the auxiliary rectifying panel with milliammeter and relay, but exclude the rectifying valve. Special grade of recording paper to be known as Fultopaper as well as solution are to be marketed.

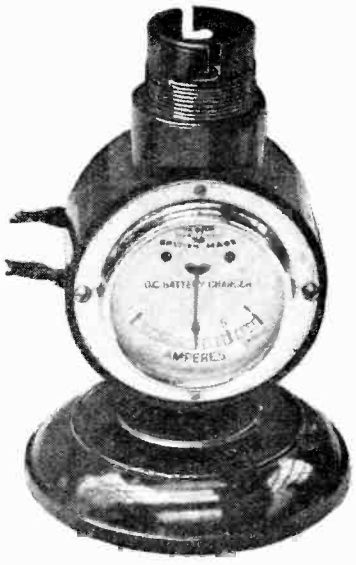
*Wireless Pictures* (1928), *Ltd.*, 14-16, *Regent Street, London, S.W.1.*

### GOLTONE. (18)

An exhibit of wires suitable for almost every conceivable requirement is the main feature of this stand.

There is also a set of parts for the home construction of a double wave-range frame aerial primarily intended for use with the new Cossor Melody Maker receiver, but also adapted to any other set (except those including reaction on the first grid circuit; even circuits of this kind could be accommodated by a slight modification).

A swivelling device is fitted, and suitable wire for winding is included with the component parts, which are sold at 10s. 6d. complete.



The Indispenso Battery Charging Adaptor.

The Indispenso Dual Purpose Charger is a new component, comprising a socket for a lamp (which acts as a resistance) and an ammeter reading up to 1 amp., which also acts as a polarity indicator. These are mounted in a neat moulded case, to which two sets of flexible leads are fitted. One of these is joined to a lamp adapter for connection to the mains supply, while the other terminates in a pair of spade tags for attachment to the battery. Needless to say, the unit can only be used in conjunction with D.C. supplies.

It will charge H.T. or L.T. batteries; although the ammeter may be insufficiently sensitive to indicate very low charging rates when recharging the former, it still serves a useful purpose, as by momentarily joining the output leads across a part of the battery the deflection of the meter will show if polarity is correct. This component is very reasonably priced.

*Ward and Goldstone, Ltd., Frederick Road, Pendleton, Manchester.*

### HOLZMAN (HYDRA). (60)

Although this stand is primarily devoted to the display of Hydra condensers for all wireless purposes new items of interest include bakelite and Insol mouldings, sheets and panels, as well as a range of panel and Crescent testing meters.

A useful instrument for the amateur. The Crescent (Louis Holzman) moving coil meter with five ranges of milliamperes and volts.

The small edgewise meters of the moving coil type are particularly suited for receiver construction. They are inexpensive and press-button operated. A new useful model is one with a double range reading of 60 mA. and 240 volts. To meet the requirements of the amateur a multi-range instrument is available suitably mounted in a case giving five readings by means of a plug switch. It is a moving coil instrument with ranges of 10, 100, and 1,000 mA as well as 10 and 200 volts, and sells at 45s.

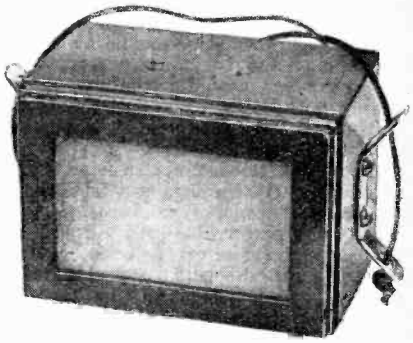
*Louis Holzman, 34, Kingsway, Holborn, London, W.C.2.*

### IGRANIC. (52)

Intended principally for cinemas and dance-halls, the Igranic electrical reproducing equipment contains many points of interest. It comprises a pedestal cabinet carrying two electrically-driven turntables, and a panel on which are mounted volume controls and a "fading-out" adjustment by means of which the output from either pick-up may be passed to the amplifier without abrupt interruption of artistic continuity.

The associated amplifier has a total of five valves, the last two being connected with parallel grids and independent anodes, so that separate loud speakers—or banks of loud speakers—situated in different positions may be conveniently supplied. The self-contained eliminator supplies H.T. current at 450 volts and also the necessary grid bias. For still greater output an extra amplifier is available comprising two parallel D.E.T.1 transmitting valves and an eliminator delivering 1,100 volts. This unit is capable of an undistorted signal energy output of 25 watts.

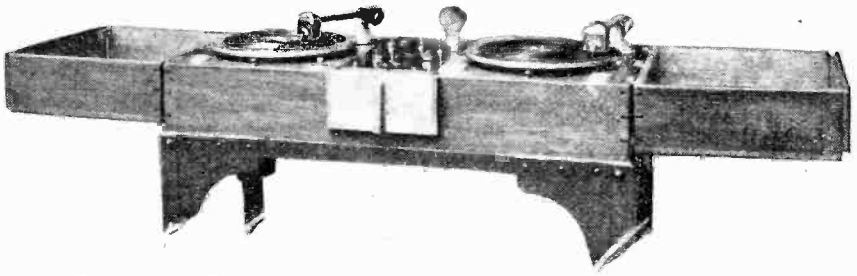
Magnavox loud speakers are used in conjunction with the electrical reproducing equipment, for which a microphone of new type has just been developed for the purpose of making announcements. This instrument is described as being of the "transverse current" pattern, and comprises a number of compartments filled with carbon granules of different sizes, each section being designed to deal with a particular band of frequencies. This accessory is used in conjunction with a control box



A new microphone: The Igranic "transverse current" device.

containing the necessary transformer and a switch; it may be purchased separately.

A new output transformer with a high-impedance primary winding designed to match pentode valves and an output winding to correspond with the impedance of the average loud speaker has now been produced. It is also observed that the two-speed "Microvernier" dial fitted to the H.F. tuning condenser of the new Igranic short-wave receiver exhibited at Olympia is now sold as a

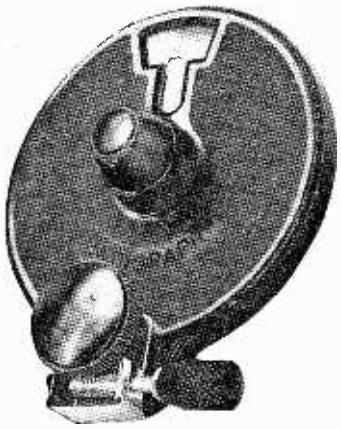


The Igranic Electrical Reproducing Equipment, with dual turntables.

**Manchester Radio Show.—**

separate component. It consists of an ordinary Indigraph dial, to which is added an extra reduction gear, giving a ratio of 500 to 1.

*Igranic Electric Co., Ltd.*, 147, *Queen Victoria Street, London, E.C.*4.



**Specially intended for short-wave work: the Igranic two-speed dial with a reduction ratio of 500 : 1.**

### K.N. (107)

A novel form of L.F. intervalve and output coupling is the K.N. Amplifformer An insulating moulding is the U piece of the transformer core, while the centre bar with its windings can be readily withdrawn. The latter are supplied in varying numbers of turns, and as interchangeable discs provide for changing the transformer ratio. By this means primary windings can be made to suit valve impedances and ratios modified to suit permissible grid swings. As an output transformer a ratio can be chosen to suit the loud speaker winding. On this stand, also was to be seen a new Goodman product, the new "Junior" moving-coil loud speaker kit. The 6-volt model complete with all materials is offered at £3 10s., and very little work is involved in its assembly.

*Stand No.* 107, *K.N. Electrical Products, Ltd.*, 87, *Wardour Street, London, W.*1, *and Goodmans*, 27, *Farringdon Street, London, E.C.*4.

### LONDON RADIO. (6)

The home constructor will be interested in the super cabinet cone, inside the cabinet of which there is space for building a two- or three-valve amplifier,

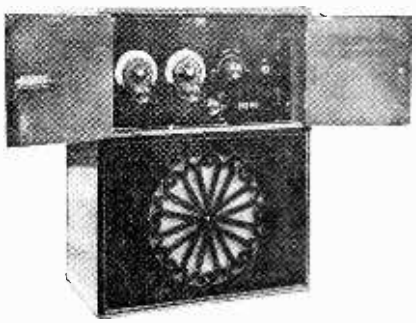
**The Orphean wall plug and jack for loud-speaker extensions (London Radio Manufacturing Co.).**

below which the necessary batteries may be accommodated. Thus the instrument could be used for electrical gramophone reproduction without external apparatus beyond a pick-up and turntable, and arrangements could be made to connect to it the cutput of a detector valve (preceded if desired by H.F. amplification) operating in a radio receiver.

When wiring a house for reception in a number of rooms it is always a difficult matter to devise a neat and inconspicuous connection point for the loud speaker; the Orphean plug and jack will go a long way to solve this problem, as it is both small in size and extremely easy to mount in almost any position.

Moulded in walnut coloured bakelite it sells at 3s. 6d. complete with a standard plug.

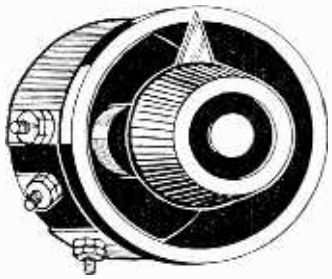
*London Radio Manufacturing Co., Ltd., Trafalgar Works, Station Road, London, S.W.*19.



**The Lotus (Garnett Whiteley) transportable receiver with screened grid H.F. amplifier.**

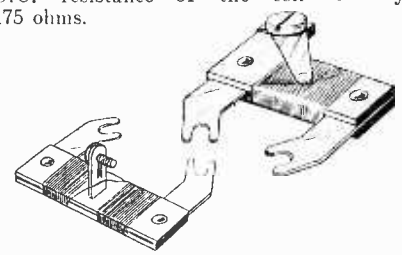
### CLAUDE LYONS. (13)

Primarily, this stand is devoted to General Radio instruments, and mainly comprises high-grade laboratory equipment. There are, however, a number of radio components for use in set construction bearing the mark of high-class manufacture evidenced in the laboratory gear. Among the latter are the type 541 heavy duty push-pull transformers, being of new design and suitable for use with valves having anode currents considerably in excess of 25 mA. The windings are



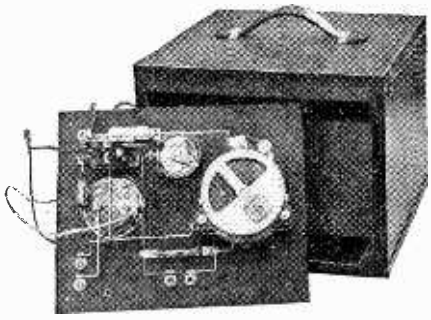
**The G.R. precision filament rheostat (Claude Lyons, Ltd.).**

divided into many sections, and each half of the double secondary has equal coupling with the primary. A heavy duty output push-pull transformer is also available to accompany the intervalve coupling with secondary windings to suit high or low resistance loud speakers. The speaker filter—type 587 B—is also a new component, and it is suitable for passing a current up to 100 mA. It includes a 4 mfd. feed condenser, while the D.C. resistance of the coil is only 175 ohms.



**General Radio potential dividers for use with battery eliminators and A.C. heated filament circuits. (Claude Lyons, Ltd.).**

An entirely new device is the centre tap resistance unit necessary as a means of obtaining a mid-potential point on an A.C. filament supply. It can be actually clipped on to the A.C. transformer terminals, and the mid-point of its 60 ohm. resistance is brought out to a connecting screw. Voltages up to 12 may be applied to it, its current carrying capacity being 200 mA. In a modified form this device is supplied with a sweeping contact so that the tap contact may be slightly off centre to allow for lack of balancing.



**Interior view of the G.R. (Claude Lyons, Ltd.) crystal-controlled valve oscillator.**

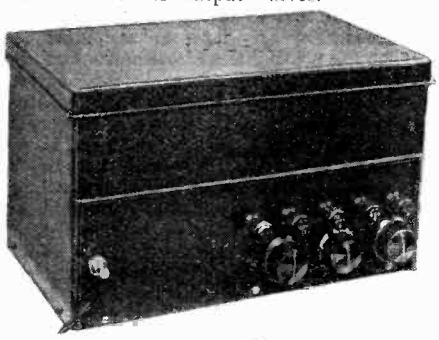
Another original component is the type 446 voltage divider. It is flat wound on a plate of insulating material, the required voltages being tapped off by means of clamps. An independent section is useful for providing grid biasing potentials when the voltage divider forms part of an anode circuit.

To a visitor to the stand the most tempting of components are the G.R.C. rheostats and potentiometers They are precision instruments, selling at a popular price, and possess a remarkably smooth action. Both base and knob of the rheostat are cleanly moulded in bakelite, and the resistance wire is carried on a wide non-absorbent fibre strip. Five models are supplied, with maximum resistance values of from 0.5 to 25 ohms, carrying currents of 3.5 to 0.5 amperes. As a potentiometer the resistance is 200 ohms, carrying up to 175 mA.

Departing for a moment from apparatus which is strictly that of General Radio, Claude Lyons, Ltd., are producing an A.C. battery eliminator. It is housed in an all-metal box with safety

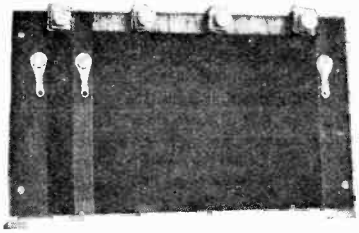
**Manchester Radio Show.—**

catch to break the mains circuit on opening the lid. Four voltage outputs are obtained, all but the maximum being capable of critical adjustment. At a current of 50 mA, the output voltage is 200. General Radio transformers and chokes are used in its construction, while voltage control is obtained by three Clarostats The rectifier is of the glow discharge type. A useful feature is the inclusion of a pair of terminals giving an A.C. voltage for directly heating the filaments of the output valves.



**Claude Lyons H.T. battery eliminator using a glow discharge rectifier and giving four voltage outputs.**

Faced with the recent circular letter issued by the Post Office, holders of experimental transmitting permits will pay particular attention to the Piezo-electric equipment. It would seem that the transmitting amateur is now required to compare his wave meter, which would presumably be of the absorption type, with a Piezo-electric standard. To meet this need a well-built Piezo-electric oscillator, comprising the valve and condenser circuit of an oscillator with crystal controlled grid, is receiving the special attention of Claude Lyons Ltd. The user will, presumably, require a tuned radio frequency amplifier in conjunction with this oscillator when



**General Radio (Claude Lyons, Ltd.), potential divider for use in battery eliminator construction and laboratory apparatus.**

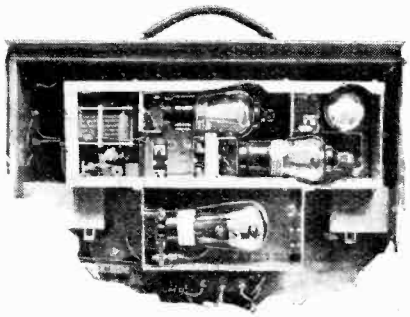
making use of its harmonics. The price of the crystal oscillator apparatus is £12 12s.

*Claude Lyons, Ltd.*, 76, *Old Hall Street, Liverpool.*

### McMICHAEL. (56)

The new four-valve portable set with two screened grid valves, a detector, and pentode, gathers large crowds of admirers, for among sets of this type it can be said to be of outstanding merit. The intricate screening arrangements housing the hinged valve-holders at once reveal that it is only following extended research that two stages of screened grid coupling (one of which is tuned) can be made really docile while still retaining adequate stage gains. With a frame aerial, H.T. and L.T. battery and associated leads only a few inches away from the amplifier, it has needed de-coupling devices in the H.T. and even the L.T. leads to prevent feed-back. A raging controversy exists at the moment as to whether an ordinary high-quality reed-driven cone loud speaker will give really good quality of reproduction when fed from a pentode; a demonstration of one of these portable sets soon disposed of the argument, for the quality was highly satisfactory and should even be better now, since the built-in Celestion loud speaker is being wound with a special pentode winding of higher impedance.

When two or more high-frequency chokes are used in a multi-stage receiver, it is often desirable to employ those with dissimilar characteristics. The M.H. double-cone H.F. choke which is well known to amateurs has an inductance of 60,000 microhenrys, whilst the new junior H.F. choke, which has just been placed on the market, has an inductance of 90,000 microhenrys, and, being wound on the binocular system, has a negligible



**The intricate screening arrangements of the new McMichael portable set containing two screened grid valves with hinged valve holders.**

external field. The D.C. resistance is 250 ohms, and the price 4s.

The "Dimic" coils, covering wavelengths from 15 to 10,000 metres, have been reduced in price to 5s. Since they are split at the centre it is possible to connect the two halves in series, parallel, series astatic and parallel astatic, thus producing in the two latter cases inductances which are specially suitable for screened grid valve circuits. The "Unimic" low-loss single inductances have been reduced to 3s. 6d.

The well-known screened "Dimic Three" receiver can now be obtained in component form ready for home construction.

*L. McMichael, Ltd., Wexham Road, Slough.*

### MAKERIMPORT. (49)

This company is showing a range of extremely well finished cabinets. Model D has a lower compartment below its double doors approximately 24in. × 28in., while there is ample room in the upper section for housing a modern four-valve receiver. The cabinet is built entirely of oak, and all side and back panels are substantial oak boards. Doors are well made and the ornamentation is of tasteful design and well executed. This cabinet, selling at £5 10s. in Jacobean style, represents extraordinary good value, which has become possible by manufacturing on mass-production lines. The range of cabinets described in List No 12 should meet all requirements for housing home-constructed self-contained receivers incorporating, where necessary, eliminators, batteries, and baffle board. The absence of plywood anywhere in the construction of these cabinets was a point one could not fail to notice.

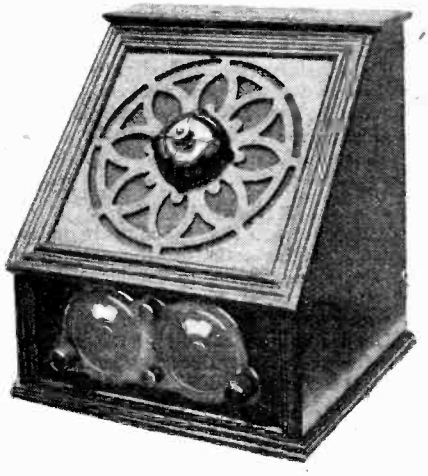
*Makerimport Co., 9, York Street, Duke Street, Liverpool.*

### MARCONIPHONE. (40)

Although there is little new in Marconiphone products since the Olympia Show, it is not out of place to mention the Marconiphone model 23A receiver. It is a self-contained two-valve loud speaker set, complete with batteries or battery eliminator. Two slow-motion-operated tuning dials occupy the lower front of the cabinet with the loud speaker grille above. Long or short wave ranges are obtained by a change-over switch. At a price of £13 9s. 6d. this instrument is supplied complete with detector valve, pentode, and all batteries.

With the increasing popularity of the pentode valve an output transformer has been introduced for using the pentode with the Marconiphone moving-coil loud speaker.

An interesting product is the model S24 short-wave adaptor. Actually it is a short-wave superheterodyne, though including only the beat frequency oscillator



**Marconiphone receiver model 23A. It is a two-valve receiver with pentode and self-contained loud speaker.**

and first detector, so that it can be used in conjunction with a broadcast receiver, now serving as an intermediate amplifier. It covers a wave range of 12 to 100 metres.

*Marconiphone Co., Ltd.*, 210-212 *Tottenham Court Road, London, W.1. Local Manchester Office:* 10, *Dolefield*

**Manchester Radio Show.—**

### METRO-VICK. (30)

As an alternative to the conventional push-pull output transformer, this company is marketing a centre tapped output choke with which two condensers should be used, one on either side of the loud speaker. The price of this component is 18s. 6d., and the inductance approximately 100 henrys.

A new short-path power output valve with a maximum anode watts dissipation of 15 will interest the enthusiast who requires powerful loud speaker signals. The valve is known as the AC/P2, has a filament consumption of 1 ampere at 4 volts, and is indirectly heated; the amplification factor is 5, and the mutual conductance 2.5 milliamperes per volt, which represents a high standard of efficiency.

Readers will have already heard of the new indirectly heated screened grid valve known as the AC/S, with a magnification factor of no less than 1,200, and a mutual conductance of 2; supplies are not yet available, but it is claimed that a stage gain of at least 100 per valve is possible with suitable inter-valve coupling.

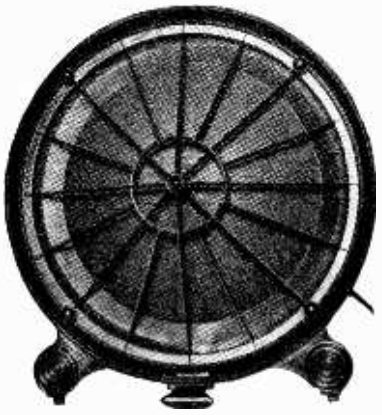
Another component which is attracting a great amount of interest is the new elastic aerial unit, which in effect electrically reduces the length of an ordinary aerial from its normal length to a few inches. By this means selectivity can be varied to a marked degree, and a local station which has hitherto been incapable of elimination can be now entirely cut out without the addition of wave trap or loose coupling. The circuit employed in this instrument is really a high-frequency potentiometer with a balanced network of inductances and capacities, so arranged that a point can be found at which local pick-up on coils and earth wire are nullified. The price is 12s. 6d.

Those possessing A.C. lighting mains will welcome the reduction in price of the well-known AC/G and AC/R valves to 15s. and 17s. 6d. respectively.

*Metro-Vick Supplies, Ltd., Trafford Park, Manchester.*

### MULLARD. (45)

Judging from the difficulty in obtaining a close inspection of the components on this stand, owing to the large crowds of enthusiasts, it must be inferred that the new valves are the attraction. High-frequency amplification, detection, and low-frequency amplification have suddenly been improved by leaps and bounds by the advent of the new screened grid valves, the new high mutual conductance special detectors and the pentode—the latter being capable of replacing satisfactorily two stages of triode L.F. amplification. Readers should note that there is at present a complete range of 2- and 4-volt valves for this series, namely, P.M.12 (screened grid); P.M.2DX (special detector with steep slope and marked bend in characteristic), and P.M.22 (2-volt pentode). The 4-volt series is P.M.14, P.M.4DX, and P.M.24 (4-volt pentode), but at present in the 6-volt series there is only the special detector—the P.M.6D—with a magnification factor of 18, and an impedance of 9,000 ohms. A mains potential divider with ten tappings on a miniature resistance element supported in vacuo with a total measurement of about 2½in. × 4in.

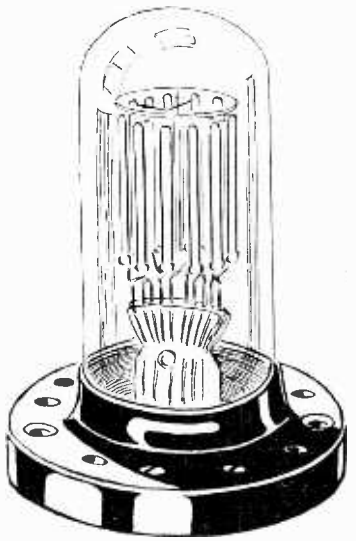


**The Mullard H type balanced armature reed-driven cone loud speaker housed in skeleton bakelite moulding.**

should create keen interest. The tappings are not equally disposed along the length of the resistance, therefore any number of voltages up to a total of 10 can be derived from this component, provided the total milliamperes do not exceed 60. It is claimed that grid bias can be satisfactorily obtained.

The new model H loud speaker with 16in. cone and balanced armature movement is attractively housed within a skeleton bakelite moulding—no metal whatsoever being used. The suspension of the cone is by a peripheral cord which is tensioned by an external adjusting screw against a spiral spring. The movement has a winding with a tapping which is not central, so that there are three impedances available—the largest giving specially good results with pentode out put valves.

*Mullard Wireless Service Co., Ltd., Mullard House, Denmark Street, London, W.C.2.*



**Mullard mains potential divider, the resistance element of which is supported in vacuo.**

### OLDHAM BATTERIES. (44)

The use of accumulator batteries with suitable chargers is undoubtedly the safest and most certain solution of the current supply problem. In the case of L.T. supply the method provides good regulation, so that the current taken by one valve will not affect that supplied to another. Applied to H.T., the advantage gained is that of having an H.T. source of exceedingly low internal resistance, so that the possibilities of oscillation and distortion resulting from stray battery coupling is avoided. The Oldham Autopower unit is a 2- or 6-volt battery in metal container, which encloses also a Balkite rectifier. It is only necessary to insert the lamp plug provided into a lighting socket, and the tags of a flexible connector direct to the receiving set, in order to obtain a continuous L.T. supply from A.C. mains. Battery charging is not carried out when connected through to the receiver, so that there is no danger of mains hum occurring. For H.T. supply a complete metal-housed charging unit is supplied for use in conjunction with the H.T. battery, and when the latter is contained in a crate, as is the case with Oldham H.T. accumulators, the charging unit is readily attached. For use with D.C. supply, the charger consists of a well-ventilated resistance, and is arranged to give a charging rate of 60 mA. to a 150-volt battery. With A.C. supply the charging unit, which is of the same external appearance as for D.C., is fitted with a Westingbouse metal rectifier giving a charging rate up to 60 mA. depending upon the voltage of the battery. The D.C. and A.C. H.T. battery charging units are priced at 40s. and 55s. respectively.

*Oldham and Sons, Ltd., Denton, Manchester.*

### PARFAIT. (65)

A complete range of ebonite panels is shown on this stand, available finishes including polished black, mahogany, and cubed surfaces. The latter is new, and offers the advantage that the appearance of the panel is not affected by finger-marks.

*H. B. Potter and Co., Ltd., Station Buildings, Rochdale.*

### PERTINAX. (102)

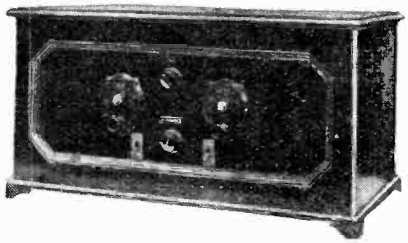
The highly polished bakelite boards marketed under the name of Pertinax are well known to readers for panel construction. They are attractive in colour, have extraordinarily high insulation and surface insulation properties, are easily worked with ordinary tools, and are durable. A 24-hour postal service has been introduced by which panels can be ordered, accurately cut and finished to any size. Thin Pertinax polished sheet only 8/1000in. thick has been introduced for constructing loud speaker diaphragms, for which purpose it would seem admirably suited, as it is stiff and light, will not soften or warp, and is

**Manchester Radio Show.**—unaffected by atmospheric conditions. To ensure suitable adhesion at the edges, a special solution has been introduced. Twelve- and eighteen-inch discs are available, the former selling at 1s. 6d.

*George L. Scott and Co., Ltd., Morris House, 60-66, Rochester Row, London, S.W.1.*

### PETO-SCOTT. (39)

The "Majestic Screened Grid Three" is a good example of the popular combination of S.G. H.F. amplifier, grid detector, and pentode. Wave-range switching and capacity controlled reaction are included, while volume can



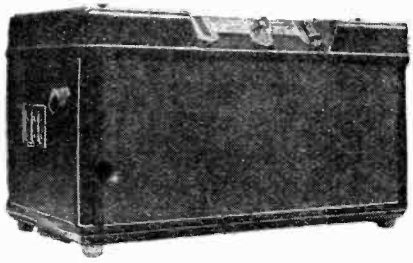
**The Peto-Scott Majestic Receiver.**

be reduced by dimming the H.F. valve filament. The apparatus is fitted in a large cabinet with space for H.T. and L.T. batteries.

*Peto-Scott Co., Ltd., 77, City Road, London, E.C.1.*

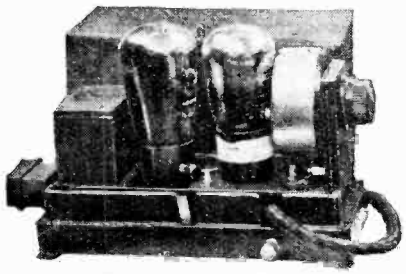
### PHILIPS. (21)

One of the most interesting receivers of to-day is the Philips four-valve all-mains operated set, type 2511. Ignoring technicalities, and viewed entirely from the utility standpoint, it can be adjudged an ideal receiver on the following points: It is a long-range loud speaker set, extremely sensitive, adequately selective, and is tuned by a single side knob. Its transparent illuminated edgewise scale reveals station settings. All broadcast wavelengths are



**The new Philips 4-valve receiver. It is entirely operated from the mains, has a single tuning knob and makes use of two screened grid H.F. stages and a pentode.**

covered by the action of a small lever switch. It is all-metal enclosed and screened, tastefully finished, entirely mains operated, and complies with the requirements of the electric power companies. On the technical side it is unique, embodying two H.F. stages with screened grid valves, followed by detector and pentode. Extreme efficiency results from the use of indirectly heated screened grid valves in the H.F. stages, having a magnification factor of 1,000, and giving a stage gain of possibly 100. The detector is indirectly heated, and the pentode has a mains-fed filament.



**Compact Philips gramophone amplifier.**

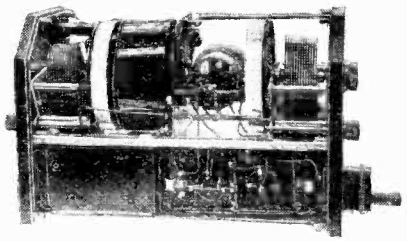
Anode current supply is derived from a thermionic rectifier built into the set. A two-pin socket provides for the use of a gramophone pick-up, while separate output connectors are arranged to suit the output conditions, depending upon the type of loud speaker employed. The complete receiver, with valves, costs £32 10s. On test it was shown to bring in a large number of programmes from all principle European stations at full strength and good quality, using only a small indoor aerial.

**Philips 2-valve receiver operating entirely from the mains. The output valve is a pentode.**

As a popular receiver, the Philips three-valve set should meet all requirements, and is supplied either for battery operation, mains operation with eliminator, or as an all-mains set with self-contained mains equipment. An accompanying illustration shows the general appearance, tuning being effected by a geared knob at one side, while at the other end is a volume control. A simple switch trigger gives a wave range covering all broadcast transmissions. The container is of metal and is assembled on metal framing. Screened grid, detector, and pentode is the valve combination, using specially designed valves of high efficiency. Prices range from £15 to £23, according to the mains equipment incorporated.

Another interesting Philips receiver is the two-valve entirely mains-operated set using a pentode with an indirectly heated detector, and selling complete at £12 10s.

To those interested in building an electrically driven reproducing gramophone is a new Philips gramophone amplifier. It embodies two stages with pentode output. Construction is interesting and makes use of a cast-metal base with bakelite panel and a rectangular removable cover. Its overall dimensions are only 7½in. × 3½in. × 5¼in. Volume control is provided, as well as separate output sockets, depending upon the type of loud speaker to be employed. The compact design has been developed so that it can



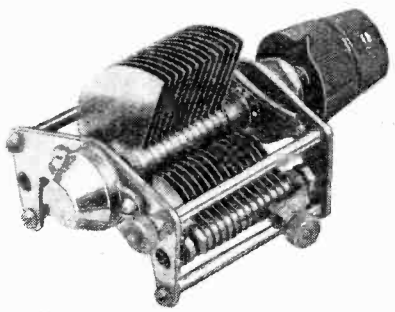
**The Philips 3-valve receiver. This interior view shows the tuning equipment and the underside of the rectifier and valve panel.**

readily be accommodated in a gramophone cabinet. The price, including valves and connecting leads, is £6 10s.

*Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.*

### POLAR. (70)

Owing to the extended use of the screened grid valve in receivers embodying high-frequency amplification, the employment of reaction on to the inter-stage coupling with negligible aerial re-radiation becomes a feature of great importance. There are many methods of controlling the amount of regeneration by means of a condenser, but a critical movement of the vanes which is so desirable is not too easy when the control knob is perhaps no more than ¾in. in diameter. This company has paid special attention to the design of slow-motion reaction condensers, an example of which is the Q.J. model, which can be obtained in capacities from 0.0001 mfd. to 0.00025 mfd. The plates are well finished in chemically cleaned brass, and a slow-



**Polar slow motion reaction condenser with a capacity of 0.00025 mfd.**

motion drive is provided which gives a reduction ratio of 20 to 1. Ball bearings are employed for radial and end-thrust, and a pigtail flexible lead ensures perfect connection to the rotor. Another type of reaction condenser which can be supplied

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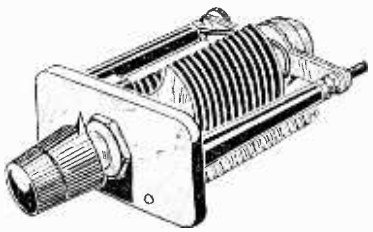
with a capacity of 0.000075 mfd. or 0.00005 mfd. will interest the "Hartley" enthusiast. A slow-motion control is fitted, and the rotor vanes are so shaped that the minimum capacity is only 6 micromicrofarads. The balls in the bearings are of phosphor bronze, which effectively prevent noise at ultra-high frequencies. A new "Volcon" reaction



**Polar reaction condenser with slow motion dial. The maximum capacity is 0.00005 mfd. and the minimum 6 micromicrofarads.**

condenser selling at 5s. 6d., having an ebonite nut and bush for use with metal panels, will have considerable appeal. Slow-motion tuning dials and drum control condensers are also being exhibited on this stand.

*Wingrove and Rogers, Ltd., Mill Lane, Old Swan, Liverpool.*

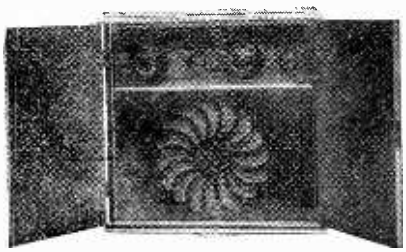
### RADIOVIM. (93)

Residents in Manchester and in the area within ten miles of that city, who wish to be relieved of all responsibility and trouble in connection with the supply of current for their receivers, will be interested in the services offered by this firm, which will contract to deliver H.T. and L.T. accumulator batteries at regular intervals and at a moderate charge. A booklet giving full particulars of the service is issued.

*Radiovim, Ltd., Sandford Street, Ancoats, Manchester.*

### RIALTON. (80)

The most ambitious and interesting of the series of portable receivers manufactured by this company is the "Melva," which makes use of three screened grid H.F. amplifying valves in cascade followed by a detector and a pentode output valve. Strictly speaking, this set is in



**Three screened grid H.F. stages are included in the Rialton transportable receiver.**

the transportable class, as it weighs nearly 50 lb. There are two tuning controls and wave range switching. It is observed that the manufacturers take advantage of the increased efficiency of 4-volt valves, and fit a two-cell L.T. battery. The cabinet, both from the points of view of artistic design and execution, attains a standard of excellence well above the average.

There is also a four-valve portable with two aperiodic H.F. stages, a detector, and a pentode output valve. This set is of compact design and exceptionally workmanlike appearance; a small recessed panel plate carries the edgewise tuning and reaction controls and also the wave range switch.

*Rialton Radio, 27, Old Bond Street, W.1, and 21a, Barbican, London, E.C.1.*

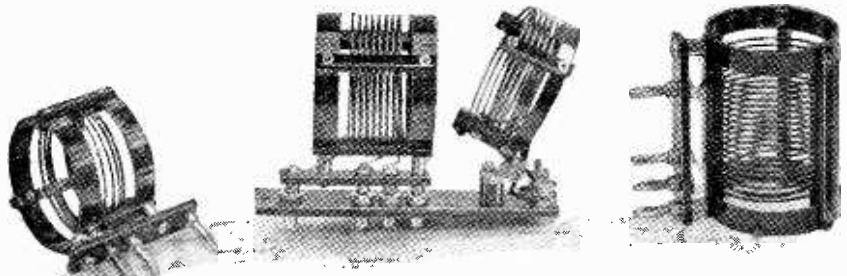
### RITHO. (108)

Messrs. Ritherdon and Co., Ltd., who are obviously specialists in work of this kind, seem to be well qualified to meet the growing demand for metal panels and cabinets. The majority of their products are enamelled in imitation of polished wood; so good is this imitation that in some cases it is difficult to realise that metal is the material used.

Although a wide range of containers are manufactured, the leading exhibit is a series of Queen Anne style caskets with domed removable lids. An aperture is cut out of the front to reveal the panel, which can be finished in a style either to harmonise or contrast with the container, which, incidentally, is made of steel, while the panel is of aluminium. Workmanlike metal containers for eliminators are also produced, and there is on show a large pedestal cabinet with a compartment for the receiver and space below it for batteries or an eliminator.

This firm manufactures the sectional cabinet for the new Formo receiver which is described elsewhere.

*Ritherdon and Co., Ltd., North Bridge Mills, Deansgate, Bolton.*

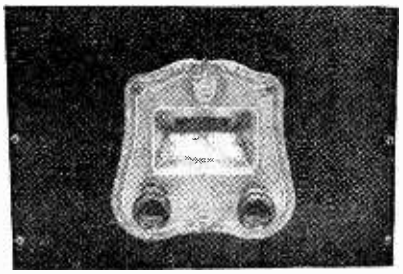


**The new Aero International coil kit.** **The coils are only 2in. in diameter.**

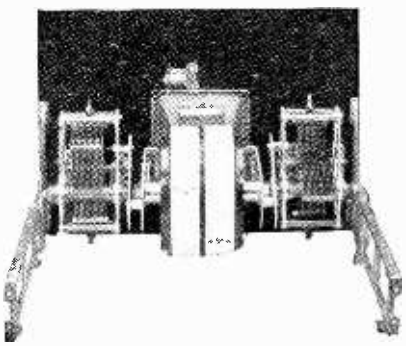
### ROTHERMEL. (34)

American radio apparatus has always been a matter of interest to the British experimenter. Of the enormous range of gear manufactured in the United States a judicious selection has been made by the Rothermel Corporation so that one was able, at the stand, to examine the best products of a market which is in some directions more specialised and extensive than our own. Omitting those instruments that are well known in this country, space permits of reference only to new products.

The Aero International coil kit differs from the well-known Aero short-wave tuner kit in that the coils have been reduced in diameter to 2in. The kit comprises three interchangeable reacting grid coils together with aerial coil and mount.



**The Pilot illuminated drum control (Rothermel Type 1283).**



**Separate adjustment is obtained when using the pilot drum control by rotating the condensers on their mountings (Rothermel).**

They are space wound and practically air supported, at the same time being robust. The wave range covered is 16.5 to 89.5 metres. An Aero R.F. choke has been specially designed to give constant action over a wide range of wavelengths, and is stated to be specially suitable for use in a short-wave tuner in that its impedance is well and uniformly maintained.

Among Amrad products is the Mershon electrolytic condenser. The principle merit of this condenser is that should it be broken down it is self-sealing by the application of a D.C. voltage. It is supplied in the moderate capacity values of 25 to 90 microfarads.

Potential dividers of the high resistance type are invariably adopted as a

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means of volume control. The Centralab, with its rocking metal back plate, is well known in connection with its use in the Megavox receiver. Another type which is stated to be popular owing to its reliability is the Electrad Royalty. It resembles an ordinary filament resistance in that a spring arm travels over a wire wound strip. The wire winding, however, is not continuous, and every turn is severed and bedded in the resistance material. Eleven types priced at 9s. give resistance values up to seven megohms with current carrying capacities between 0.2 and 37.5 mA. Yet another variable high resistance is the Electrad Truvolt. Nichrome wire is closely wound on an asbestos cord having an enamelled copper wire centre which, in turn, is spiral wound on a tube of Isolantite. A knob operated sweeping contact varies the resistance value. Selling at 15s. 6d. the Truvolt is rated at 25 watts, and twelve types have maximum resistance values ranging from 500 to 50,000 ohms with current carrying capacities of 224 to 22.5 mA. Royal-Frost Gem Rheostats are practically all-metal built, possess a particularly smooth metal contact, and are of the exceptionally small diameter of 1½in. with a depth of $\frac{11}{16}$in. Frost variable high resistances which are incidentally used for volume control purposes in the Panatrope are fitted with

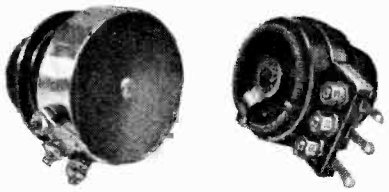
**The Crosley Gembox. It is a 5-valve all-mains operated receiver with two neutralised stages and single knob tuning. (Rothermel).**

roller contacts to eliminate friction and wear. Four models have maximum resistance values of 50,000, 100,000, 200,000 and 500,000 ohms, and are priced at 6s. 3d.

Now that many variable condensers are supplied with extended spindles for ganging purposes the introduction of a flexible coupling will be appreciated. It consists of a pair of crossed "H" pieces and compensates for errors in alignment. Incidentally, it will serve to insulate the condenser spindles. It is suitable for ¼in. spindles.

Of first importance among Rothermel products is, of course, the moving coil Magnavox loud speaker. Minor modifications were to be observed by way of a larger centre pole with modified transformer and feed choke. It might be mentioned that three types are available, the first with a resistance of 12 ohms for 6-volt battery exitation, the second with windings suitable for D.C. mains of 100 to 240 volts and consuming 5 watts, while the third is for A.C. operation, and incorporates a dry metal rectifier taking from the mains approximately 20 watts.

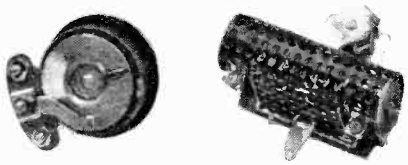
Geared condenser dials, particularly



**Frost and Electrad Royalty high resistance potential divider. (Rothermel.)**

those of the drum control type, are primarily an American product. The model 1283 is shown, comprising panel plate with double and illuminated aperture with two small friction drive knobs. An attractive receiver can be built using this drum dial control as a basis as the majority of sets merely demand means for manipulating two tuned circuits. The mounting plate carries brackets for supporting the two variable condensers, and a novel feature is that approximately corresponding tuning settings are obtained on the two dials by rotating a condenser about its centre fixing hole and locking it into position by means of an adjustable bracket.

The majority of modern American receiving sets are designed so that they can be entirely operated from house-lighting mains. Foremost among receivers of this type is probably the Crosley, the latest model being known as the "Gem Box." Very little can be discerned as to the technicalities of its design as all the units are accommodated in pressed metal cases and assembled on a metal frame so that on removing the lid no wiring is visible and the components can scarcely be identified. Actually, two high frequency stages are employed in a genuine neutrodyne circuit, yet only a single knob is used for tuning. Following the detector valve is a two-stage L.F. amplifier with a power output valve operating on high anode voltage. The battery eliminator is also self-contained, yet the metal cabinet measures only about 18in. × 6in. × 13in. In addition to the tuning control are two "trimming" levers for critically adjusting, if necessary, the band driven tuning condensers, an "on" and "off" switch as well as a volume control. This



**The Royal-Frost Gem rheostat and the Electrad Truvolt variable high resistance unit (Rothermel.)**

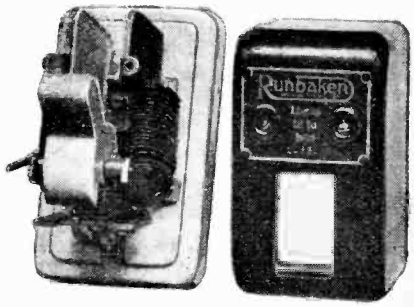
receiver is capable of tuning in many British and foreign stations, has a tuning range of 200 to 600 metres, and in operation does not oscillate or depend upon regeneration for sensitivity.

A new Rothermel catalogue was to be found at the stand, containing 64 pages of interesting information.

*Rothermel Corporation, Ltd.*, 24-26. *Maddox Street, Regent Street, London, W.1. Local Manchester office*, 33, *Bridge Street.*

### RUNBAKEN. (104)

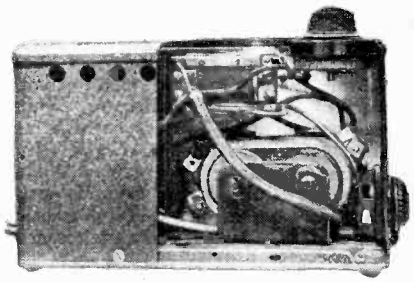
There is evidence that radio is developing in the direction of absolute simplicity of control and that apparatus is being made as foolproof as possible. It is with interest that the listener, who wishes to forget his L.T. battery, will view the new Runbaken automatic charger for A.C. mains which is self-acting, for as soon as the wireless receiver is switched off trickle charging is commenced, or, alternatively, as soon as the set is switched on the charging ceases. The




**Runbaken break switch with adjustment for disconnecting the circuit at any value between 2 and 20 amperes.**

instrument contains a step-down transformer, followed by a metal oxide rectifier bridge capable of giving 1 ampere at 2, 4 or 6 volts. The price is £3 15s.

An automatic break-switch for interposing in the lighting main leads before an eliminator is a useful component.



**Sectioned view of the Runbaken automatic charger.**

The trip can be set to break contact at any current between two and twenty amperes, and, of course, is actuated by a short-circuit. A feature of interest is the impossibility of replacing the switch until the fault is rectified. A number of battery capacity indicators, giving the approximate state of charge of an accumulator, are being shown.

*Runbaken Magneto Co.*, 240, *Deansgate, Manchester.*

### SHEFFIELD MAGNET. (117)

A set of parts for the construction of a permanent magnet moving-coil loud speaker is exhibited by this firm. The

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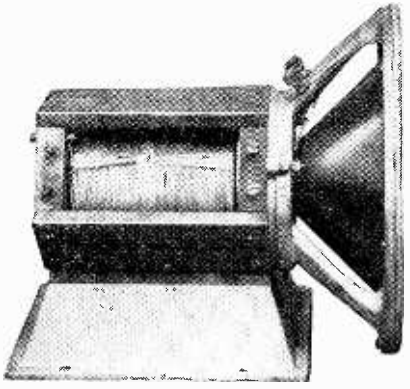
necessary magnetic flux at the gap (which is 5/64in. wide) is produced by twelve bar magnets mounted on hexagonal end pieces, the centre pin being also a permanent magnet. The coil remains in positions so that the unit can be remagnetised at any time; the firm gives a long guarantee as to the retention of magnetism, undertaking to make good any loss in this respect which may occur. All steel parts are coppered to prevent rust.



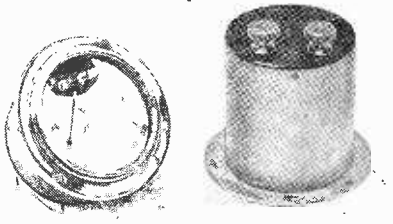
**The Sheffield Magnet Co.'s permanent loud speaker; two of the bars are removed to show the magnetising windings, which remain in position.**

Moving coils of various types are available, including a high resistance winding suitable for use with pentode output valves.

*Sheffield Magnet Co.*, 116-126, *Broad Lane, Sheffield.*

### SIFAM. (85)

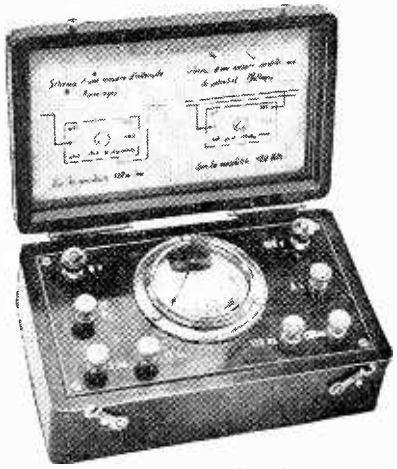
A seven-valve receiver incorporating supersonic heterodyne principles using the screened grid valve has many novel features, the most interesting of which is undoubtedly the sight tuning chart. Besides a volume control and the necessary wave-change switching and L.T. switches, there are two small tuning knobs without any calibrated dials. These control two cursors, which are arranged at right-angles to one another, and when resonance is obtained during preliminary calibration a mark is made on the chart at the point of intersection of the cursors. As a frame aerial is used



**Sifam voltmeter reading to 500 volts. Note the external series resistor. This meter is suitable for reading the voltage from heavy duty eliminators.**

the calibration remains practically constant, and it was found particularly easy to tune the receiver to stations having widely different frequencies in the minimum of time.

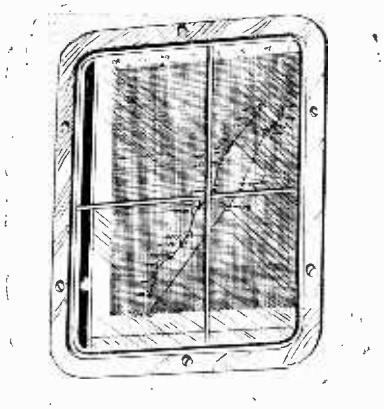
The Sifam testing set consists of a single moving coil instrument with the necessary shunts and series resistances to give 3, 12, 120, 1,200 mA. and 6



**Sifam multi-range testing instrument. Seven milliampere and voltage ranges are available.**

amperes, also 6 and 120 volts; the total current consumption is 3 mA at full voltmeter scale reading, and the price is extremely moderate at £3 3s.

A new voltmeter reading to 500 volts, which will be appreciated by those who step up the mains and like really big volume from L.S.5As and L.S.6As, is now available at 37s. 6d. At full scale reading



**Tuning chart employed on the Sifam super-seven receiver. Resonance is achieved by making the two cursors intersect at a point which has been predetermined on the chart.**

the consumption is only 2 mA, so that practically no load is placed across a battery substitute equipment. An extensive range of meters to cope with every type of demand is being exhibited.

*Sifam Electrical Instrument Co., Ltd., Bush House, Aldwych, London, W.C.2.*

### STANDARD INSULATORS. (58)

As the name of this firm would indicate, the most important exhibits are insulating materials, which are shown in a variety too great to enumerate in detail.

Bakelite panels are produced in a number of finishes, among which burr walnut is one of the most unusual and attractive. Bakelised tubes for inductance formers are manufactured in a full range of sizes and are sold at a competitive price.

Wires of different types are also on show, including lead-coated rubber aerial wire and "Kontact" insulated wire for the internal connections of receivers.

*Standard Insulator Co., Ltd., Winsley House, Wells Street, Oxford Street, London, W.1.*

### STANDARD WET BATTERY. (69)

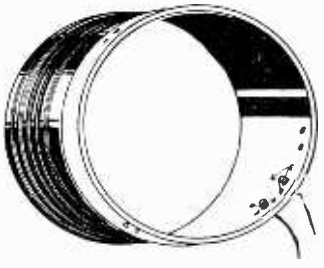
The slight difficulty sometimes encountered in making intermediate voltage tappings to the H.T. batteries supplied by this firm has been overcome by the production of a special connector consisting of an insulated brass rod carrying a clip for attachment to the zinc elements of any of the cells. Tests which show the capabilities of the batteries are carried out on the stand.

*Standard Wet Battery Co.*, 184-8, *Shaftesbury Avenue, London, W.C.1.*

**A two-range voltmeter exhibited by the Standard Wet Battery Company.**

### STAR ENGINEERING. (13)

This firm was probably the first to enter the field of moving-coil loud speaker construction, supplying parts for the early constructional articles appearing in this journal. Their present models consist of steel castings, which, with 1 ampere at 6 volts, are stated to give



**A 2,500 turn section wound coil wound on a bakelised former for moving-coil loud speaker construction suiting the requirements of the pentode output valve. (Star Engineering.)**

a flux density of 9,500 lines to the square centimetre. The greatest problem in moving-coil loud speaker construction is that of producing a rigid former for the moving coil which will withstand temperature change without losing its shape. In the Webson model the coil former is of bakelised tube.

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Of special interest is a section-wound 2,500-turn coil for use with the pentode output stage.

*Star Engineering, Didsbury, Manchester.*

*(On the stand of Claude Lyons, Ltd.)*

### TROLITE. (28)

A new finish has been added to the range of Trolite panels; this takes the

**Front view of the new Blue Spot Cone Loud Speaker.**

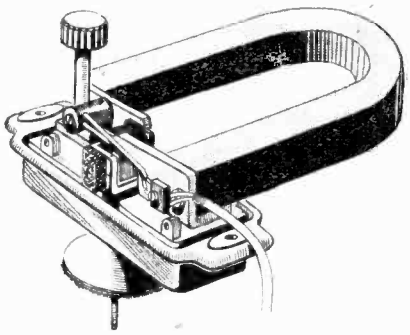
form of an imitation morocco leather surface in black, which has a good appearance, and which is not easily marred by finger-marks.

The original Blue Spot balanced armature loud speaker unit was first introduced at the Manchester Exhibition last year; in our review of the Show we outlined some of the advantages of this system. This year we have to record the addition of another model, in which provision is made for adjusting the position of the armature with respect to the

**Back view of the Blue Spot loud speaker illustrated above.**

magnet system. The external appearance of the new instrument is practically unchanged.

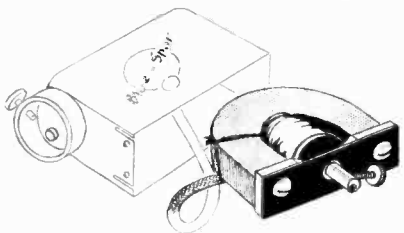
A Blue Spot gramophone pick-up has just been introduced; its construction is on fairly conventional lines, the needle



**The Blue Spot adjustable loud speaker unit.**

carrier being secured to a horseshoe magnet by means of a screw bushed with rubber, which provides the necessary damping. This carrier operates between pole-pieces attached to a substantial horseshoe magnet, the whole being enclosed in a small nickeled case.

The new Blue Spot loud speaker (Type 101) appears to be of promising design, and it certainly has an attractive appearance. A 7½in. paper cone which is attached to a small baffle by means of a



**The Blue Spot pick-up removed from its container.**

leather surround is driven by a Blue Spot unit, the whole being supported on a metal stand. A cleverly moulded Trolite ornamental front, with grille, finished in imitation burr walnut, is superimposed on the front of the loud speaker. An instrument of similar design is also supplied in a wooden cabinet (Type No. 59).

In addition there is a heavy-duty model with two cones, one of buckram and the other of paper, which are mounted side by side. Individual cones are driven by separate balanced armature movements connected in parallel, and the whole assembly is mounted in a large cabinet with ornamental front.

*F. A. Hughes and Co., Ltd., 204-206, Great Portland Street, London, W.1.*

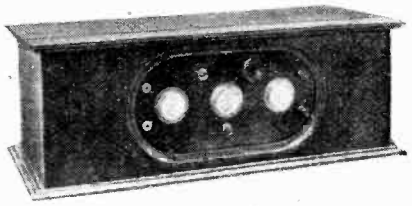
### TUTILLS. (16)

A gramophone amplifier called the "Tinol," in which careful attention has been paid to the numerical treatment of grid swings, is being shown by this company. The valves are coupled by transformer and push-pull respectively, and the plate current from each valve is passed through separate milliammeters, so that overloading can immediately be detected and traced to the correct stage.

A variable ohmic resistance is shunted across the pick-up and acts as a volume control, while a choke across the primary of the input push-pull transformer in conjunction with a variable resistance acts as a bass note control.

The Chronicle Dual-Range-Three embodies the now conventional screened grid H.F. stage, detector, and pentode output, and sells at the moderate price of £16 10s., including royalties.

A range of well-finished high- and low-tension A.C. eliminators are being shown. The model H.T.4 gives a maximum of 30 milliamperes on a 230-volt input. There are three tappings fitted, which are controlled by Clarostats,



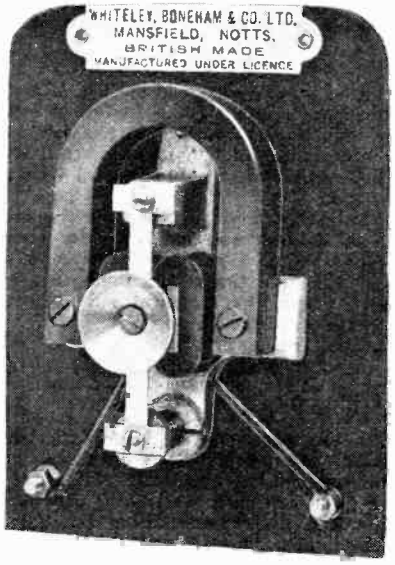
**Tutills "Tinol" gramophone amplifier with three milliammeters in the plate circuits of the valves, which readily reveal overloading.**

whereby a continuously variable voltage from zero to maximum is available. In these eliminators special attention has been paid to the incorporation of decoupling devices so that "motor boating" is entirely eliminated.

*Tutills, Ltd., 7-9, Swan Street, Manchester.*

### W.B. (7)

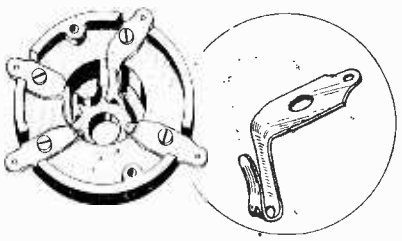
The electro-magnetic unit included in the Whiteley-Boneham loud speakers is now being marketed as a separate component. It is of robust and heavy construction, the large horseshoe magnet being made from Vickers-Armstrong cobalt steel. The position of the reed with respect to the magnet pole-pieces is




**The W.B. loud speaker unit for home constructors.**

**Manchester Radio Show.—**

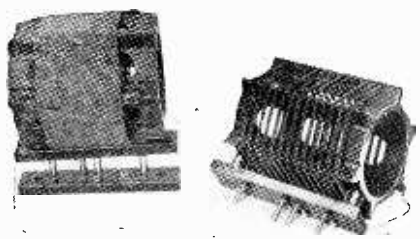
adjustable by the rotation of a knob, and the whole is mounted on a board measuring 5in. × 4in. Suitably shaped cone washers are supplied, and two Belling-Lee terminals are fitted. The unit lends



**Underside of the W.B. rigid valve holder. Inset: The one-piece spring clip and soldering tag.**

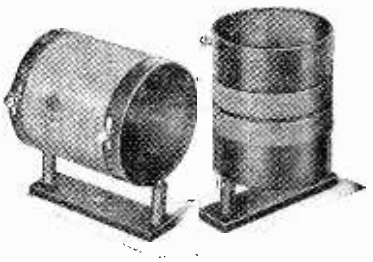
itself readily to the easy assembly of a loud speaker by the home constructor.

As a companion to the popular W.B. Anti-microphonic Valve Holder, a new



**Wearite coils for the "Megavox Three."**

component without spring suspension has been introduced. It is of sound design, matters being so arranged that there is a minimum of solid dielectric between the valve pins, which are gripped by spring clips; there can be little doubt that this is an improvement over the more conventional sockets, which, of course, cannot adjust themselves to valve pins of varying diameter. Each clip, with its soldering tag, is a one-piece fitting in nickel silver, so the possibility of poor or intermittent connections is reduced to a minimum. In the matter of price these valve holders are equally



**Wearite coils for the new "Pentode Two."**

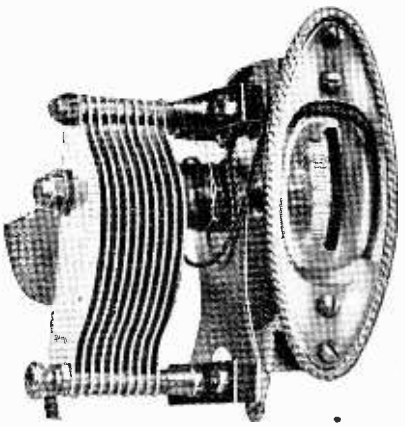
attractive; they are sold at 9d. each, 3d. being added for terminals, which are fitted if desired.

A new exhibit is the cabinet loud speaker with a free-edge cone, priced at 47s. 6d.

*Whiteley-Boneham and Co., Ltd., Nottingham Road, Mansfield, Notts.*

**WEARITE. (94)**

Among the latest additions to the series of *Wireless World* coils produced commercially by Messrs. Wright and Weaire, Ltd., are approved interchangeable aerial-grid inductances for the "Megavox Three" receiver, and also coils for the "Pentode Two." For the first mentioned, ribbed formers are used,



**A new direct-drive Simplicon condenser with edgewise control.**

a large proportion of the ebonite being cut away. The other coils are fitted with ebonite bases arranged so that they can be mounted in their correct relative positions on the baseboard.

On this stand there is also exhibited a new Simplicon thumb-controlled variable condenser without a reduction gear. This has been introduced since the Olympia Exhibition.

*Wright and Weaire, Ltd.*, 740, *High Road, Tottenham, London, N.*17.

# 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, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.**

*B.B.C. AND OSCILLATION.*

Sir,—I have been reading the 1929 B.B.C. Handbook, and made special note of the fact that in their technical section they still advocate magnetic reaction, and yet give four pages of information on how to avoid oscillation, and also state that 15,000 complaints of interference from oscillation are received in a year

Surely they must realise that the comparatively easy handling of Reinartz reaction is a safer instrument in the hands of the novice. The majority of circuits shown in the book are very much like those used four years ago. I wish the B.B.C. would leave the technical side of reception to competent journals who specialise in it. H. FOSTER.

Kentish Town, N.W.5.
October 16th, 1928.

*WHY IS IT?*

Sir,—In these days of efficient transmission, efficient receivers, and efficient loud speakers, why is it (1) that most transmissions are hopelessly obliterated by continuous heterodyne; (2) that such stations as can be heard without jamming are ruined by knob-twiddling fanatics who try to get an infinite number of stations in twenty-five minutes on receivers that can't do it?

Here, in Cambridge, London, presumably our local station, is 50 per cent. of the time hopelessly distorted. Daventry (5GB) is often "improved upon" by the aforesaid "experts on knob and dial."

Can nothing be done to clear away this hopeless chronic and nerve-wracking whistle, screech, heterodyne, oscillation, jam, or whatever you like to call it?

The oscillator of to-day ought to be put in his set's cabinet and the lid screwed down, and quietly boiled in creosote.

Cambridge. WATT SISNAME.
October 10th, 1928.

*REALISTIC REPRODUCTION.*

Sir,—Mr. Wolstenholme takes exception to a letter I wrote in your August 29th issue. In this same issue, curiously enough, appeared an article on page 252 which dealt with this very subject of the time constant in L.F. amplifiers. Are we to place this very excellent article in the category of "back-dated literature"?

The question of grid bias does not arise, since in any amplifier it is notoriously difficult to prevent grid current flow "under any circumstances." It is only too painfully easy to overload even the LS5A! Yet the valve may be operating on the middle of its straight-line characteristic.

I think it is high time that the radio engineer should grasp the reason why it is so difficult to get a cultured musician to

accept radio reproduction as satisfactory. First, the big sforzandos of music are very imperfectly received on a loud speaker. This is, with all due respect to Mr. Wolstenholme, entirely the fault of the amplifier, and were there no time factor to deal with the sforzandos would be as realistic as in the concert hall. Secondly, the higher frequencies are never satisfactorily passed, and when by some corrective process a boosting of them is effected, they are not in phase with each other; the result being that the fundamental tones of the producing instruments do not receive proper reinforcement. In short, the synthetic reproduction of music is by no means faithful.

I do not claim to have solved these problems to my complete satisfaction in my own amplifier, nor am I concerned to dispel "the grave doubts" of any of your readers. From September 22nd to 29th I demonstrated my receiver to a great number of people who took the trouble to visit 28, West Kensington Gardens that week. Certain it is that no grid current was allowed to flow under any circumstances, nor was the slightest flicker of the milliammeter needle permitted on even fortissimo passages. I was also able to show that a steel pot magnet energised by a six-volt accumulator and passing 1.75 amps was exceedingly efficient for the moving coil speaker employed. As to the quality of the reproduction, I am quite content to leave the verdict in the hands of those who heard it.

Hampstead, N.W.6. NOEL BONAVIA-HUNT.
October 2nd, 1928.

## B.B.C. CONTROL ROOM.

Sir,—May I be permitted to express my delight at your editorial in the October 17th issue of *The Wireless World* on the B.B.C. control room?

For a very long time I have felt convinced that at 5XX generally there were different views on (as it appears to me) strength of output as between one programme and another. It was practically a valve difference at times. Another thing, if in a band or orchestral item a moment of "forte" came, then the reception for the remainder of that programme was severely reduced in strength (to my intense irritation, of course).

I can recall two days of excellent reception; they were October 1st and 2nd, with a strong dynamo hum which I do not mind, but after these two days it was back in the usual, sometimes good, sometimes weak.

Another thing I notice is that singers are sometimes good in relation to piano accompaniment, but more often they seem to be behind a veil that is, "distant," while the piano is well to the fore.

To-night, 8.30 p.m. reception from 5XX is louder than it has been for a long time. I trust your article has taken effect already. Again thanking you. H. H. BRIMSON.

Reading.
October 18th, 1928.

Sir,—I have read with interest your various correspondents' remarks about the controlling engineer at the B.B.C. transmitting stations, and I have suffered myself (perhaps more than most people) from his interference with the programmes. I say "perhaps more than most people" because I feel that I have a very nearly perfect moving coil equipment, which is capable of reproducing orchestral or chamber music more nearly true to reality than any receiving set I have heard.

I speak as a musician with a very critical ear, and one who has heard regularly chamber and orchestral music of the best kind for the past thirty years.

As an example of what I frequently have to suffer: Last night, October 10th, while listening to the song recital by Hubert Eisdell, between 10 and 10.30 p.m. from 5XX, it started with perfect clearness and quality, the piano accompaniment being particularly good, it was difficult to realise that both piano and singer were not really in the room. Suddenly the volume was increased by about 50 per cent. from the transmitting end, accompanied by severe distortion at the middle register notes of both piano and singer.

I put up with this state of affairs for about ten minutes, and then switched off in disgust. I can quite believe that an ordinary type loud speaker or headphones would not have detected this distortion, but the moving coil speaker is coming more and more into general use, and while perhaps there are no moving coil sets built commercially which give anything like the results that an intelligent amateur can obtain, I think the day is not far off when this will be put right.

At any rate, I feel convinced that the quality of broadcasting should be decided by the moving coil speaker only, as this, in my opinion, is the only instrument capable of giving faithful reproduction, and of finding out the slightest faults at the transmitting end.

Surely transmission quality which is satisfactory with a moving coil speaker should be also satisfactory for other types, and if there are times when orchestral passages are too loud to be dealt with by the diaphragm speaker, it should be left to the individual listener to control them for himself.

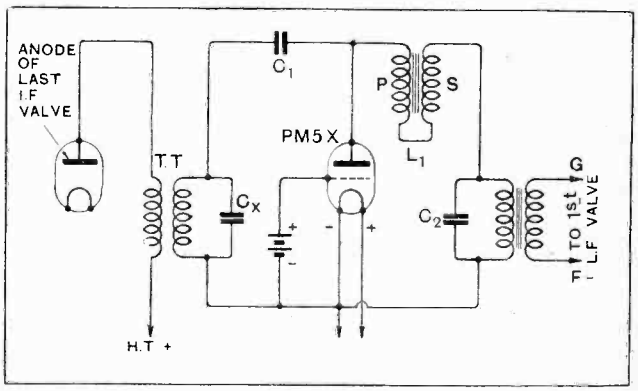
Willaston, Birkenhead. GEOFFREY SUMMERS.
October 11th, 1928.

## DIODE RECTIFIERS.

Sir,—The letter from Mr. H. W. Stacey in the issue of your journal for October 10th is very interesting.

I endorse his views entirely: for some time past I have been advocating the use of "diode rectification" for second detector of Supersonic receivers. It is much to be regretted that Mr. Stacey did not attach the proper circuit to his letter. The system is immeasurably superior to either leaky-grid rectification or "anode bend." I have pleasure in giving herewith the proper connections, in case others may desire to see how a great improvement may be effected in the normal "straight-eight supers," and I trust you can find space in your Correspondence columns to publish this circuit for the benefit of all and sundry.

TT is the "tuned transformer" of my Super. The secondary is coupled to the anode and to LT—as shown, the fixed condenser $C_1$ having a value of .00025 or .0003 mfd. The purpose of the biasing battery is to maintain the grid at a *positive* potential. In my case a PM 5X is being employed as the rectifier, and the best value was found to be +7.5V. The purpose of this positive voltage on the grid is primarily to reduce the space-charge and the impedance of the rectifier.



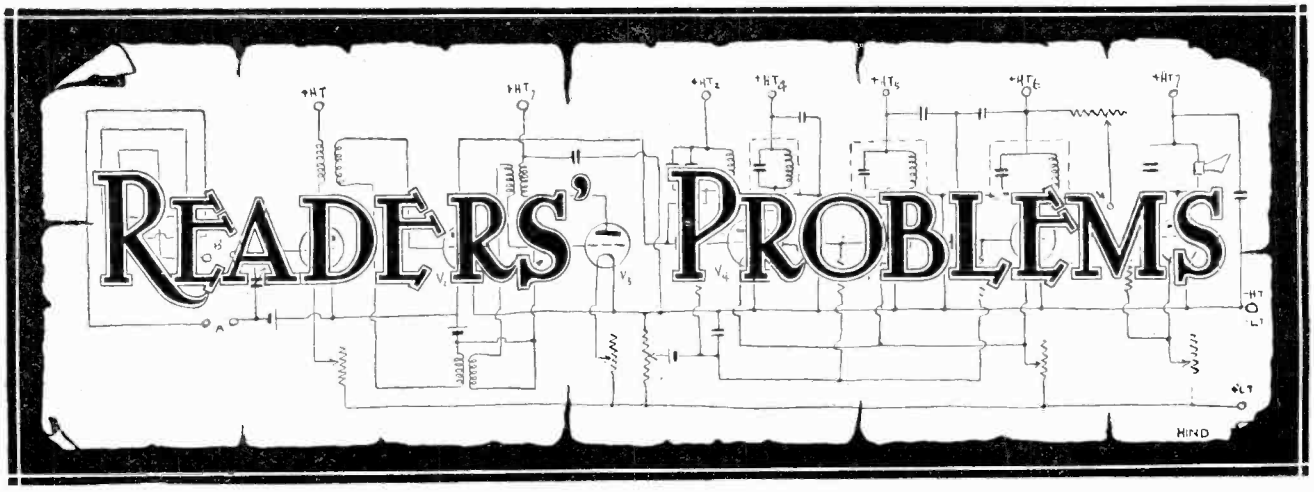

**Circuit employing diode rectifier.**

No HT is fed to the anode of the valve, the rectified signal being fed *via* the primary of a high-quality low-frequency transformer, the end of the transformer normally connected to "HT +amplifier" being taken to LT—. The primary should always be by-passed. An average value of the by-pass condenser $C_2$ is .0002 mfd. The choke $L_1$ is essential, and this is the component which it is difficult to select, for few L.F. chokes have the correct constants; very little "core" should be present. I have myself employed a 30 Kc. Supersonic transformer, connecting P. and S. in series. The particular transformer used is of American origin and has very few laminations in the core and core-shield.

I have not found it possible to overload such a rectifier, and, as Mr. Stacey has stated, the I.F. amplifier may be made considerably more sensitive, without any suspicion of background mush, than is possible with any other method of rectification at present known to me.

I have not yet had time to make careful demodulation comparisons by laboratory measurement; the improvement, however, is very apparent. C. L. LYONS.

Liverpool. October 11th, 1928.




"The Wireless World" Supplies a Free Service of Technical Information.

*The Service is subject to the rules of the Department which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.*

### An Indifferent Amplifier.

*Do you recommend me to pursue the idea of using a stage of choke coupling with a screened grid valve? I am thinking of adding an H.F. unit, built on these lines, to my existing receiver.* B. E. S.

An article in *The Wireless World* for September 26th showed that the impedance of an average H.F. choke seldom rises beyond 20,000 ohms at the middle of the broadcast waveband. Now the impedance of a screened grid valve averages about 200,000 ohms, so it will be obvious that a very small percentage of the total amplification available will be obtained by using this method of coupling. Therefore, unless you have in mind an increased amplification on the long waves only, we doubt if the results obtained from a unit of the type suggested will be sufficiently good to be attractive.

○○○○

### A Retrograde Step.

*Would any advantage be gained by using a fieldless coil in the aerial-grid circuit of the "Megavox Three"?* B. C. A.

It is inevitable that a fieldless coil will have a slightly higher H.F. resistance than that specified for the "Megavox," and as the receiver is designed on the assumption that its H.F. grid circuit shall have low losses, we think that you would be ill-advised to deviate from the specification in this respect.

○○○○

### Radio or Records?

*Will you show me how a gramophone pick-up may be connected to the "Megavox Three" receiver? Would it be possible to connect it direct to the output valve?* W. E.

Unless your pick-up gives an exceptionally large output, we doubt if you would be satisfied with the volume obtainable by connecting it directly in the grid circuit of the pentode valve. We consider it better to insert it in the grid circuit of the detector valve in the manner shown in Fig. 1. You will observe that a switch will be required; this will be at high radio-frequency potential,

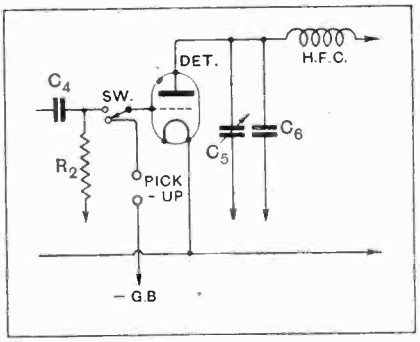



**Fig. 1.—How to connect a gramophone pick-up to the "Megavox" receiver; the reference lettering corresponds to that in the original circuit diagram.**

*RULES.*

(1.) *Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."*

(2.) *Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.*

(3.) *Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.*

(4.) *Practical wiring plans cannot be supplied or considered.*

(5.) *Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.*

(6.) *Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.*

*Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.*

and should be mounted in such a way that the disposition of the existing wiring is not radically altered. Perhaps you would find it more convenient to use two sockets with a wander plug; these could be mounted on a small ebonite platform raised slightly above the baseboard, and mounted in close proximity to the detector valve grid terminal.

○○○○

### The Car Battery.

*If it is possible to do so, I should like to charge a 6-volt L.T. accumulator from my car battery, which gives 12 volts. What value of resistance should be connected in circuit to reduce the charging current to 2 amps.?* A. S. G.

It is quite possible to charge your L.T. cells from a 12-volt battery; a series resistance of 3 ohms will pass the desired current. We expect, however, that our contemporary, *The Autocar*, would tell you that the normal type of car battery has quite enough work to do during the winter months without additional burdens, and would not recommend this course.

○○○○

### An H.F. Potentiometer.

*Would it be permissible to use a 50,000-ohm variable resistance (which I already have) for purposes of volume control in the manner suggested in the "Megavox Three" design? I find that the resistance could readily be converted to act as a potentiometer by adding an extra terminal.* T. W. McG.

We consider that an H.F. potentiometer connected across a tuned circuit should have a total resistance of not much less than 500,000 ohms; otherwise its use will cause a falling off in signal strength. The resistance you propose to use has a value which is likely to be very much less than the dynamic resistance of the tuned circuit, which may easily be of some 150,000 ohms or more.